**APPENDIX – (i)31(R)**

**UNIVERSITY OF MADRAS**

M.Sc. DEGREE COURSE IN INFORMATION TECHNOLOGY

REVISED REGULATIONS

Choice Based Credit System

(Effective from the academic year 2022-2023)

Programme Outcomes:

- The broad objective of the programme is to prepare students for challenging careers in academia and/or computing industry by providing healthy environment for teaching, learning and research in the core and applied areas of the discipline.
- The programme aims to provide an understanding of advanced Information and Computing Technologies.
- To keep a balance between fundamental concepts, core areas of information technology and specialized skills required to adapt to the needs of the dynamically evolving industry.
- The intent is on providing a strong foundation in theory along with a clear technology focus.
- To learn and evaluate a range of computing technologies, systems and application services.
- To design, analyze, develop and evaluate high-end systems.
- To undertake challenging projects and work as active researchers.
- To identify and learn about recent research and industry trends.
- To equip the student with a basic knowledge of other domains, disciplines and skills, a social and environmental consciousness and a strong value base.

**Programme Specific Outcomes:**

- Implement the concept of theory and technology with the design and analysis techniques for solving the complex problems in Information Technology.
- Be curious towards learning new and emerging technologies and adapt quickly to changes.
- Design, execute and evaluate computing projects in academia and industry using current technologies.
- Know the contextual knowledge in information technology and communicate effectively with stakeholders and with the society at large for enhancing the quality of life.
- Be honest in upholding the ethical principles and social responsibilities along with socio-economic innovations.

Course of Study and scheme of examinations:

First Semester

| Course components | Name of Course | Ins. Hours | Credits | Exam. | Max. Marks | | |
|---|---|---|---|---|---|---|---|
| | | | | | IA | UE | TO |
| Core -1 | C++ and Data Structure | 5 | 4 | 3 | 25 | 75 | 100 |
| Core -2 | Computer Architecture | 5 | 4 | 3 | 25 | 75 | 100 |
| Core -3 | Relational Database Management System | 5 | 4 | 3 | 25 | 75 | 100 |
| Elective-1 | Elective-I: Choose any one | 4 | 3 | 3 | 25 | 75 | 100 |
| Core – 4 | Practical – I: Data Structure using C++ Lab | 4 | 2 | 3 | 40 | 60 | 100 |
| Core – 5 | Practical – II: RDBMS Lab. | 4 | 2 | 3 | 40 | 60 | 100 |
| SoftSkill-1 | Communication Skills for Software Engineers | 2 | 2 | 3 | 40 | 60 | 100 |

Second Semester

| Course components | Name of Course | Hours. | Credits | Exam. | Max. Marks | | |
|---|---|---|---|---|---|---|---|
| | | | | | CIA | UE | Tot. |
| Core-6 | Design & Analysis of Algorithms | 5 | 4 | 3 | 25 | 75 | 100 |
| Core-7 | Programming in Java | 5 | 4 | 3 | 25 | 75 | 100 |
| Elective -2 | Elective – II : Choose any one | 4 | 3 | 3 | 25 | 75 | 100 |
| Elective -3 | Elective – III : Choose any one | 4 | 3 | 3 | 25 | 75 | 100 |
| Core-8 | Practical – III : Java Programming Lab | 4 | 2 | 3 | 40 | 60 | 100 |
| Core -9 | Practical – IV : Based on Elective III Lab. | 4 | 2 | 3 | 40 | 60 | 100 |
| Core-9A | Practical – IV : Based on Elective III Lab. Web Technology Lab | | | | | | |
| Core-9B | Practical – IV : Based on Elective III Lab. Python Programming Lab | | | | | | |
| Core-9C | Practical – IV : Based on Elective III Lab. Mobile Application Development Lab. | | | | | | |
| SoftSkill-2 | | 2 | 2 | 3 | 40 | 60 | 100 |
| SoftSkill-3 | Team Project | 2 | 2 | 3 | 40 | 60 | 100 |
| Internship Training | | | | | | | |

Third Semester

| Course components | Name of Course | Ins. Hours | Credits | Exam. Duration | Max. Marks | | |
|---|---|---|---|---|---|---|---|
| | | | | | CIA | UE | Tot |
| Core-10 | Computing Networks | 4 | 4 | 3 | 25 | 75 | 100 |
| Core-11 | Operating Systems | 4 | 4 | 3 | 25 | 75 | 100 |
| Core -12 | Machine Learning | 4 | 4 | 3 | 25 | 75 | 100 |
| Extra-Disciplinary | Information Security | 4 | 4 | 3 | 25 | 75 | 100 |
| Elective | Elective – IV | 4 | 3 | 3 | 25 | 75 | 100 |
| Core-13 | Practical – V: Machine Learning Lab. | 4 | 2 | 3 | 40 | 60 | 100 |
| Core -14 | Mini Project | 4 | 2 | 3 | 40 | 60 | 100 |
| Soft Skill-4 | Document Preparation Skills for Software Engineers | 2 | 2 | 3 | 40 | 60 | 100 |
| Internship** | During summer vacation 4 to 6 weeks of I Year | | 2 | | | 100 | 100 |

** Internship will be carried out during the summer vacation of the first year and marks Should be sent to the University by the College and the same will be included in the Third Semester Marks Statement.

Fourth Semester

| Course components | Name of Course | Credits | Exam. | Max. Marks | | |
|---|---|---|---|---|---|---|
| | | | | CIA | UE | Total |
| Core-15 | Project & Viva-Voce | 20 | - | 20 | 60+ 20 | 100 |

Elective – I Data Warehousing & Data Mining/E-Commerce /Agile Software Engineering
Elective – II Cloud Computing /Software Testing/Bigdata Analytics
Elective – III Web Technology / Python Programming / Mobile Application Development
Elective – IV Internet of Things / Computer Vision/ Data Visualization

**List of Soft Skill Courses**

1. Communication Skills for Software Engineers – I
2. Communication Skills for Software Engineers – II
3. Personality Development and other Soft Skills for Software Engineers

4. Document Preparation and Interview skills for Software Engineers
5. Team Project

Learning Outcome Index: Mapping of program outcome with courses

| Table 1 | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Program Outcomes | Core Courses | | | | | | | | | | | | | | |
| | CO 1 | CO 2 | CO 3 | CO 4 | CO 5 | CO 6 | CO 7 | CO 8 | CO 9 | CO10 | CO11 | CO12 | CO13 | CO14 | CO15 |
| Outcomes 1 | X | | X | | | X | | | | | X | | | X | X |
| Outcomes 2 | | X | | | X | | | X | X | | | X | | X | |
| Outcomes3 | X | | | X | | | X | | | X | X | | X | | |
| Outcomes 4 | | X | | | X | X | | X | X | | | X | | | X |
| Outcomes 5 | X | | X | | | | X | | X | | | | X | | |
| Outcomes 6 | | X | | X | X | | | X | | X | | X | | X | X |
| Outcomes 7 | X | | X | | | X | X | | X | | X | | X | | X |
| Outcomes 8 | X | | | X | | X | X | | | X | | X | | | |
| Outcomes 9 | | X | X | X | X | | | X | X | | X | | X | X | X |

CO i – $i^{th}$ Core Course

| Table 2 | | |
|---|---|---|
| Program Outcomes | Extra-Disciplinary Courses | |
| | Course 1 | Course 2 |
| Outcomes 1 | X | |
| Outcomes 2 | | X |
| Outcomes3 | X | |
| Outcomes 4 | | X |

| | | |
|---|---|---|
| Outcomes 5 | | X |
| Outcomes 6 | X | |
| Outcomes 7 | X | |
| Outcomes 8 | | X |
| Outcomes 9 | X | X |

Table 3

| Program Outcomes | Elective Courses | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CO 1 | CO 2 | CO 3 | CO 4 | CO 5 | CO 6 | CO 7 | CO 8 | CO 9 | CO10 | CO11 | CO12 |
| Outcomes 1 | X | | X | | | X | | | | | X | |
| Outcomes 2 | | X | | | X | | | X | X | X | | X |
| Outcomes3 | X | | X | X | | | X | | | X | X | |
| Outcomes 4 | | X | | | X | | | X | X | | | |
| Outcomes 5 | X | | X | | | X | X | | | X | X | |
| Outcomes 6 | | X | | X | X | | | X | | | | X |
| Outcomes 7 | X | | X | | | X | X | | X | X | | X |
| Outcomes 8 | | | | X | | X | X | | | | | X |
| Outcomes 9 | | X | X | | X | | | X | X | | X | |

| Table 4 | | | | | |
|---|---|---|---|---|---|
| Program Outcomes | Soft Skill Courses | | | | |
| | Course 1 | Course 2 | Course 3 | Course 4 | Course 5 |
| Outcomes 1 | X | | X | X | |
| Outcomes 2 | | X | | X | X |
| Outcomes3 | | X | | | |
| Outcomes 4 | X | | | | X |
| Outcomes 5 | | X | X | | |
| Outcomes 6 | X | | | X | X |
| Outcomes 7 | X | | X | | |
| Outcomes 8 | | X | | X | X |
| Outcomes 9 | X | X | X | | |

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**S.SENATE.SEPT.'2022**

**APPENDIX – 31(S)**

**UNIVERSITY OF MADRAS**

M.Sc. DEGREE COURSE IN INFORMATION TECHNOLOGY

REVISED SYLLABUS

Choice Based Credit System

(Effective from the academic year 2022-2023)

| | | | |
|---|---|---|---|
| Title of the Course/ Paper | C++ and Data Structures | | |
| Core – 1 | I Year & I Semester | Credit: 4 | |

**Objectives:**

- Object oriented concepts, C++ language.
- Classes & Objects, Inheritance, Polymorphism.
- Templates, Streams, Files.
- Able to Design & implement various forms of inheritance, String class.
- To teach efficient storage mechanisms of data for an easy access.
- To design and implementation of various basic and advanced data structures.
- To introduce various techniques for representation of the data in the real world.
- To develop application using data structures.

**Outcomes:**

- learn Object Oriented concepts, C++ language.
- Learn and analyze various problems using C++ program.
- Learn to choose appropriate data structure as applied to specified problem definition.
- Learn to handle operations like searching, insertion, deletion, traversing mechanism.
- Able to use linear and non-linear data structures like stacks, queues, and linked list.

Unit 1: Introduction to C++; Tokens, Keywords, Identifiers, Variables, Operators, Manipulators, Expressions and Control Structures in C++; Pointers - Functions in C++ - Main Function -Function Prototyping - Parameters Passing in Functions - Values Return by Functions - Inline Functions - Friend and Virtual Functions

Unit-2: Classes and Objects; Constructors and Destructors; and Operator Overloading and Type Conversions - Type of Constructors - Function overloading. Inheritance : Single Inheritance - Multilevel Inheritance - Multiple Inheritance - Hierarchical Inheritance - Hybrid Inheritance. Pointers, Virtual Functions and Polymorphism; Managing Console I/O operations.

Unit 3: Working with Files: Classes for File Stream Operations - Opening and Closing a File - End-of-File Deduction - File Pointers - Updating a File - Error Handling during File Operations - Command-line Arguments. Data Structures: Definition of a Data structure - primitive and composite Data Types, Asymptotic notations, Arrays, Operations on Arrays, Order lists.

Unit-4:Stacks - Applications of Stack - Infix to Postfix Conversion, Recursion, Maze Problems - Queues- Operations on Queues, Queue Applications, Circular Queue. Singly Linked List- Operations, Application - Representation of a Polynomial, Polynomial Addition; Doubly Linked List - Operations, Applications.

Unit-5 : Trees and Graphs: Binary Trees - Conversion of Forest to Binary Tree, Operations - Tree Traversals; Graph - Definition, Types of Graphs, Hashing Tables and Hashing Functions, Traversal - Shortest Path; Dijkstra's Algorithm.

Recommended Texts :


1. E.Horowitz, S.Sahni and Mehta, 1999, Fundamentals of Data Structures in C++, Galgotia.
2. Herbert Schildt, 1999, C++ - The complete Reference, Third Edition, Tata McGraw –Hill.


Reference Books:


1. GregoryL.Heileman, 1996, Data Structures , Algorithms and Object Oriented Programming – Mc-Graw Hill International Editions.
2. A.V.Aho, J.D. Ullman, J.E. Hopcraft: Data Structures and Algorithms-Adisson Wesley Pub.


E-learning resources:

1) https://nptel.ac.in/courses/106105151
2) https://onlinecourses.nptel.ac.in/noc21_cs02/preview
3) https://nptel.ac.in/courses/106101208
4) https://nptel.ac.in/courses/106102064
5) https://nptel.ac.in/courses/106106127

**Mapping with Programme Outcomes:**

| | **PO 1** | **PO 2** | **PO 3** | **PO 4** | **PO 5** | **PO 6** | **PO 7** | **PO 8** | **PO 9** | **PO 10** |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO 1** | S | S | S | M | M | M | M | M | M | L |
| **CO 2** | S | M | S | S | L | S | S | L | M | M |
| **CO 3** | S | S | S | S | S | L | S | M | L | M |
| **CO 4** | S | S | M | S | L | S | S | M | M | S |
| **CO 5** | S | S | M | L | S | M | S | S | L | S |

S-Strong M-Medium L-Low

| Title of the Course/ Paper | Computer Architecture | | |
|---|---|---|---|
| Core – 2 | I Year & I Semester | Credit: 4 | |

**Objectives:**

- The objective of this course is to provide the fundamental concepts associated with the digital logic and circuit design.
- To introduce the basic concepts and laws involved in the Boolean algebra and logic families and digital circuits.
- To familiarize with the different number systems, logic gates, and combinational and sequential circuits utilized in the different digital circuits and systems.
- The course will help in design and analysis of the digital circuit and system.

**Outcomes:**

- 1: Became familiar with the digital signal, positive and negative logic, Boolean algebra, logic gates, logical variables, the truth table, number systems, codes, and their conversion from to others.
- 2: Learn the minimization techniques to simply the hardware requirements of digital circuits, implement it, design and apply for real time digital systems.
- 3: Understand the working mechanism and design guidelines of different combinational, sequential circuits and their role in the digital system design

Unit – I Data and Information Features of Digital Systems, Number Systems. Decimal, Binary, Octal, Hexadecimal and their inter conversions, Representation of Data: Signed Magnitude, one's complement and two's complement, Binary Arithmetic, Fixed point representation and Floating point representation of numbers. Codes BCD, XS-3, Gray code, hamming code, alphanumeric codes (ASCII, EBCDIC, UNICODE), Error detecting and error correcting codes.

Unit- II Boolean Algebra: Basic gates (AND, OR, NOT gates), Universal gates (NAND and NOR gates), other gates (XOR, XNOR gates). Boolean identities, De Morgan Laws. Karnaugh maps: SOP and POS forms, Quine McClusky method.

Unit -III Combinational Circuits: Half adder, full adder, code converters, combinational circuit design, Multiplexers and demultiplexers, encoders, decoders, Combinational design using mux and demux, PLA.

Unit - IV Sequential Circuit Design: Flip flops (RS, Clocked RS, D, JK, JK Master Slave, T, Counters, Shift registers and their types, Counters: Synchronous and Asynchronous counters.

Unit- V ALU Structure - Memory: ROM, RAM, PROM, EPROM, EEPROM, Secondary Memory: Hard Disk and optical Disk, Cache Memory, I/O devices.

Text books:

Modern Digital Electronics by R. P. Jain, 3rd Edition, McGraw Hill

– Digital Design and Computer Organisation by Dr. N. S. Gill and J. B. Dixit, University Science Press

– Linux Commands by Bryan Pfaffaenberger BPB Publications

– UNIX by Sumitabha Das, TMH

References Books:

– Digital Principles and Applications by Malvino and Leach, McGrawHill

– Introduction to Computers by Peter Norton, McGraw Hill

– Introduction to Computers by Balagurusamy

**Mapping with Programme Outcomes:**

| **Mapping with Programmers outcomes*** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | M | S | M | S | M | S | L | M | L | L |
| CO2 | S | S | L | S | S | S | M | L | M | M |
| CO3 | L | M | S | L | M | M | S | L | S | M |
| CO4 | S | M | L | M | L | L | M | M | M | S |
| CO5 | M | S | S | S | S | S | M | L | M | S |

S-Strong M-Medium L-Low

| Title of the Course/ Paper | Relational Database Management System | | |
|---|---|---|---|
| Core – 3 | I Year & I Semester | Credit: 3-1-0-4 | |

OBJECTIVES

- To learn the fundamentals of data models and to represent a database system using ER diagrams.
- To study SQL and relational database design.
- To understand the internal storage structures using different file and indexing techniques which will help in physical DB design.
- To understand the fundamental concepts of transaction processing- concurrency control techniques and recovery procedures.
- To have an introductory knowledge about the Storage and Query processing Techniques

OUTCOMES: Upon completion of the course, the students will be able to:

- Classify the modern and futuristic database applications based on size and complexity
- Map ER model to Relational model to perform database design effectively
- Write queries using normalization criteria and optimize queries
- Compare and contrast various indexing strategies in different database systems
- Appraise how advanced databases differ from traditional databases.

UNIT I: RELATIONAL DATABASES: Purpose of Database System – Views of data – Data Models – Database System Architecture – Introduction to relational databases – Relational Model – Keys – Relational Algebra – SQL fundamentals – Advanced SQL features – Embedded SQL– Dynamic SQL

UNIT II: DATABASE DESIGN: Entity-Relationship model – E-R Diagrams – Enhanced-ER Model – ER-to-Relational Mapping – Functional Dependencies – Non-loss Decomposition – First, Second, Third Normal Forms, Dependency Preservation – Boyce/Codd Normal Form – Multi-valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form

UNIT III: TRANSACTIONS: Transaction Concepts – ACID Properties – Schedules – Serializability – Concurrency Control – Need for Concurrency – Locking Protocols – Two Phase Locking – Deadlock – Transaction Recovery - Save Points – Isolation Levels – SQL Facilities for Concurrency and Recovery.

UNIT IV: IMPLEMENTATION TECHNIQUES RAID: – File Organization – Organization of Records in Files – Indexing and Hashing –Ordered Indices – B+ tree Index Files – B tree Index Files – Static Hashing – Dynamic Hashing – Query Processing Overview – Algorithms for SELECT and JOIN operations – Query optimization using

Heuristics and Cost Estimation.

UNIT V: ADVANCED TOPICS: Distributed Databases: Architecture, Data Storage, Transaction Processing – Object-based Databases: Object Database Concepts, Object-Relational features, ODMG Object Model, ODL, OQL - XML Databases: XML Hierarchical Model, DTD, XML Schema, XQuery – Information Retrieval: IR Concepts, Retrieval Models, Queries in IR systems.

TEXT BOOKS:

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, ―Database System Concepts, Sixth Edition, Tata McGraw Hill, 2011.
2. Ramez Elmasri, Shamkant B. Navathe, ―Fundamentals of Database Systems‖, Sixth Edition, Pearson Education, 2011.

REFERENCES:

1. C.J.Date, A.Kannan, S.Swamynathan, ―An Introduction to Database Systems‖, Eighth Edition, Pearson Education, 2006.
2. Raghu Ramakrishnan, ―Database Management Systems‖, Fourth Edition, McGraw-Hill College Publications, 2015.
3. G.K.Gupta,"Database Management Systems‖, Tata McGraw Hill, 2011.

Mapping with Programme Outcomes:

| **Mapping with Programmers outcomes*** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | S | S | M | S | M | S | L | M | L | L |
| CO2 | S | M | L | S | M | S | M | L | M | M |
| CO3 | L | M | S | L | M | M | S | L | S | M |
| CO4 | S | M | L | M | L | L | M | M | M | S |
| CO5 | M | S | M | S | S | S | M | L | M | L |

S-Strong M-Medium L-Low

| Title of the Course/ Paper | Practical – I: Data Structures using C++ Lab | | |
|---|---|---|---|
| Core – 4 | I Year & I Semester | Credit: 0-0-4-2 | |

**Objectives:**

- The course is designed to develop skills to design and analyze simple linear and non linear data structures. It strengthen the ability to the students to identify and apply the suitable data structure for the given real world problem. It enables them to gain knowledge in practical applications of data structures

**Outcomes:**

At the end of this lab session, the student will

- Be able to design and analyze the time and space efficiency of the data structure
- Be capable to identity the appropriate data structure for given problem
- Have practical knowledge on the applications of data structures

For the implementation of the following problems, the students are advised to use all possible object oriented features. The implementation based on structured concepts will not accepted.

1. Implementation of Arrays (Single and Multi-Dimensional)
2. Polynomial Object and necessary overloaded operators.
3. Singly Linked Lists.
4. Circular Linked Lists.
5. Doubly Linked Lists.
6. Implementation of Stack (using Arrays and Pointers)

7. Implementation of Queue (Using Arrays and Pointers)
8. Implementation of Circular Queue (using Arrays and Pointers)
9. Evaluation of Expressions.
10. Binary Tree implementations and Traversals.
11. Binary Search Trees.

Mapping with Programme Outcomes:

| **Mapping with Programmers outcomes*** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | S | M | S | S | M | S | L | M | L | L |
| CO2 | S | S | M | S | M | L | L | L | M | L |
| CO3 | L | M | S | L | M | S | S | L | S | M |
| CO4 | S | L | L | M | L | L | M | S | M | S |
| CO5 | M | S | M | L | S | S | M | L | M | L |

S-Strong M-Medium L-Low

| Title of the Course/ Paper | Practical – II: RDBMS Lab. | | |
|---|---|---|---|
| Core – 5 | I Year & I Semester | Credit: 0-0-4-2 | |

OBJECTIVES:

- To understand data definitions and data manipulation commands
- To learn the use of nested and join queries
- To understand functions, procedures and procedural extensions of data bases
- To be familiar with the use of a front end tool
- To understand design and implementation of typical database applications

OUTCOMES: Upon completion of the course, the students will be able to:

- Use typical data definitions and manipulation commands.
- Design applications to test Nested and Join Queries
- Implement simple applications that use Views
- Implement applications that require a Front-end Tool
- Critically analyze the use of Tables, Views, Functions and Procedures

1. Data Definition Commands, Data Manipulation Commands for inserting, deleting, updating and retrieving Tables and Transaction Control statements
2. Database Querying – Simple queries, Nested queries, Sub queries and Joins
3. Views, Sequences, Synonyms 4. Database Programming: Implicit and Explicit Cursors
5. Procedures and Functions
6. Triggers
7. Exception Handling
8. Database Design using ER modeling, normalization and Implementation for any application
9. Database Connectivity with Front End Tools
10. Case Study using real life database applications.

i. Library Information Processing.
ii. Students Mark sheet processing using images.
iii. Bank Transactions (SB).
iv. Pay roll processing.
v. Inventory
vi. Purchase order processing.

Mapping with Programme Outcomes:

| **Mapping with Programmers outcomes*** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | S | M | M | S | M | S | L | M | L | L |
| CO2 | S | S | M | S | M | M | L | L | M | L |
| CO3 | L | M | S | L | M | S | S | L | S | M |
| CO4 | S | L | L | M | M | L | M | S | M | S |
| CO5 | M | S | M | L | S | S | M | L | M | L |

S-Strong M-Medium L-Low

| Title of the Course/ Paper | Design and Analysis of Algorithms | | |
|---|---|---|---|
| Core – 6 | I Year & II Semester | Credit: 3-1-0-4 | |

Outcomes:

- Learn about simple problems and complexity of their solutions.
- To understand the role of algorithms in problem solving. Learn and understand the asymptotic analysis of algorithms.
- Learn and analyze various algorithm design methods through general principles and with selected set of example problems.
- Conceptualize and use these methods to solve complex real world problems particularly problems involved in industrial projects.
- Critically analyze and compare the algorithms for a set of selected example problems which are hard in nature with design approaches like greedy, dynamic programming and branch and bound etc.

**Objectives:**

- To define the term Algorithm in the context of problem solving. To make students understand the design and analysis process of algorithms for simple problems.
- Understand various algorithm design methods, apply them for problem solving and analyze the complexity for simple problems.
- Study algorithm design methods for complex problems and compare and analyze the complexity of approximate and exact algorithms.
- Calculate and measure the performance of algorithms and compare the results. Critically assess the performance.
- Differentiate the concepts studied with certain selected examples and compare and generalize.

Unit 1: Introduction - Definition of Algorithm – pseudocode conventions – recursive algorithms – time and space complexity – big-“oh” notation – exponentiation - practical complexities – randomized algorithms – repeated element – primality testing - Disjoint Sets- disjoint set operations, union and find algorithms,

Unit-2: Divide and Conquer: General Method - Finding maximum and minimum – merge sort - Quicksort, Selection, Strassen's matrix multiplication.

Unit 3: – Greedy Method: General Method – knapsack problem - Tree vertex splitting - minimum cost spanning trees - Job sequencing with deadlines – single source shortest paths. Dynamic Programming: General Method - multistage graphs – all pairs shortest paths — 0/1 knapsack .

Unit 4: Search techniques for graphs –DFS-BFS-connected components – Spanning trees– biconnected components. Back Tracking: General Method – 8-queens - Sum of subsets - Graph

Coloring – Hamiltonian cycles.

Unit 5: Branch and Bound: General Method - Job sequencing with deadlines – 0/1 knapsack problem - Traveling Salesperson problem. - Basic Concepts of NP-Hard and NP-Complete problems.

**Recommended Texts:**

1) E. Horowitz, S. Sahni and S. Rajasekaran, 2008, Computer Algorithms, 2nd Edition, Universities Press, India.

**Reference Books**

1) G. Brassard and P. Bratley, 1997, Fundamentals of Algorithms, PHI, New Delhi.
2) A.V. Aho, J.E. Hopcroft, J.D. Ullmann, 1974, The Design and Analysis of Computer Algorithms, Addison Wesley, Boston.
3) S.E.Goodman and S.T.Hedetniemi, 1977, Introduction to the Design and Analysis of algorithms, Tata McGraw Hill Int. Edn, New Delhi.

**E-learning resources**

1) http://www.cise.ufl.edu/~raj/BOOK.html

Mapping with Programme Outcomes:

| **Mapping with Programmers outcomes*** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | S | S | M | S | M | M | L | M | L | L |
| CO2 | S | S | M | S | M | M | L | L | M | L |
| CO3 | L | M | S | L | M | S | S | L | S | M |
| CO4 | S | L | L | M | M | L | L | S | M | S |
| CO5 | M | S | M | L | S | M | M | L | M | L |

S-Strong M-Medium L-Low

| Title of the Course/ Paper | Programming in Java | | |
|---|---|---|---|
| Core – 7 | I Year & II Semester | Credit: 3-1-0-4 | |

**OBJECTIVES:**

- To understand the concepts of Object Oriented Programming.
- To learn about the control structures, class with attributes and methods used in Java

**OUTCOMES:**

- Knowledge of the structure and model of the Java programming language.
- Understand the basic principles of creating Java applications with GUI.
- Demonstrate use of string and String Buffers, develop multithreaded programs in Java

**Unit – I**

The History and Evolution of Java – Object Oriented Programming - Data Types, Variables and Arrays - Operators – Control Statements.

**Unit – II**

Introducing Classes - Class Fundamentals – Declaring Objects –Introducing Methods - Constructors – this Keyword - Garbage Collection – Finalize() Method – Methods and Classes – Inheritance – Packages and Interfaces.

**Unit – III**

Exception Handling – The Java Thread Model – Enumeration Fundamentals – String Handling – The Stream Classes – Byte Stream – Character Streams.

**unit – IV**

The Applet Class – Event Handling - Introducing the AWT: Working with Windows, Graphics and Text – AWT Controls, Layout Managers and Menus- Networking.

**Unit – V**

Java Beans – Advantages of Java Bean – Introducing Swing – Swing Buttons – Servlets – JDBC – Applications on databases - Multimedia streaming applications – Java Media Framework.

**Text Book**

1. The Complete Reference - Java – Seventh Edition , Herbt Schildt- ISBN 978-0-07-163177-8

**Reference Book**

2. Hortsmann & Cornell, “Core Java2 Advanced Features, Vol II”, Pearson Education, 2002.

Mapping with Programme Outcomes:

| Mapping with Programmers outcomes* | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | S | S | M | S | M | M | L | M | L | L |
| CO2 | S | S | M | S | S | M | L | L | M | L |
| CO3 | L | M | S | L | M | S | S | L | S | M |
| CO4 | S | L | L | M | M | L | L | S | M | S |
| CO5 | M | S | M | L | S | M | M | L | M | L |

S-Strong M-Medium L-Low

| Title of the Course/ Paper | Practical – III : Java Programming Lab. | | |
|---|---|---|---|
| Core – 8 | I Year & II Semester | Credit: 0-0-4-2 | |

**Objectives:**

- To write programs using abstract classes.
- To write programs that connects database using JDBC
- To write multithreaded programs.
- To write GUI programs using AWT controls in Java.
- To impart hands on experience with java programming.

**Outcomes:**

- Develop program using Oops concept of Java
- Develop program using GUI framework (AWT and Swing)
- Handle events of AWT and Swing Components.
- Develop programs to handle events in Java Programming.
- Develop Java Programs using Networking Concepts.
- Develop programs using Database.
- Develop programs using Servlets.

**List of Exercise:**

1. Write a Java program to find area and perimeter of different shapes.
2. Write a java Program to find sum of n prime numbers.
3. Write a java program to find simple and compound Interest using this keyword.
4. Write a Java program to create a class account using the inheritance and static that show all function of the bank(Withdrawal, Deposit) .
5. Write a Java program to perform different string manipulation.
6. Write a Java program to handle exception using try and multiple catch block.
7. Write a java program that connects to a database using JDBC and perform add, deletes, modify and retrieve operations
8. Write a program to demonstrate the use of AWT components like Label, Textfield, TextArea, Button, Checkbox, RadioButtonetc
9. Write a program using AWT to create a menubar where menubar contains menu items such as File, Edit, View and create a submenu under the File menu: New and Open.
10. Develop an Applet that receives an integer in one text field & compute its factorial value & returns it in another text filed when the button "Compute" is clicked.
11. Write a program to demonstrate status of key on Applet window such as KeyPressed, KeyReleased, KeyUp, KeyDown

12. Write a program to demonstrate various mouse events using MouseListener and MouseMotionListener interface
13. Write a Servlet program to send username and password using HTML forms and authenticate the user

Mapping with Programme Outcomes:

| **Mapping with Programmers outcomes*** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | S | M | M | S | S | M | L | M | L | L |
| CO2 | S | S | M | S | S | M | L | L | M | L |
| CO3 | L | M | S | L | M | S | S | L | S | M |
| CO4 | S | L | L | M | M | L | L | S | M | S |
| CO5 | M | S | M | L | S | M | M | L | M | L |

S-Strong M-Medium L-Low

| Title of the Course/ Paper | Practical – IV : Based on Elective III Lab. | | |
|---|---|---|---|
| Core – 9 | I Year & II Semester | Credit: 0-0-4-2 | |

| Title of the Course/ Paper | Practical – IV : Based on Elective III Lab. Web Technology Lab | | |
|---|---|---|---|
| Core – 9A | I Year & II Semester | Credit: 0-0-4-2 | |

**OBJECTIVES**

- To explore about JavaScript objects
- To implement XML and Web services
- Explain how to create dynamic Web pages by using ASP.NET.
- Create a user interface on an ASP.NET page by using standard Web server controls.
- Create a user control and a custom server control and add them to an ASP.NET page.
- Display dynamic data from a data source by using ADO.Net

**OUTCOMES:**

At the end of this Lab course students will be able to

- Create Web Pages using Javascript object
- Design web pages using xml and webservices
- Create user interactive web pages using ASP.Net.
- Create simple data binding applications using ADO.Net connectivity.

**LIST OF PROGRAMS:**

1. Validate the Registration, user login and payment by credit card pages using JavaScript.
2. Write a JavaScript to design a simple calculator to perform the following operations: sum, product, difference and quotient
3. Write a program to implement XML Document Creation
4. Write a program to implement Internal DTD Creation
5. Write a program to implement External DTD Creation
6. Write a program to implement XML Schema Creation
7. Write a program to implement WSDL Service (HelloService.WSDL File)
8. Write a program the service provider can be implement a single get price (), static
9. Write a program to implement to create a simple web service that converts the temperature from Fahrenheit to Celsius (using HTTP Post Protocol)
10. Write a program to study the Validation controls in asp.net.
11. Write a program to study the grid view control in asp.net.
12. Write a program to study the ADO.net and Stored procedure in asp.net.
13. Write a program to access data sources through ADO.NET

14. R.CHERAN [M.Sc Computer Science]  Page 3
17. SYLLABUS
19. ASP.NET Lab

Mapping with Programme Outcomes:

| **Mapping with Programmers outcomes*** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | S | S | M | S | M | M | L | M | L | L |
| CO2 | S | S | M | S | S | M | L | L | M | L |
| CO3 | L | M | S | L | M | S | S | L | S | M |
| CO4 | S | M | S | M | M | L | L | S | L | S |
| CO5 | M | S | M | L | S | M | M | L | M | L |

S-Strong M-Medium L-Low

| Title of the Course/ Paper | Practical – IV : Based on Elective III Lab. Python Programming Lab | | |
|---|---|---|---|
| Core – 9B | I Year & II Semester | Credit: 0-0-4-2 | |

**OBJECTIVE:**

- To implement the python programming features in practical applications.
- To write, test, and debug simple Python programs.
- To implement Python programs with conditionals and loops.
- Use functions for structuring Python programs.
- Represent compound data using Python lists, tuples, dictionaries, turtles, Files and modules.

**OUTCOMES:**

- Understand the numeric or real life application problems and solve them
- Apply a solution clearly and accurately in a program using Python.
- Apply the best features available in Python to solve the situational problems

**List of Exercise:**

1. Design a script in Scratch to make a sprite to draw geometrical shapes such as Circle, Triangle, Square, and Pentagon.
2. Design a script in Scratch to make a sprite to ask the user to enter two different numbers and an arithmetic operator and then calculate and display the result
3. Design a Python Script to convert a given number to words
4. Design a Python script to convert a Binary number to Decimal number and verify if it is a Perfect number.
5. Design a Python script to sort numbers specified in a text file using lists.
6. Design a Python script to determine the difference in date for given two dates in YYYY:MM:DD format 0 <= YYYY <= 9999, 1 <= MM <= 12, 1 <= DD <= 31 following the leap year rules.
7. Design a Python Script to determine the Square Root of a given number without using inbuilt functions in Python
8. Design a Python Script to generate the frequency count of words in a text file.
9. Design a Python Script to print a spiral pattern for a 2 dimensional matrix
10. Write a Python program to create a dictionary grouping a sequence of key-value pairs into a dictionary of lists. Original list: [('yellow', 1), ('blue', 2), ('yellow', 3), ('blue', 4), ('red', 1)] Grouping a sequence of key-value pairs into a dictionary of lists: {'yellow': [1, 3], 'blue': [2, 4], 'red': [1]}
11. Design a Python script to generate statistical reports (Minimum, Maximum, Count, Average

& Sum) on public datasets

12. Write a Python program to check that a string contains only a certain set of characters in this case a-z, A-Z and 0-9
13. Write a Python program to find the occurrence and position of the substrings within a string.

Mapping with Programme Outcomes:

| **Mapping with Programmers outcomes*** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | S | S | M | S | M | M | L | M | L | L |
| CO2 | S | S | M | S | S | M | L | L | M | L |
| CO3 | M | M | S | L | L | S | S | L | S | M |
| CO4 | S | L | L | M | M | L | L | S | M | S |
| CO5 | M | S | M | L | S | M | M | L | M | L |

S-Strong M-Medium L-Low

| Title of the Course/ Paper | Practical – IV : Based on Elective III Lab. Mobile Application Development Lab. | | |
|---|---|---|---|
| Core – 9C | I Year & II Semester | Credit: 0-0-4-2 | |

**Objective:**

The objective of this lab is to get an overview of the various application techniques and can able to demonstrate them using android.

**Outcomes:**

After the completion of the course the student can able to:

- Understand complexity of android application and techniques and their limitations.
- Capable of confidently applying common android application in practice and implementing their own.
- Capable of performing experiments in android application using virtual games.

**List of Exercise:**

1. Develop an application that uses GUI components, Font and Colors.
2. Develop an application that uses Layout Managers and event listeners.
3. Develop a native calculator application.
4. Write an application that draws basic graphical primitives on the screen.
5. Develop an application that makes use of database.
6. Implement an application that implements Multithreading.
7. Develop a native application that uses GPS location information.
8. Implement an application that writes data to the SD card.
9. Implement an application that creates an alert upon receiving a message.
10. Write a mobile application that creates alarm clock.

Mapping with Programme Outcomes:

| **Mapping with Programmers outcomes*** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | S | S | M | S | M | M | L | M | L | L |
| CO2 | S | S | M | S | S | M | L | L | M | L |
| CO3 | M | M | S | L | L | S | S | L | S | M |
| CO4 | S | L | L | M | M | L | L | S | M | S |
| CO5 | M | S | M | L | S | M | M | L | M | L |

S-Strong M-Medium L-Low

| Title of the Course/ Paper | Computing Networks | | |
|---|---|---|---|
| Core – 10 | II Year & III Semester | Credit: 3-1-0-4 | |

**Course Objectives**

- 1 To define the computer networks and identify the taxonomy of computer networks in terms of its transmission technology and scalability. Outline the features of the OSI and TCP/IP network architectures
- 2 Critically understand and assess various transmission media and algorithms for modulation and multiplexing.
- 3 Understand , apply and analyze various algorithms used for error correction and detection and transmission protocols in point to point for broad cast communication systems.
- 4 Understand and evaluate well known algorithms used for routing packets and avoid congestion in complex internetworks.
- 5 Conceptually understand the protocols used in end to end communication to establish, and release connection and segment transmission to provide reliable service to applications. Create sample protocols and evaluate the performance.

**Course Outcomes:**

- 1 Learn and understand the basic concepts of networking and its applications. To understand well established layered architectures in computer networks
- 2 Understand the concepts of the transmission medium, modulation and multiplexing techniques
- 3 Learn and understand well established error detection and correction codes and various protocols used in dealing with point to point and broad cast communications systems data link layer.
- 4 Comprehend the design issues and to assess the routing and congestion control algorithms.
- 5 Enumerate the transport layer service, conceptualize the internet transport protocols and the network security.

Unit 1: Introduction - Uses of networks - Network architectures - OSI and TCP/IP reference model and services – Example Networks.
Unit 2: Physical layer - Transmission media - Guided and wireless – Digital Modulation and multiplexing – Public switched Telephone network.
Unit 3: Data link layer Design issues - error detection and correction - elementary data link

protocols - sliding window protocols - Packet over SONET- ADSL. MAC sublayer protocols.
Unit 4: Network layer-design issues – Routing and congestion control algorithms, Quality of service, internetworking – Network layer in the INTERNET.
Unit 5: Transport layer – transport service - Addressing, Establishing & Releasing a connection, Multiplexing, Crash Recovery, Internet transport protocol TCP, Network security-cryptography.

Text book: 1. A. S. Tanenbaum, N. Feamster and D.J. Wetherall, 2021, Computer Networks, 6th Edition, Pearson Education.
Reference books:
1. D. Bertsekas and R. Gallagher, 1992, Data Networks, Prentice hall of India, New Delhi.
2. L. L Peterson and B. S Davie, "Computer Networks – A Systems Approach", MK Publishers, Fifth Edition, 2012
3.J. F Kurose and K. W Ross, "Computer Networking – A Top Down Approach", Eigth Edition, Pearson Education, 2021.

**E-learning resources**

- 1 https://nptel.ac.in/courses/106/105/106105183/
- 2 https://nptel.ac.in/courses/106/105/106105081/
- 3. https://nptel.ac.in/courses/106/105/106105080/
- 4. http://intronetworks.cs.luc.edu/current/ComputerNetworks.pdf
- 5. Linux Network Administrators Guide, http://tldp.org/LDP/nag2/index.html

Mapping with Programme Outcomes:

| **Mapping with Programmers outcomes*** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | S | M | M | S | M | S | L | M | L | L |
| CO2 | S | M | S | M | M | L | S | L | M | L |
| CO3 | L | M | S | L | M | S | M | L | S | M |
| CO4 | S | L | L | M | M | L | L | S | M | S |
| CO5 | S | S | M | L | S | M | M | L | M | L |

S-Strong M-Medium L-Low

| Title of the Course/ Paper | Operating Systems | | |
|---|---|---|---|
| Core – 11 | II Year & III Semester | Credit: 3-1-0-4 | |

**OBJECTIVES**

- To understand the basic concepts and functions of operating systems
- To understand Processes and Threads
- To analyze Scheduling algorithms.
- To understand the concept of Deadlocks.
- To analyze various memory management schemes.
- To understand I/O management and File systems.

**OUTCOMES**

At the end of the course, the students should be able to:

- Analyze various scheduling algorithms.
- Understand deadlock, prevention and avoidance algorithms.
- Compare and contrast various memory management schemes.
- Understand the functionality of file systems.

**Unit I:** Introduction- Operating Systems- Computer System Architecture- Operating System Structure- Operating System Services- User and Operating System Interface- System Calls- Types of System Calls- System Programs- Operating System Debugging –Operating System Generation- System Boot- Process - Process Scheduling- Interprocess Communication- Examples of IPC Systems- Communication in Client– Server Systems.

**Unit II:** Threads- Multicore Programming- Multithreading Model- Threading Issues- Process Synchronization- The Critical-Section Problem- Peterson's Solution- Synchronization Hardware - Mutex Locks- Semaphores- Monitors- CPU Scheduling- Scheduling Criteria- Scheduling Algorithm- Thread Scheduling- Multiple Processor Scheduling- System Model- Methods for Handling Deadlocks- Deadlock Prevention- Deadlock Avoidance- Deadlock Detection.

**Unit III:**Main Memory- Swapping- Contiguous Memory Allocation- Segmentation- Paging- Structure of the Page Table- Example: ARM Architecture- Virtual Memory- Demand Paging- Page Replacement- Thrashing- Memory-Mapped Files- Allocating Kernel Memory

**Unit IV:** Mass-Storage Structure- Disk Structure-Disk Attachment-Disk Scheduling -Disk Management –Swap Space Management RAID Structure – Stable Storage Implementation- File Concept -Access Methods -Directory and Disk Structure - File-System Mounting - File Sharing – Protection- File-System Structure File System Implementation-Directory Implementation-

Allocation Methods - Free Space Management Efficiency and Performance - Recovery – NFS-I/O Hardware -Application I/O Interface- Kernel I/O Subsystem - Transforming I/O Requests to Hardware Operations.

**Unit V:** Protection- Goals of Protection-Principles of Protection-Domain of Protection-Access Matrix- Implementation of the Access Matrix-Access Control -Revocation of Access Rights-Capability-Based Systems-Language Based Protection- The Security Problem-Program Threats-System and Network Threats -Cryptography as a Security Tool -User Authentication-Implementing Security Defenses-Firewalling to Protect Systems and Networks -Computer Security Classifications

**TEXT BOOK :**

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, ―Operating System Concepts‖, 9th Edition, John Wiley and Sons Inc., 2012.

**REFERENCES :**

1. RamazElmasri, A. Gil Carrick, David Levine, ―Operating Systems – A Spiral Approach‖, Tata McGraw Hill Edition, 2010. os Notes
2. AchyutS.Godbole, AtulKahate, ―Operating Systems‖, McGraw Hill Education, 2016.
3. Andrew S. Tanenbaum, ―Modern Operating Systems‖, Second Edition, Pearson Education, 2004. CS8493 Notes Operating Systems
4. Gary Nutt, ―Operating Systems‖, Third Edition, Pearson Education, 2004.

**E-Resources:**

https://applied-programming.github.io/Operating-Systems-Notes/
https://ecomputernotes.com/fundamental/disk-operating-system/what-is-operating-system

Mapping with Programme Outcomes:

| Mapping with Programmers outcomes* | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | S | S | M | S | M | M | L | M | L | L |
| CO2 | S | M | S | M | S | L | S | L | M | L |
| CO3 | L | M | S | M | M | S | L | L | S | M |
| CO4 | S | L | L | M | M | L | M | S | M | S |
| CO5 | S | S | M | L | S | M | M | L | M | L |

S-Strong M-Medium L-Low

| Title of the Course/ Paper | Machine Learning | | |
|---|---|---|---|
| Core – 12 | II Year & III Semester | Credit: 3-1-0-4 | |

**Objectives:**

- To provide mathematical base for Machine learning
- To provide theoretical knowledge on setting hypothesis for pattern recognition.
- To impart Knowledge of machine learning techniques for data handling
- To provide the skill to evaluate the performance of algorithms and to provide solution for various real-world applications.
- To impart the knowledge of identifying similarities and differences in various patterns of data

**Outcomes:**

- Recognize the characteristics of machine learning strategies.
- Apply various supervised learning methods to appropriate problems.
- Identify and integrate more than one technique to enhance the performance of learning.
- Create probabilistic and unsupervised learning models for handling unknown pattern.
- Analyze the co-occurrence of data to find interesting frequent patterns.
- Preprocess the data before applying to any real-world problem and can evaluate its performance.

**Unit 1:** The Fundamentals of Machine Learning: The Machine Learning Landscape - Types of Machine Learning Systems - Main Challenges of Machine Learning - Testing and Validating. End-to-End Machine Learning Project - Look at the Big Picture - Get the Data - Discover and Visualize the Data to Gain Insights - Prepare the Data for Machine Learning Algorithms - Select and Train a Model - Fine-Tune Your Model - Launch, Monitor, and Maintain Your System.

**Unit 2:** Ingredients of machine learning: Tasks – Models – Features. Supervised Learning: Classification – Binary classification and related tasks – Scoring and ranking – class probability estimation – Multi-class classification. Unsupervised Learning: Regression – Unsupervised and descriptive learning. Concept Learning: The hypothesis space – paths through the hypothesis space – beyond conjunctive concepts – learnability.

**Unit 3:** Tree Models: Decision trees – Ranking and probability estimation trees – tree learning as variance reduction. Rule Models: Learning ordered rule lists – learning unordered rule sets – descriptive rule learning – first–order rule learning. Linear Models: The least-squares method – The perceptron – Support vector machines.

**Unit 4:** Distance-based Models: Neighbours and exemplars – Nearest-neighbour classification –

Distance-based clustering – K-Means algorithm – Hierarchical clustering. Probabilistic Models: The normal distribution and its geometric interpretations – probabilistic models for categorical data – Naïve Bayes model for classification – probabilistic models with hidden values – Expectation-Maximization.

**Unit 5:** Features: Kinds of features – Feature transformations – Feature construction and selection. Model ensembles: Bagging and random forests – Boosting – Mapping the ensemble landscape. Machine Learning experiments: What to measure – How to measure it – How to interpret it.

**Text Books:**


1. Flach, P, "Machine Learning: The Art and Science of Algorithms that Make Sense of Data", Cambridge University Press, 2012
2. Aurélien Géron, "Hands-On Machine Learning with Scikit-Learn and Tensor Flow: Concepts, Tools, and Techniques to Build Intelligent Systems", First Edition, 2017 (Chapters 1 and 2)


**References**


1. John D. Kelleher, Brian Mac Namee, Aoife D'Arcy, "Fundamentals of Machine Learning for Predictive Data Analytics: Algorithms, Worked Examples, and Case Studies", The MIT Press, First Edition, 2012
2. Kevin P. Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 2012
3. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, Third Edition, 2014
4. Tom Mitchell, "Machine Learning", McGraw-Hill, 1997
5. Stephen Marsland, "Machine Learning - An Algorithmic Perspective", Chapman and Hall/CRC Press, Second Edition, 2014.


**Web References:**

- https://www.youtube.com/watch?v=r4sgKrRL2Ys&list=PL1xHD4vteKYVpaIiy295pg6_SY5qznc77

Mapping with Programme Outcomes:

| **Mapping with Programmers outcomes*** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | S | M | S | L | S | M | L | M | L | L |
| CO2 | S | M | S | M | S | L | M | L | M | L |
| CO3 | M | S | M | M | S | S | L | L | L | M |
| CO4 | S | L | L | M | M | L | M | S | M | S |
| CO5 | S | S | M | S | S | M | M | L | M | L |

S-Strong M-Medium L-Low

| Title of the Course/ Paper | Information Security | | |
|---|---|---|---|
| Extra-Disciplinary | II Year & III Semester | Credit: 3-1-0-4 | |

**Objectives:**

- To acquire knowledge of cryptography and network security
- To acquire knowledge of security management and incident response
- To acquire knowledge of security in software and operating systems
- To acquire knowledge of data security and secure system development
- To acquire knowledge of privacy and data protection
- To provide the ability to examine and analyze real-life security cases.

**Outcomes:**

- Test and evaluate security in systems and networks
- Use methods for planning and designing secure systems
- Apply techniques and tools for secure system deployment and operation
- Perform continuous testing, assessment and updating of system security
- Evaluate vulnerability of an information system and establish a plan for risk management.
- Demonstrate how to secure a network. Evaluate a company's security policies and procedures.

**Unit 1:** Introduction: Security- Attacks- Computer criminals- Method of defense Program Security: Secure programs- Non-malicious program errors- Viruses and other malicious code- Targeted malicious code- Controls against program threats

**Unit 2:** Operating System Security: Protected objects and methods of protection- Memory address protection- Control of access to general objects- File protection mechanism- Authentication: Authentication basics- Password- Challenge-response- Biometrics.

**Unit 3:** Database Security: Security requirements- Reliability and integrity- Sensitive data- Interface- Multilevel database- Proposals for multilevel security

**Unit 4:** Security in Networks: Threats in networks- Network security control- Firewalls- Intrusion detection systems- Secure e-mail- Networks and cryptography- Example protocols: PEM- SSL- Ipsec.

**Unit 5:** Administrating Security: Security planning- Risk analysis- Organizational security policies- Physical security - Legal- Privacy- and Ethical Issues in Computer Security - **P**rotecting programs and data- Information and law- Rights of employees and employers- Software failures- Computer crime- Privacy- Ethical issues in computer society- Case studies of ethics.

**Recommended Text**

1) C. P. Pfleeger, and S. L. Pfleeger, Security in Computing, Pearson Education, 4th Edition, 2003

2) Matt Bishop, Computer Security: Art and Science, Pearson Education, 2003.

**Reference Books**

1) Stallings**,** Cryptography & N/w Security: Principles and practice, 4th Edition, 2006

2) Kaufman, Perlman, Speciner, Network Security, Prentice Hall, 2nd Edition, 2003

3) Eric Maiwald, Network Security : A Beginner's Guide, TMH, 1999

4) Macro Pistoia, Java Network Security, Pearson Education, 2nd Edition, 1999

5) Whitman, Mattord, Principles of Information Security, Thomson, 2nd Edition, 2005

**Website and e-Learning Source**

1) http://www.cs.gsu.edu/~cscyqz/courses/ai/aiLectures.html

2) http://www.eecs.qmul.ac.uk/~mmh/AINotes/

3) https://nptel.ac.in/courses/106106129

4) https://nptel.ac.in/courses/106106199

Mapping with Programme Outcomes:

| **Mapping with Programmers outcomes*** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | S | M | S | M | S | M | L | M | L | L |
| CO2 | S | M | S | M | S | M | M | L | M | L |
| CO3 | M | S | M | M | S | S | L | L | L | M |
| CO4 | S | L | L | M | M | L | M | S | M | S |
| CO5 | S | S | M | S | S | M | M | L | M | L |

S-Strong M-Medium L-Low

| Title of the Course/ Paper | Practical – V: Machine Learning Lab. | | |
|---|---|---|---|
| Core-13 | II Year & III Semester | Credit: 0-0-4-2 | |

**Objectives:**

- Make use of Data sets in implementing the machine learning algorithms
- Implement the machine learning concepts and algorithms in any suitable language of choice.
- The programs can be implemented in either JAVA or Python.
- For Problems 1 to 6 and 10, programs are to be developed without using the builtin classes or APIs of Java/Python.
- Data sets can be taken from standard repositories (https://archive.ics.uci.edu/ml/datasets.html) or constructed by the students.

**Outcomes:**

- Understand the implementation procedures for the machine learning algorithms.
- Design Java/Python programs for various Learning algorithms.
- Apply appropriate data sets to the Machine Learning algorithms.
- Identify and apply Machine Learning algorithms to solve real world problems.
- be capable of confidently applying common Machine Learning algorithms in practice and implementing their own;

1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file

2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.

3. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.

4. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.

5. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering

few test data sets.

6. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.

7. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.
8. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.

9. Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.

10. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

**Recommended Texts:**

- Lab manual of Machine Learning: Machine Learning Practicals in Python by Dr. Kamlesh Namdev, LAP LAMBERT Academic Publishing

**Reference Books:**

- Introduction to Machine Learning with Python by Andreas C. Müller, Sarah Guido Released October 2016 Publisher(s): O'Reilly Media, Inc. ISBN: 9781449369415

**Web References:**

- https://www.youtube.com/watch?v=RnFGwxJwx-0

Mapping with Programme Outcomes:

| **Mapping with Programmers outcomes*** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | S | M | S | L | S | M | L | M | L | L |
| CO2 | S | M | S | S | S | M | M | L | M | L |
| CO3 | M | S | M | M | S | S | L | L | L | M |
| CO4 | S | L | M | M | M | L | M | L | M | S |
| CO5 | S | S | M | S | L | M | M | L | M | L |
| S-Strong M-Medium L-Low | | | | | | | | | | |

| Title of the Course/ Paper | Practical – X: Mini Project | | |
|---|---|---|---|
| Core – 14 | II Year & III Semester | Credit: 2 | |

**Objectives:**

- To provide the hands on experience in analyzing, designing and implementing various projects.
- To assign minor projects based on the languages they have learned so far.
- To comprehend technical literature and document project work
- To create test cases and implement different testing strategies
- To provide software development skill for a given problem

**Outcomes:**

- Apply the software engineering principles on a real software project
- Develop a software product using the methodologies applied in the industry.
- Work with different version control system.
- Apply technology tools to analyze, design, develop and test the application
- Design a system, model, component or a process to meet desired/industrial needs

Mini Project: Each student will develop and implement application software based on any emerging latest technologies.

Mapping with Programme Outcomes:

| **Mapping with Programmers outcomes*** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | M | S | S | L | S | M | L | M | L | L |
| CO2 | S | M | S | M | S | M | M | L | S | L |
| CO3 | M | S | M | M | S | S | L | L | L | M |
| CO4 | S | L | M | M | M | L | M | L | M | S |
| CO5 | S | S | M | S | L | M | M | L | M | L |

S-Strong M-Medium L-Low

| Title of the Course/ Paper | Project & Viva-Voce | | |
|---|---|---|---|
| Core- 15 | II Year & IV Semester | Credit: 20 | |

**Objectives:**

- To make the project an extended piece of individual work.
- To work on a topic that interests the student
- To have regular meetings with their supervisor and/or external project provider to discuss progress
- To produce dissertations that contain some element of original work.
- To encourage and reward individual inventiveness and application of effort

**Outcomes:**

- Construct a project from initial ideas;
- Plan, schedule, monitor and control their own work;
- Defend their ideas in discussions and presentations;
- Use libraries and other information resources;
- Apply tools and techniques from taught courses
- Communicate their findings through a written report.

Project: The project work is to be carried out either in a software industry or in an academic institution for the entire semester and the report of work done is to be submitted to the University.

Mapping with Programme Outcomes:

| **Mapping with Programmers outcomes*** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | M | S | L | L | S | M | L | M | S | L |
| CO2 | S | M | S | S | S | M | M | L | M | L |
| CO3 | M | S | M | S | M | S | L | L | L | M |
| CO4 | S | L | M | M | S | L | M | L | M | S |
| CO5 | S | S | M | S | L | S | M | L | M | L |

S-Strong M-Medium L-Low

**Syllabus of Elective courses.**

| Title of the Course / Paper | Data Mining and Data Warehousing | | |
|---|---|---|---|
| Elective-1 | I Year & I Semester | Credit: 3 | |

**Objective:**

- To understand the principles of Data warehousing and Data Mining.
- To be familiar with the Data warehouse architecture and its Implementation.
- To know the Architecture of a Data Mining system.
- To understand the various Data preprocessing Methods.
- To perform classification and prediction of data.

**Outcomes:**

- Define the scope and necessity of Data Mining & Warehousing for the society.
- Modeling and design of data warehouses.
- Comparing the design of data warehousing techniques so that it can be able to solve the root problem.
- Apply various tools of Data Mining and their techniques to solve the real time problems.
- To analyze and design various algorithms based on data mining tools.
- To evaluate research and design of new Data Mining Techniques.

Unit 1: Data Warehousing and Business Analysis: - Data warehousing Components –Building a Data warehouse –Data Warehouse Architecture – DBMS Schemas for Decision Support – Data Extraction, Cleanup, and Transformation Tools –Metadata – reporting – Query tools and Applications – Online Analytical Processing (OLAP) – OLAP and Multidimensional Data Analysis.

Unit 2: Data Mining: - Data Mining Functionalities – Data Preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation- Architecture Of A Typical Data Mining Systems- Classification Of Data Mining Systems. Association Rule Mining: - Efficient and Scalable Frequent Item set Mining Methods – Mining Various Kinds of Association Rules – Association Mining to Correlation Analysis – Constraint-Based Association Mining.

Unit 3: Classification and Prediction: - Issues Regarding Classification and Prediction – Classification by Decision Tree Introduction – Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction – Accuracy and Error Measures – Evaluating the Accuracy of a Classifier or Predictor – Ensemble Methods – Model Section.

Unit 4: Cluster Analysis: - Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical methods – Density-Based Methods – Grid-Based Methods – Model-Based Clustering Methods – Clustering High-Dimensional Data – Constraint-Based Cluster Analysis – Outlier Analysis.

Unit 5: Mining Object, Spatial, Multimedia, Text and Web Data: Multidimensional Analysis and Descriptive Mining of Complex Data Objects – Spatial Data Mining – Multimedia Data Mining – Text Mining – Mining the World Wide Web.

**Recommended Texts:**

1) Jiawei Han, Micheline Kamber and Jian Pei"Data Mining Concepts and Techniques", Third Edition, Elsevier, 2011.

**Reference Books:**

1) Alex Berson and Stephen J. Smith "Data Warehousing, Data Mining & OLAP", Tata McGraw – Hill Edition, Tenth Reprint 2007.
2) K.P. Soman, Shyam Diwakar and V. Ajay "Insight into Data mining Theory and Practice", Easter Economy Edition, Prentice Hall of India, 2006.
3) G. K. Gupta "Introduction to Data Mining with Case Studies", Easter Economy Edition, Prentice Hall of India, 2006.
4) Pang-Ning Tan, Michael Steinbach and Vipin Kumar "Introduction to Data Mining", Pearson Education, 2007.

**E-learning resources:**

1) https://nptel.ac.in/courses/106105174
2) https://onlinecourses.nptel.ac.in/noc21_cs06/preview
3) https://onlinecourses.swayam2.ac.in/cec20_cs12/preview

Mapping with Programme Outcomes:

| **Mapping with Programmers outcomes*** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | M | S | M | L | S | M | L | M | S | L |
| CO2 | S | M | S | M | S | M | M | L | M | L |
| CO3 | M | S | M | S | M | S | L | L | L | M |
| CO4 | S | L | M | M | S | L | L | M | M | S |
| CO5 | S | S | M | S | L | S | M | L | M | L |

S-Strong M-Medium L-Low

| Title of the Course/ Paper | E-Commerce | | |
|---|---|---|---|
| Elective-1 | I Year & I Semester | Credit: 3 | |

OBJECTIVES:

- To Learn the E-Commerce Platform and its concepts
- To Understand the Technology, infrastructure and Business in E-Commerce
- To Understand the Security and Challenges in E-Commerce
- To Build an Own E-Commerce using Open Source Frameworks

OUTCOMES: On Successful completion of the course ,Students will be able to

- Design Website using HTML CSS and JS
- Design Responsive Sites
- Manage, Maintain and Support Web Apps

UNIT I: INTRODUCTION TO E-COMMERCE AND TECHNOLOGY INFRASTRUCTURE : Working of Web - HTML Markup for Structure - Creating simple page - Marking up text - Adding Links - Adding Images - Table Markup - Forms - HTML5

UNIT II: BUILDING AN E-COMMERCE WEBSITE, MOBILE SITE AND APPS Systematic approach to build an E-Commerce: Planning, System Analysis, System Design, Building the system, Testing the system, Implementation and Maintenance, Optimize Web Performance – Choosing hardware and software – Other E-Commerce Site tools – Developing a Mobile Website and Mobile App

UNIT III E-COMMERCE SECURITY AND PAYMENT SYSTEMS
E-Commerce Security Environment – Security threats in E-Commerce – Technology Solutions: Encryption, Securing Channels of Communication, Protecting Networks, Protecting Servers and Clients – Management Policies, Business Procedure and Public Laws - Payment Systems

UNIT IV BUSINESS CONCEPTS IN E-COMMERCE
Digital Commerce Marketing and Advertising strategies and tools – Internet Marketing Technologies – Social Marketing – Mobile Marketing – Location based Marketing – Ethical, Social, Political Issues in E-Commerce

UNIT V PROJECT CASE STUDY
Case Study : Identify Key components, strategy, B2B, B2C Models of E-commerce

Business model of any e-commerce website - Mini Project : Develop E-Commerce project in any one of Platforms like Woo-Commerce, Magento or Opencart

TEXT BOOK:

1. Kenneth C.Laudon, Carol Guercio Traver ―E-Commerce‖, Pearson, 10th Edition, 2016

REFERENCES

1. http://docs.opencart.com/
2. http://devdocs.magento.com/
3. http://doc.prestashop.com/display/PS15/Developer+tutorials
4. Robbert Ravensbergen, ―Building E-Commerce Solutions with WooCommerce‖, PACKT, 2nd Edition

Mapping with Programme Outcomes:

| **Mapping with Programmers outcomes*** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | M | S | M | L | S | M | L | M | S | L |
| CO2 | S | M | S | M | S | M | M | L | M | L |
| CO3 | M | S | M | S | M | S | L | L | L | M |
| CO4 | S | L | M | M | S | L | L | M | M | S |
| CO5 | S | S | M | S | L | S | M | L | M | L |

S-Strong M-Medium L-Low

| Title of the Course/ Paper | Agile Software Engineering | | |
|---|---|---|---|
| Elective-1 | I Year & I Semester | Credit: 3 | |

**Objectives:**

- To provide students with a theoretical as well as practical understanding of agile software development practices and how small teams can apply them to create high-quality software.
- To provide a good understanding of software design and a set of software technologies and APIs.
- To do a detailed examination and demonstration of Agile development and testing techniques.
- To understand the benefits and pitfalls of working in an Agile team.
- To understand Agile development and testing.

**Outcomes:**

- Upon completion of the course, the students will be able to:
- Realize the importance of interacting with business stakeholders in determining the requirements for a software system
- Perform iterative software development processes: how to plan them, how to execute them.
- Point out the impact of social aspects on software development success.
- Develop techniques and tools for improving team collaboration and software quality.
- Perform Software process improvement as an ongoing task for development teams.
- Show how agile approaches can be scaled up to the enterprise level.

**UNIT I** AGILE METHODOLOGY: Theories for Agile Management – Agile Software Development – Traditional Model vs. Agile Model - Classification of Agile Methods – Agile Manifesto and Principles – Agile Project Management – Agile Team Interactions – Ethics in Agile Teams - Agility in Design, Testing – Agile Documentations – Agile Drivers, Capabilities and Values

**UNIT II** AGILE PROCESSES: Lean Production - SCRUM, Crystal, Feature Driven Development- Adaptive Software Development - Extreme Programming: Method Overview – Lifecycle – Work Products, Roles and Practices.

**UNIT III** AGILITY AND KNOWLEDGE MANAGEMENT: Agile Information Systems – Agile Decision Making - Earl_ S Schools of KM – Institutional Knowledge Evolution Cycle – Development, Acquisition, Refinement, Distribution, Deployment, leveraging – KM in Software Engineering – Managing Software Knowledge –

Challenges of Migrating to Agile Methodologies – Agile Knowledge Sharing – Role of Story-Cards – Story-Card Maturity Model (SMM).

**UNIT IV** AGILITY AND REQUIREMENTS ENGINEERING: Impact of Agile Processes in RE–Current Agile Practices – Variance – Overview of RE Using Agile – Managing Unstable Requirements – Requirements Elicitation – Agile Requirements Abstraction Model – Requirements Management in Agile Environment, Agile Requirements Prioritization – Agile Requirements Modeling and Generation – Concurrency in Agile Requirements Generation.

**UNIT V** AGILITY AND QUALITY ASSURANCE: Agile Product Development – Agile Metrics – Feature Driven Development (FDD) – Financial and Production Metrics in FDD – Agile Approach to Quality Assurance - Test Driven Development – Agile Approach in Global Software Development.

**Recommended Texts:**

- David J. Anderson and Eli Schragenheim, ―Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results, Prentice Hall, 2003.
- Hazza and Dubinsky, ―Agile Software Engineering, Series: Undergraduate Topics in Computer Science , Springer, 2009.

**Reference Books:**

- Craig Larman, ―Agile and Iterative Development: A Manager_s Guide, Addison-Wesley, 2004.
- Kevin C. Desouza, ―Agile Information Systems: Conceptualization, Construction, and Management, Butterworth-Heinemann, 2007.

**Web References:**

- https://www.youtube.com/watch?v=x90kIAFGYKE&t=8s

Mapping with Programme Outcomes:

| **Mapping with Programmers outcomes*** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | M | S | M | S | M | S | L | M | L | L |
| CO2 | S | M | M | S | M | M | S | L | M | L |
| CO3 | L | M | S | L | M | S | M | L | S | M |
| CO4 | S | L | L | M | M | L | L | S | M | S |
| CO5 | M | S | M | L | S | M | M | L | M | L |

S-Strong M-Medium L-Low

| Title of the Course/ Paper | Cloud Computing | |
|---|---|---|
| Elective-II | I Year & II Semester | Credit: 3 |

**Objectives:**

- To introduce the cloud computing concepts and map reduce programming model.
- To provide skills and knowledge about operations and management in cloud technologies so as to implement large scale systems.
- To provide skills to design suitable cloud infrastructure that meets the business services and customer needs.
- To provide Knowledge of different CPU, memory and I/O virtualization techniques that serve in offering software, computation and storage services on the cloud; Software Defined Networks (SDN) and Software Defined Storage (SDS); cloud storage technologies and relevant distributed file systems, NoSQL databases and object storage;
- To introduce the variety of programming models and develop working experience in several of them.

**Outcomes:**

- Understand the evolution, principles, and benefits of Cloud Computing in order to assess existing cloud infrastructures to choose an appropriate architecture that meets business needs.
- Decide a suitable model to capture the business needs by interpreting different service delivery and deployment models.
- Understand virtualization foundations to cater the needs of elasticity, portability and resilience by cloud service providers.
- Infer architectural style, work flow of real-world applications and to implement the cloud applications using map reduce programming models.
- Compare operation and economic models of various trending cloud platforms prevailing in IT industry.

**Unit I:** Foundations of cloud: Inception and need for cloud computing: Motivations from distributed computing predecessors - Evolution - Characteristics - Business Benefits – Challenges in cloud computing - Exploring the Cloud Computing Stack - Fundamental Cloud Architectures – Advanced Cloud Architectures - Specialized Cloud Architectures

**Unit II**: Service Delivery and Deployment Models: Service Models (XaaS): Infrastructure as a Service (IaaS) - Platform as a Service (PaaS) - Software as a Service(SaaS) - Deployment Models: Types of cloud - Public cloud - Private cloud - Hybrid cloud – Service level agreements - Types of SLA – Lifecycle of SLA- SLA Management

**Unit III:** Cloud Resource Virtualization: Virtualization as Foundation of Cloud – Understanding Hypervisors – Understanding Machine Image and Instances - Managing Instances – Virtual Machine Provisioning and Service Migrations Cloud Computing Applications and Paradigms: Existing Cloud Applications and Opportunities for New Applications - Architectural Styles for Cloud Applications - Workflows: Coordination of Multiple Activities - Coordination Based on a State Machine Model: The ZooKeeper - The MapReduce Programming Model - A Case Study: The Grep The Web Application

**Unit IV:** Resource Management and Scheduling in Cloud: Policies and Mechanisms for Resource Management – Stability of a Two-Level Resource Allocation Architecture-Feedback Control Based on Dynamic Thresholds - Coordination of Specialized

Autonomic Performance Managers - A Utility-Based Model for Cloud-Based Web Services - Resource Bundling: Combinatorial Auctions for Cloud Resources – Scheduling Algorithms for Computing Clouds - Resource Management and Dynamic Application Scaling

**Unit V:** Cloud Platforms and Application Development: Comparing Amazon web services, Google AppEngine, Microsoft Azure from the perspective of architecture (Compute, Storage Communication) services and cost models. Cloud application development using third party APIs, Working with EC2 API – Google App Engine API - Facebook API, Twitter API. Advances is Cloud: Media Clouds - Security Clouds - Computing Clouds - Mobile Clouds – Federated Clouds – Hybrid Clouds

**Recommended Texts:**

1. Rajkumar Buyya, James Broberg, Andrzej, M. Goscinski, Cloud Computing: Principles and Paradigms, Wiley, 1st Edition, 2013.
2. Sosinsk, Barrie, Cloud Computing Bible, John Wiley & Sons, 1st Edition, 2011.

**Reference Books:**

1. Marinescu, Dan C. Cloud Computing: Theory and Practice. Morgan Kaufmann, 2017.
2. Toby Velte, Anthony Velte, Robert Elsenpeter, Cloud Computing: A Practical Approach, Mc Graw Hill Education, 1st Edition, 2017.
3. Buyya, Rajkumar, Christian Vecchiola, and S. Thamarai Selvi. Mastering Cloud Computing: Foundations and Applications Programming, Tata Mcgraw Hill, 1st Edition, 2017.

**Web References:**

1. https://www.youtube.com/watch?v=-8O32k26RWA
2. Mapping with Programme Outcomes:

| Mapping with Programmers outcomes* | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | S | S | M | M | S | M | L | L | S | L |
| CO2 | S | M | S | M | S | L | M | L | M | L |
| CO3 | M | S | M | S | M | S | L | L | L | M |
| CO4 | S | L | M | S | S | L | L | M | M | S |
| CO5 | S | S | M | S | L | M | M | L | M | L |

3. S-Strong M-Medium L-Low

| | | |
|---|---|---|
| Title of the Course/ Paper | Software Testing | |
| Elective-II | I Year & II Semester | Credit: 3 |

**Objectives:**

- To understand the principles of Software Testing and tools..
- Enable the students to learn about the principle and tools of Software testing.
- Improve knowledge in software testing tools.

**Outcomes:**

- Understand the fundamentals of software testing.
- Gain software testing experience by applying software testing knowledge and methods to practice-oriented software testing projects.
- Analyze path testing concept. Analyze state testing concept. Execute programs and test data in Client-Server Architecture.
- Able to debug the project and to test the entire computer based systems at all levels.
- Able to apply quality and reliability metrics to ensure the performance of the software.
- Able to evaluate the web applications using bug tracking tools.

Unit 1: Purpose of Software testing – Some Dichotomies – a model for testing – Playing pool and consulting oracles – Is complete testing possible – The Consequence of bugs – Taxonomy of Bugs.

Unit 2: Testing Fundamentals– Test case Design – Introduction of Black Box Testing and White Box testing – Flow Graphs and Path testing – Path testing Basics - Predicates, Path Predicates and Achievable Paths - Path Sensitizing – Path Instrumentation – Implementation and Application of Path Testing.

Unit 3: Transaction Flow testing – Transaction Flows – techniques – Implementation Comments – Data Flow Testing – Basics – Strategies – Applications, Tools and effectiveness – Syntax Testing – Why, What, How – Grammar for formats – Implementation – Tips.

Unit 4: Logic Based Testing – Motivational Overview – Decision tables – Path Expressions – KV Charts – Specifications – States, State Graphs and transition Testing – State Graphs – Good & bad states – state testing Metrics and Complexity.

Unit 5: Testing Types -Testing GUIs – Testing Client – Server Architecture – Testing for Real-time System – A Strategic Approach to Software testing – issues – unit testing – Integration Testing – Validation testing – System testing – The art of Debugging.

**Recommended Texts:**

1) Boris Beizer, Software testing techniques, DreamTech Press, Second Edition – 2003.
2) Myers and Glenford.J., The Art of Software Testing, John-Wiley & Sons,1979.

**Reference Books:**


1) Roger.S.Pressman, Software Engineering – A Practitioner's Approach,McGraw Hill, 5th edition, 2001.
2) Marnie.L. Hutcheson, Software Testing Fundamentals, Wiley-India, 2007.


**E-learning resources:**

1) https://www.tutorialspoint.com/software_testing/index.htm
2) https://www.guru99.com/software-testing-introduction-importance.html
3) https://nptel.ac.in/courses/106/105/106105150/ Course

Mapping with Programme Outcomes:

| **Mapping with Programmers outcomes*** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | S | S | M | M | S | M | L | L | S | L |
| CO2 | S | M | S | M | S | L | M | L | M | L |
| CO3 | M | S | M | S | M | S | L | L | L | M |
| CO4 | S | L | M | S | S | L | L | M | M | S |
| CO5 | S | S | M | S | L | M | M | L | M | L |

S-Strong M-Medium L-Low

| Title of the Course/Paper | Big Data Analytics | |
|---|---|---|
| Elective II | I Year & II Semester | Credit:3 |

**Objectives:**

- To gives an overview of Big Data, i.e. storage, retrieval and processing of big data.
- To focus on the "technologies", i.e., the tools/algorithms that are available for storage, processing of Big Data.
- To help a student to perform a variety of "analytics" on different data sets and to arrive at positive conclusions.
- To introduce the tools required to manage and analyze big data like Hadoop, NoSql MapReduce.
- To teach the fundamental techniques and principles in achieving big data analytics with scalability and streaming capability

**Outcomes:**

- Understand Big Data and its analytics in the real world
- Analyze the Big Data framework like Hadoop and NOSQL to efficiently store and process Big Data to generate analytics
- Design of Algorithms to solve Data Intensive Problems using Map Reduce Paradigm
- Design and Implementation of Big Data Analytics using pig and spark to solve data intensive problems and to generate analytics
- To have skills that will help them to solve complex real-world problems in for decision support.

UNIT – I: ESSENTIALS OF BIG DATA AND ANALYTICS: Data, Characteristics of data and Types of digital data, Sources of data, Working with unstructured data, Evolution and Definition of big data, Characteristics and Need of big data, Challenges of big data; 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 –II: HADOOP: Introducing Hadoop, Need of Hadoop, limitations of RDBMS, RDBMS versus Hadoop, Distributed computing challenges, History of Hadoop, Hadoop overview, Use case of Hadoop, Hadoop distributors, HDFS (Hadoop Distributed File System) , Processing data with Hadoop, Managing resources and applications with Hadoop YARN (Yet another Resource Negotiator), Interacting with Hadoop Ecosystem.

UNIT – III: MAPREDUCE PROGRAMMING: Introduction, Mapper, Reducer,

Combiner, Partitioner, Searching, Sorting, Compression, Real time applications using MapReduce, Data serialization and Working with common serialization formats, Big data serialization formats.

UNIT – IV: HIVE: Introduction to Hive, Hive architecture, Hive data types, Hive file format, Hive Query Language (HQL), User-Defined Function (UDF) in Hive;

UNIT – V: PIG: The anatomy of Pig , Pig on Hadoop, Pig Philosophy, Use case for Pig; ETL Processing , Pig Latin overview , Data types in Pig , Running Pig , Execution modes of Pig, HDFS commands, Relational operators, Piggy Bank , Word count example using Pig.

**Recommended Texts:**

1. Seema Acharya, Subhashini Chellappan, "Big Data Analytics", 1st Edition, Wiley, 2015.

**Reference Books:**

1. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, "Professional Hadoop Solutions",1st Edition, Wrox, 2013.
2. Chris Eaton, Dirk Deroos et. al., "Understanding Big data", Indian Edition, McGraw Hill, 2015.
3. Tom White, "HADOOP: The definitive Guide", 3rd Edition, O Reilly, 2012.
4. Vignesh Prajapati, "Big Data Analytics with R and Hadoop", 1st Edition, Packet Publishing Limited, 2013.

**Web References:**

1. https://www.youtube.com/watch?v=xvEKQefqQ7A

Mapping with Programme Outcomes:

| **Mapping with Programmers outcomes*** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | S | S | M | M | S | M | L | L | S | L |
| CO2 | S | M | S | M | S | L | M | L | M | L |
| CO3 | M | S | M | S | M | S | L | L | L | M |
| CO4 | S | L | M | S | S | L | L | M | M | S |
| CO5 | S | S | M | S | L | M | M | L | M | L |

S-Strong M-Medium L-Low

| Title of the Course/Paper | Web Technology | |
|---|---|---|
| Elective -III | I Year & II Semester | Credit:3 |

**Objectives:**

- To understand the basics of Javascript and to acquire the knowledge about XML,Webservies
- and ASP.NET in Web technology
- To understand about the internet technologies and Client side programming javascript
- To Empower the websites with use of XML and web services
- To Identify the Basics of ASP.Net Framework Architecture and its controls
- To Learn the Database connection architecture using ADO.net

**Outcome:**

At the end of the course, the students should be able to:

- Acquire vast knowledge of Javascript and Internet Technologies
- Understand and explore various Features of ASP.Net Framework
- Understand the details of XML and Webservices
- Apply the knowledge of ASP.NET object, ADO.NET data access to develop a client server model

**Unit I:** Understanding Internet , Difference between websites and web server, Internet technologies Overview. Understanding websites and web servers: Understanding the difference between internet and intranet. Web 2.0: Basics, RIA Rich Internet Applications , collaborations tools .HTML and CSS: HTML 5.0. XHTML, CSS 3**.** An introduction to JavaScript, JavaScript DOM Model- Built-in objects, Date and Objects -Regular Expressions -Exception Handling, Validation. Event Handling , DHTML with JavaScript.

**Unit II:** XML : Introduction to XML, DTD, CSS, Namespace, Schema, XSD, XSL- Introduction to Web Services : The Web Services Type System, Data Type Mappings - SOAP : Communication on the Web -WSDL : Describing Web Services.

**Unit III:** Understanding ASP.NET Controls: Web forms, Buttons, Text Box, Labels, Checkbox, Radio Buttons, List Box etc. Running a web Application, creating a multiform web project.

**Unit IV:** Form Validation Controls- Required Field, Compare, Range. Calendar Control, Ad Rotator Control, State Management-View State, Session State, Application State.

**Unit V:** Architecture Of ADO.NET, Connected and Disconnected Database, Create Connection Using ADO.NET Object Model, Connection Class, Command Class, DataReader Class, Data adapter Class, Dataset Class. Display Data on Bound Controls and Gridview. Database

Accessing on Web Applications: Insert records in database, delete and update records from database, Display a particular record and all records on web form.

**Textbook :**

1. Deitel, Deiteland Nieto, Internet and World Wide Web : How to Program, 5 thEdition, 2012, Prentice Hall,. ISBN-13: 978-0-13-215100-9

2. Jeffrey C. Jackson, "Web Technologies A computer Science Perspective", 2011, Pearson, ISBN 9780133001976.

3. Beginning XML by David Hunter, Andrew Watt (Wrox P ublication)

4. Teach yourself ASP programming in 21 days – Fleet, Warret, Hen Stojanovic , Techmedia.

5. ASP.NET 2.0 Black Book By RudrakshBatra, CharulShukla (Dream Tech Press)

6. ASP. NET Bible By MridulaParihar and et al. (Hungry Minds, New York)

**Reference book:**

1. XML, Web Services, and the Data Revolution, F.P.Coyle, Pearson Education. 2. ASP.NET Developer's Guide By G Buezek (TMH)

**Web References:**

1. https://www.w3schools.com/js/
2. https://www.w3schools.com/xml/xml_services.asp
3. https://www.tutorialspoint.com/asp.net/index.htm

Mapping with Programme Outcomes:

| **Mapping with Programmers outcomes*** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | S | M | S | M | S | M | L | L | S | L |
| CO2 | S | M | S | M | S | L | M | L | M | L |
| CO3 | S | S | M | S | M | S | L | M | L | M |
| CO4 | S | L | M | S | S | L | M | M | M | S |
| CO5 | S | S | M | S | L | M | M | L | M | L |

S-Strong M-Medium L-Low

| Title of the Course/Paper | Python Programming | |
|---|---|---|
| Elective –III | I Year & II Semester | Credit:3 |

**OBJECTIVES:**

1. To teach problem solving through flow charting tool-Raptor.
2. To elucidate problem solving through python programming language.
3. To introduce function oriented programming paradigm through python.
4. To train in development of solutions using modular concepts.

**OUTCOMES:**

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

1. Summarize the fundamental concepts of python programming.
2. Interpret object oriented and event driven programming in python.
3. Apply the suitable data structures to solve the real time problems.
4. Apply regular expressions for many different situations.

**UNIT-I**

Introduction to python: Numbers, strings, variables, operators, expressions, Indentation, String operations and functions, math function calls, Input/output statements, conditional if, while and for loops.

**UNIT-II**

Functions: user defined functions, parameters to functions, recursive functions, and lambda function. Event driven programming: Turtle graphics, Turtle bar chart, Widgets, key press events, mouse events, timer events.

**UNIT-III**

Data structures: List- list methods & functions, Tuple-tuple methods & functions, Dictionaries-dictionary methods & functions, traversing dictionaries. Sets-methods & functions, Files.

**UNIT-IV**

OOP: class, object, methods, constructors, inheritance, inheritance types, polymorphism, operator overloading, abstract classes, exception handling.

**UNIT-V**

Regular expressions: Power of pattern matching and searching using RegEx in python, Meta characters and Sequences used in Patterns, Password, email, URL validation using regular expression, Pattern finding programs using regular expression.

**TEXT BOOKS:**


1. Kenneth Lambert,"Fundamentals of Python: First Programs" , ISBN-13: 978-1337560092,cengage learning publishers, first edition,2012.
2. Allen B. Downey, "think python: how to think like a computer scientist", ISBN-13: 978-1491939369, O'reilly, 2nd edition, 2016.
3. Reema Thareja, "Python Programming using Problem Solving Approach", ISBN-13:978-0-19-948017-3, Oxford University Press, 2017.


**REFERENCE BOOKS:**


1. Vamsikurama, "Python programming : A modern approach", ISBN-978-93-325-8752-6,pearson,2018.
2. Mark Lutz , "Learning python", ISBN: 1-56592-464-9,Orielly, 4th edition, 1999 .
3. W.Chun, "Core python programming", ISBN-13: 978-0132269933, pearson, Second Edition, 2016.


Mapping with Programme Outcomes:

| **Mapping with Programmers outcomes*** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | S | M | S | M | S | M | L | L | S | L |
| CO2 | S | M | S | M | S | L | M | L | M | L |
| CO3 | S | S | M | S | M | S | L | M | L | M |
| CO4 | S | L | M | S | S | L | M | M | M | S |
| CO5 | S | S | M | S | L | M | M | L | M | L |

S-Strong M-Medium L-Low

| Title of the Course/Paper | Mobile Application Development | |
|---|---|---|
| Elective -III | I Year & II Semester | Credit:3 |

**OBJECTIVES:**

1. To facilitate students to understand android SDK
2. To help students to gain a basic understanding of Android application development
3. To inculcate working knowledge of Android Studio development tool

**OUTCOMES:**

At the end of this course, students will be able to:

1. Identify various concepts of mobile programming that make it unique from programming for other platforms.
2. Critique mobile applications on their design pros and cons.
3. Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces
4. Program mobile applications for the Android operating system that use basic and advanced phone features
5. Deploy applications to the Android marketplace for distribution.

**Unit- I**

Introduction- The Mobile Ecosystem: Operators - Networks - Devices - Platforms – Operating Systems - Application Frameworks - Applications – Services- Mobile Devices Profiles - Options for development - Categories of Mobile Applications: SMS - Mobile Websites - Mobile Web Widgets - Native Applications - Games - Utility Apps- Location, Based Services(LBS) Apps - Informative Apps - Enterprise Apps

**Unit- II**

Mobile Information Architecture: Introduction - Sitemaps - Click Streams - Wireframes - Prototyping - Architecture for Different Devices. Mobile Design: Interpreting Design – Elements of Mobile Design - Mobile Design Tools - Designing for Different Device/ Screens

**Unit– III**

Introduction to Android: The Android Platform-Android SDK-Eclipse Installation-Android Installation- Building you First Android application-Understanding Anatomy of Android Application-Android Manifest file

**Unit –IV**

Android Application Design Essentials: Anatomy of an Android applications-Android

terminologies-Application Context- Activities-Services-Intents-Receiving and Broadcasting Intents-Android Manifest File and its common settings-Using Intent Filter- Permissions.

**Unit – V**

Android User Interface Design Essentials: User Interface Screen elements-Designing User Interfaces with Layouts-Drawing and Working with Animation-Testing Android applications: Publishing Android application-Using Android preferences-Managing Application resources in a hierarchy-working with different types of resources.

**TEXT BOOKS:**


1. Mobile Design and Development by Brian Fling, O'Reilly Media, Inc 2009
2. Lauren Darcey and Shane Conder, "Android Wireless Application Development", Pearson Education, 2nd ed. (2011)
3. 3. J2ME: The Complete Reference, James Keogh, Tata McGrawHill 2003


**REFERENCE BOOKS:**


1. Reto Meier, "Professional Android 2 Application Development", Wiley India Pvt Ltd
2. Mark L Murphy, "Beginning Android", Wiley India Pvt Ltd
3.Android Application Development All in one for Dummies by Barry Burd, Edition: I


E-Resource:
https://www.tutorialspoint.com/android/android_resources.htm

Mapping with Programme Outcomes:

| **Mapping with Programmers outcomes*** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | S | M | S | M | S | M | L | L | S | L |
| CO2 | S | M | S | M | S | L | M | L | M | L |
| CO3 | S | S | M | S | M | S | L | M | L | M |
| CO4 | S | L | M | S | S | L | M | M | M | S |
| CO5 | S | S | M | S | L | M | M | L | M | L |

S-Strong M-Medium L-Low

| | | | |
|---|---|---|---|
| Title of the Course/ Paper | Internet of Things | | |
| Elective – IV | II Year & III Semester | Credit: 3 | |

**Objectives:**

- To understand the concepts of Internet of Things and the application of IoT.
- To Determine the Market Perspective of IoT.
- To Understand the vision of IoT from a global context
- To learn how to integrate IoT with the environment; communicate from and to machines and some aspects of security of IoT.

**Outcomes:**

- Students would have become familiar with IoT and its flavors; realised the IoT ecosystem and topologies; learnt how to integrate IoT with the environment; communicate from and to machines and some aspects of security of IoT.
- Implement basic IoT applications on embedded platforms**.**
- Design IoT applications in different domain and be able to analyze their performance.

**Unit 1:** Introduction: Defining Internet of Things (IoT) – IoT: AWeb 3.0 View – Ubiquitous IoT Applications – Important vertical IoT applications - Four Pillars of IoT: M2M, RFID, WSN and SCADA – DNA of IoT: Device, Connect and Manage.

**Unit 2:** Middleware for IoT: An Overview of middleware – Communication middleware for IoT – LBS and Surveillance middleware. Protocol Standardization for IoT - IoT Protocol Standardization Efforts: M2M and WSN Protocols – SCADA and RFID Protocols – Issues with IoT Standardization – Unified Data Standards.

**Unit 3:** Architecture Standardization for Web of Things (WoT): Web of Things versus Internet of Things — Platform Middleware for WoT – Unified Multitier WoT Architecture – WoT Portals and Business Intelligence

**Unit 4:** Cloud of Things: Cloud Computing - Grid/SOA and Cloud Computing - Cloud Middleware - NIST's SPI Architecture and Cloud Standards - Cloud Providers and Systems. IoT and Cloud Computing - Mobile Cloud Computing – The Cloud of Things Architecture - Four Deployment Models - Vertical Applications - Fifteen Essential Features - Four Technological Pillars - Three Layers of IoT Systems - Foundational Technological Enablers

**Unit 5:** Applications: Case Studies illustrating IoT design – Smart lighting and intrusion detection in Home – Smart parking in cities – Weather Monitoring System and Forest Fire detection – Smart irrigation – IoT printer.

**Text Books:**

1. Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective", CRC Press, Taylor and Francis Group, 2012
2. Arshdeep Bahga , Vijay Madisetti , "Internet of Things: A Hands-on-Approach", 2014. (Chapter 9)

**References**


1. Jean-Philippe Vasseur, Adam Dunkels,,"Interconnecting Smart Objects with IP: The Next Internet", Morgan Kuffmann, 2010.
2. Dieter Uckelmann; Mark Harrison; Florian Michahelles-(Editors), Architecting the Internet of Things, First Edition, Springer – 2011
3. Adrian McEwen, Hakim Cassimally, Designing the Internet of Things, First Edition, Wiley, 2014.
4. Olivier Hersent, David Boswarthick, Omar Elloumi , "The Internet of Things – Key applications and Protocols", Wiley, 2012


Mapping with Programme Outcomes:

| **Mapping with Programmers outcomes*** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | M | S | S | L | S | M | M | L | S | L |
| CO2 | S | M | S | M | S | L | M | L | M | L |
| CO3 | M | S | M | S | S | S | L | M | L | M |
| CO4 | S | L | M | S | S | L | M | M | M | S |
| CO5 | S | S | M | S | L | S | M | L | M | L |

S-Strong M-Medium L-Low

| Title of the Course/Paper | **Computer vision** | | |
|---|---|---|---|
| Elective - IV | II Year - III Semester | | Credit: 3 |

**Objectives:**

- Understanding the Basics of Computer Vision.
- Acquiring skills to develop computer vision-based applications.
- To introduce students the fundamentals of image formation
- To introduce students the major ideas, methods, and techniques of computer vision and pattern recognition
- To develop an appreciation for various issues in the design of computer vision and object recognition systems
- To provide the student with programming experience from implementing computer vision and object recognition applications

**Outcomes:**

- Ability to understand the computer vision pipeline.
- Ability to build solutions using computer vision algorithms.
- Identify basic concepts, terminology, theories, models and methods in the field of computer vision
- Describe known principles of human visual system
- Describe basic methods of computer vision related to multi-scale representation, edge detection and detection of other primitives, stereo, motion and object recognition
- Suggest a design of a computer vision system for a specific problem

**UNIT I** Image Formation Models: Monocular imaging system, Orthographic& Perspective Projection, Camera model and Camera calibration, Binocular imaging systems

**UNIT II** Image Processing and Feature Extraction: Image representations (continuous and discrete), Edge detection

**UNIT III** Motion Estimation: Regularization theory, Optical computation, Stereovision, Motion estimation, Structure from motion

**UNIT IV** Shape Representation and Segmentation: Deformable curves and surfaces, Snakes and active contours, Level set representations, Fourier and wavelet descriptors, Medial representations, Multiresolution analysis

**UNIT V** Object recognition: Hough transforms and other simple object recognition methods, Shape correspondence and shape matching, Principal Component analysis, Shape priors for recognition. Classifying image content – Image segmentation: Graph cuts – Segmentation using clustering – OpenCV: Basics – processing video – tracking.

**Recommended Texts:**

- Computer Vision - A modern approach, by D. Forsyth and J. Ponce, Prentice Hall Robot Vision, by B. K. P. Horn, McGraw-Hill.

**Reference Books:**

- Richard Szeliksy "Computer Vision: Algorithms and Applications" (http://szeliski.org/Book/)
- Haralick& Shapiro, "Computer and Robot Vision", Vol II
- Gerard Medioni and Sing Bing Kang "Emerging topics in computer vision"
- Emanuele Trucco and AllessandroVerri "Introductory Techniques for 3-D Computer Vision", Prentice Hall, 1998.
- Olivier Faugeras, "Three-Dimensional Computer Vision", The MIT Press, 1993

**Web References:**

- https://www.youtube.com/watch?v=3LaVxEX3F0o&list=PLwdnzlV3ogoVsma5GmBSsgJM6gHv1QoAo

Mapping with Programme Outcomes:

| **Mapping with Programmers outcomes*** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | M | S | S | L | S | M | M | L | S | L |
| CO2 | S | M | S | M | S | L | M | L | M | L |
| CO3 | M | S | M | S | S | S | L | M | L | M |
| CO4 | S | L | M | S | S | L | M | M | M | S |
| CO5 | S | S | M | S | L | S | M | L | M | L |

S-Strong M-Medium L-Low

| Title of the Course/ Paper | Data Visualization | | |
|---|---|---|---|
| Elective - IV | II Year & III Semester | Credit: 3 | |

**Course Objectives:**

- To understand the various types of data, apply and evaluate the principles of data visualization
- Acquire skills to apply visualization techniques to a problem and its associated dataset
- To apply structured approach to create effective visualizations
- To learn how to bring valuable insight from the massive dataset using visualization
- To learn how to build visualization dashboard to support decision making
- 6.To create interactive visualization for better insight using various visualization tools

**Expected Course Outcome:**

After successfully completing the course the student should be able to

- Identify the different data types, visualization types to bring out the insight.
- Relate the visualization towards the problem based on the dataset to analyze and bring out valuable insight on large dataset.
- Design visualization dashboard to support the decision making on large scale data.
- Demonstrate the analysis of large dataset using various visualization techniques and tools.

Unit I: Introduction to Data Visualization and Visualization techniques: Overview of data visualization - Data Abstraction - Task Abstraction - Analysis: Four Levels for Validation. Visualization Techniques -Scalar and point techniques – colour maps – Contouring – Height Plots - Vector visualization techniques – Vector properties – Vector Glyphs – Vector Color Coding. Visual Analytics:Visual Variables- Networks and Trees –Tables - Map Color and Other Channels- Manipulate View.

Unit II: Visualization Tools: Fundamentals of R- Visualization using R library -Introduction to various data visualization toolstableau

Unit III: Geo spatial visualization: Geo spatial data and visualization techniques : Chloropleth map, Hexagonal Binning, Dot map, Cluster map, cartogram map

Unit IV: Diverse Types Of Visual Analysis: Time- Series data visualization – Text data visualization – Matrix visualization techniques – Heat Map- Multivariate data visualization and case studies. Visualization of Streaming Data: Introduction to Data Streaming, processing and presenting of streaming data, streaming visualization techniques, streaming analysis.

Unit V: Visualization Dashboard Creations: Dashboard creation using visualization tools for the use cases: Finance-marketing-insurance healthcare etc., Recent Trends.

**Text Books**

1. Tamara Munzer, Visualization Analysis and Design, CRC Press 2014.
2. Aragues, Anthony. Visualizing Streaming Data: Interactive Analysis Beyond Static Limits. O‟Reilly Media, Inc., 2018

**Reference Books**

1. Chun-hauh Chen, W.K.Hardle, A.Unwin, Hand book of Data Visualization, Springer publication, 2016.
2. Christian Toninski, Heidrun Schumann, Interactive Visual Data Analysis, CRC press publication,2020
3. Alexandru C. Telea, Data Visualization: Principles and Practice, AK Peters, 2014.

Mapping with Programme Outcomes:

| **Mapping with Programmers outcomes*** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | M | S | S | L | S | M | M | L | S | L |
| CO2 | S | M | S | M | S | L | M | L | M | L |
| CO3 | M | S | M | S | S | S | L | M | L | M |
| CO4 | S | L | M | S | S | L | M | M | M | S |
| CO5 | S | S | M | S | L | S | M | L | M | L |

S-Strong M-Medium L-Low

**Syllabus of Soft Skill Courses**

| Title of the Course/Paper | Communication Skills for Software Engineers - I | | |
|---|---|---|---|
| Soft Skill - | Year - Semester | | Credit: 2 |

**Objectives:**

- Understand the need of current soft skills
- Generalize self development and implementation procedures
- Demonstrate narration skills
- Design simple comprehension with given requirements
- Develop implementations in latest technologies
- Demonstrate the applications with varied soft skills like debate, oration, tell about yourself etc.

**Outcomes:**

- Enumerate varied soft skills needed for employment
- Identify the lack in oneself and improve it
- Learn the current technical implementations
- Summarize the different requirements for employability
- Calculate self performance ,Generalize narration , oration and debate skills
- Conceptualize the representation of current technologies

**1 Basics of Communication**

1.1 Definition and process of communication

1.2 Types of communication - formal and informal, oral and written, verbal and non-verbal

1.3 Communications barriers and how to overcome them

1.4 Barriers to Communication, Tools of Communication

**2 Application of Grammar**

2.1 Parts of Speech (Noun, verb, adjective, adverb) and modals

2.2 Sentences and its types

2.3 Tenses

2.4 Active and Passive Voice

2.5 Punctuation

2.6 Direct and Indirect Speech

**3 Reading Skill**

Unseen passage for comprehension (one word substitution, prefixes, suffixes, antonyms, synonyms etc. based upon the passage to be covered under this topic)

**4 Writing Skill**

4.1 Picture composition

4.2 Writing paragraph

4.3 Notice writing

**5 Listening and Speaking Exercises**

1. Self and peer introduction
2. Newspaper reading
3. Just a minute session-Extempore
4. Greeting and starting a conversation
5. Leave taking
6. Thanking
7. Wishing well
8. Talking about likes and dislikes
9. Group Discussion
10. Listening Exercises.

● Student should be encouraged to participate in role play and other student centred activities in class room and actively participate in listening exercises

● Assignments and quiz/class tests, mid-semester and end-semester written tests − Actual practical work, exercises and viva-voce − Presentation and viva-voce

**Recommended Texts:**

1. Communicating Effectively in English, Book-I by RevathiSrinivas; Abhishek Publications, Chandigarh.
2. Communication Techniques and Skills by R. K. Chadha; DhanpatRai Publications, New Delhi.

**Reference Books:**

1. High School English Grammar and Composition by Wren & Martin; S. Chand & Company Ltd., Delhi.
2. Excellent General English-R.B.Varshnay, R.K. Bansal, Mittal Book Depot, Malhotra
3. The Functional aspects of Communication Skills – Dr. P. Prsad, S.K. Katria & Sons, New Delhi
4. Q. Skills for success – Level & Margaret Books, Oxford University Press.
5. e-books/e-tools/relevant software to be used as recommended by AICTE/ NITTTR, Chandigarh.

**Web References:**

1. http://www.mindtools.com
2. http://www.letstalk.com.in
3. http://www.englishlearning.com
4. http://learnenglish.britishcouncil.org/en/
5. http://swayam.gov.in

Mapping with Programme Outcomes:

| **Mapping with Programmers outcomes*** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | L | L | M | S | M | S | L | S | S | M |
| CO2 | S | M | L | M | L | S | M | L | M | S |
| CO3 | M | S | S | L | M | S | L | M | S | M |
| CO4 | S | L | S | M | S | L | L | M | M | S |
| CO5 | S | M | L | S | L | M | S | L | M | S |

S-Strong M-Medium L-Low

| Title of the Course/Paper | Communication Skills for Software Engineers - II | | |
|---|---|---|---|
| Soft Skill - | Year - Semester | | Credit: 2 |

**Objectives:**

- Knowledge of English Language plays an important role in career development.
- This subject aims at introducing basic concepts of communication besides laying emphasis on developing listening, speaking, reading and writing skills as parts of Communication Skill.

**Outcomes:**

- Frame correct sentences with illustrations
- Comprehend the language correctly and Interpret the language correctly
- Use given material in new situations.
- Correspond effectively using various types of writings like letters, memos etc.
- Communicate effectively in English with appropriate body language making use of correct and appropriate vocabulary and grammar in an organised set up and social context.

**1. Functional Grammar**

1.1 Prepositions

1.2 Framing Questions

1.3 Conjunctions

1.4 Tenses

**2 Reading**

2.1 Unseen Passage for Comprehension ( Vocabulary enhancement - Prefixes, Suffixes, one word substitution, Synonym and Antonym) based upon the passage should be covered under this topic.

**3 Writing Skill**

3.1. Correspondence a) Business Letters- Floating Quotations, Placing Orders, Complaint Letters. b) Official Letters- Letters to Government and other Offices

3.2. Memos, Circular, Office Orders

3.3. Agenda & Minutes of Meeting

3.4. Report Writing

**LIST OF PRACTICALS**

Note: Teaching Learning Process should be focused on the use of the language in writing reports and making presentations. Topics such as Effective listening, effective note taking, group discussions and regular presentations by the students need to be taught in a project oriented manner where the learning happens as a byproduct.

**4 Speaking and Listening Skills**

1. Debate
2. Telephonic Conversation: general etiquette for making and receiving calls
3. Offering- Responding to offers.
4. Requesting – Responding to requests
5. Congratulating
6. Exploring sympathy and condolences
7. Asking Questions- Polite Responses
8. Apologizing, forgiving
9. Complaining
10. Warning
11. Asking and giving information
12. Getting and giving permission
13. Asking for and giving opinions

● Students should be encouraged to participate in role play and other student-centered activities in class rooms and actively participate in listening exercises

● Assignments and quiz/class tests, mid-semester and end-semester written tests - Actual practical work, exercises and viva-voce - Presentation and viva-voce

**Recommended Texts:**

1. Communicating Effectively in English, Book-I by RevathiSrinivas; Abhishek Publications, Chandigarh.
2. Communication Techniques and Skills by R. K. Chadha; Dhanpat Rai Publications, New Delhi.

**Reference Books:**

1. High School English Grammar and Composition by Wren & Martin; S. Chand & Company Ltd., Delhi.
2. e-books/e-tools/relevant software to be used as recommended by AICTE/NITTTR, Chandigarh.

**Web References:**

1. http://www.mindtools.com
2. http://www.letstalk.com.in
3. http://www.englishlearning.com
4. http://learnenglish.britishcouncil.org/en/
5. http://swayam.gov.in

Mapping with Programme Outcomes:

| Mapping with Programmers outcomes* | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | L | L | M | S | M | S | L | S | S | M |
| CO2 | S | M | L | M | L | S | M | L | M | S |
| CO3 | M | S | S | L | M | S | L | M | S | M |
| CO4 | S | L | S | M | S | L | L | M | M | S |
| CO5 | S | M | L | S | L | M | S | L | M | S |

S-Strong M-Medium L-Low

| Title of the Course/Paper | Personality Development and other Soft Skills for Software Engineers | |
|---|---|---|
| Soft skill | | Credit:2 |

**Objectives:**

- The course intends to develop talent, facilitate employability enabling the incumbent to excel and sustain in a highly competitive world of business.
- The programme aims to bring about personality development with regard to the different behavioural dimensions that have far reaching significance in the direction of organisational effectiveness.
- To make students know about self-awareness, life skills, soft skills, need for personal development etc**.**

**Outcomes:**

- The student will be able to understand, analyse develop and exhibit accurate sense of self.
- Think critically.
- Demonstrate knowledge of personal beliefs and values and a commitment to continuing personal reflection and reassessment.
- Learn to balance confidence with humility and overcome problems associated with personality

**Unit 1: Personality Development : A Must for Leadership and Career Growth**

Case 1: One's Personality Sends Out a Signal that Others Read

Case 2: Same Person: Consciously Different Personalities can be Powerful

Case 3: There isn't One Right Personality

Learnings About Personality Development from the Three Cases

Personality Analysis - Freudian Analysis of Personality Development - Swami Vivekananda's Concept of Personality Development - Physical Self- Energy Self - Intellectual Self - Mental Self - Blissful Self - Personality Begets Leadership Qualities - Interpersonal Skills - Resolving Conflict - A Smiling Face - Appreciative Attitude - Assertive Nature - Communication - Skills-Listening Skills -Developing Empathy - The Personality Attribute of Taking Bold Decisions - Personality Types and Leadership Qualities - Mapping the Different Personality Types - Perfectionists-Helpers-Achievers-Romantics-Observers -Questioners - Enthusiasts or Adventurers-Bosses or-Asserters-Mediators or Peacemakers - Personality Tests - Example of a Personality Test: Jung Typology Test - Personality Assessment

**Unit 2: Soft Skills: Demanded by Every Employer**

Case I: Dr Devi Shetty

Case II: Abraham Lincoln

Case III: Jeff Immelt

**Lessons from the Three Case Studies - Change in Today's Workplace: Soft Skills as a Competitive Weapon - Antiquity of Soft Skills - Classification of Soft Skills -** Time Management -Attitude -Responsibility - Ethics, Integrity, Values, and Trust -Self-confidence and Courage - Consistency and Predictability - Teamwork and Interpersonal Skills - Communication and Networking - Empathy and Listening Skills - Problem Solving, Troubleshooting and Speed-reading - Leadership

**Unit 3: Your Resume or Curriculum Vitae: The First Step Forward**

The Strategy of Resume Writing—From an Employer's Perspective

Strategy I: The Resume Should Reveal the Personality Traits that Align with the Organization's Values

Strategy II: The Resume Should Convince the Potential Employer of Right Fitment to the Opening

Strategy III: The Resume Should Show to the Employer the Benefits that the Candidate Will Bring in

A Favourable First Impression—The 'Career Objective' in the Resume - The Main Body of the Resume - Clarity and Crispness of the Resume - Format and Content of the Resume - A Fresher's Resume - Examples - Example of a Well-written Resume by an Experienced Professional -Example of a Well-written Resume of a Fresh Graduate - Example of a Poorly Written Resume - Writing a Modern Resume - How is the Modern CV Different from the Traditional One? - Various Modern Resume Formats -

**Unit 4: Group Discussion: A Test of Your Soft Skills**

Case Studies - Learning from the Three Case Studies - Ability to Work as a Team - Communication Skills, Including Active Listening - Non-verbal Communication - Leadership and Assertiveness - Reasoning - Ability to Influence - Innovation, Creativity and Lateral Thinking - Flexibility - Group Discussion Types - The Responsibility of the First Speaker - Concluding the Discussion — The Technique of Summing Up

**Recommended Texts:**

1. Personality Development and SOFT SKILLS, BARUN K. MITRA, Oxford University Press

**Reference Books:**

1. Communicating Effectively in English, Book-I by Revathi Srinivas; Abhishek Publications, Chandigarh.
2. Communication Techniques and Skills by R. K. Chadha; Dhanpat Rai Publications, New Delhi.

**Web References:**

1. http://www.mindtools.com
2. http://www.letstalk.com.in

3. http://www.englishlearning.com
4. http://learnenglish.britishcouncil.org/en/
5. http://swayam.gov.in

Mapping with Programme Outcomes:

| **Mapping with Programmers outcomes*** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | L | L | M | S | M | S | L | S | S | M |
| CO2 | S | M | L | M | L | S | M | L | M | S |
| CO3 | M | S | S | L | M | S | L | M | S | M |
| CO4 | S | L | S | M | S | L | L | M | M | S |
| CO5 | S | M | L | S | L | M | S | L | M | S |

S-Strong M-Medium L-Low

| Title of the Course/Paper | Documentation and Interview skills for Software Engineers | | |
|---|---|---|---|
| Soft Skill - | Year - Semester | | Credit: 2 |

**Objectives:**

- Ensure that you understand what the job involves, and that you have the necessary skills
- Make sure you do want to work for the company
- Check that the philosophy/values of the company match your personal requirements
- Find out more about the job, training, career structure etc.

**Outcomes:**

- Understand the purpose of interviews
- Be aware of the processes involved in different types of interviews
- Know how to prepare for interview
- Be clear about the importance of self presentation

**Unit 1: Job Interviews: The Gateway to the Job Market**

Types of Interviews - Groundwork Before the Interview - Abide by the Dress Code - Importance of Body Language in Interviews - Need for Proper Articulation - **Probable Interview Questions**: Tell Us about Yourself - Would You Call Yourself a Team Player? - **Few Tricky Questions and Possible Answers:**Why Should We Employ You? - Do You Have Off ers from Other Companies? - What Salary are You Expecting? - How Much do You ink You are Worth? - What Kind of a Culture are You Comfortable with? - What is More Important to You—Salary or Growth Opportunities? - What do You Know about Our Company? - Tell Us about Your Strengths and Weaknesses - Where do You See Yourself in 5 or 10 Years? - What are Your Plans for Higher Studies? - When Leading a Team, How Will You Motivate Your Team Members and Resolve Any Differences between them? - What Has Been the Biggest Challenge You Have Faced, and How Did You Handle It? - What Do You ink are the Essential Qualities of a Good Employee? - You Claim to be Computer-savvy. Can You Mention Any Innovative Way to Enhance the Sales of the Company Using Your Computer Knowledge and Skills? — Concluding an Interview - Telephonic or Video Interview—A Growing Trend - Disadvantages of Telephonic or Video Interview - **A Mock Interview:**Why did the Interview Team Select Vikram? - Why did the Interview Team not Select Chandra and Amit?

**Unit 2:Body Language: Reveals Your Inner Self and Personality**

Emotions Displayed by Body Language:Aggressive - Submissive - Attentive - Nervous - Upset - Bored - Relaxed - Power - Defensive—Handshake—The Most Common Body

Language— Eyes— A Powerful Reflection of One's Inner Self —Entry to My Space— Personal Zones May Vary: Intimate Zone - Personal Zone - Social Zone - Public Zone - Typical Body Language when Zones are Intruded — Body Language Exhibited During Different Professional Interactions -Interview - Manager's Discussions with a Subordinate Employee - Discussions with Supervisor - Presentation to a Large Audience - Group Discussions - Video-conference

**Unit 3: Enhance Your Writing Skill to Create an Impression**

Fifteen Principles to Increase Clarity of Communication - Use Short, Simple and Clear Words - Use Short Sentences - Do not Cram Di erent Points into One Sentence - Using Compact Substitutes for Wordy Phrases - Remove Redundant Words and Expressions - Avoid Use of Mixed Metaphors - Avoid Hackneyed and Stilted Phrases - Avoid Verbosity in the Use of Common Prepositions - Do not Twist the Word Order - Present Similar Ideas in a Sentence with Same Structural and Grammatical Form - Make Positive Statements Without Being Hesitant or Non-committal - e Statements Without Being Hesitant or Non-committal - Avoid Pompous Words and Phrases - Use Active Instead of Passive Voice - Ensure Correct Spelling and Grammar in the Text - Substitute Easily-understood Words for Words Imported from Other Fields - Edit-Edit-Edit - The Reader's Perspective - Clarity of Thought - Clarity of Text - Example of Poorly and Well-written Texts

**Unit 4: Fog Index: Provides Guidance for Proper Writing**

Fog Index or Clarity Index -Examples of Passages with High and LowFog Index - Infogineering Clarity Rating - Flesch Kincaid Reading Ease Index - Other Readability Indices - Checking Grammar, Spelling and Voice - Clarity of Verbal Communication - Case 1 - Case 2

**Recommended Texts:**

1. Personality Development and SOFT SKILLS, BARUN K. MITRA, Oxford University Press

**Reference Books:**

1. **C**ommunicating Effectively in English, Book-I by Revathi Srinivas; Abhishek Publications, Chandigarh.
2. Communication Techniques and Skills by R. K. Chadha; Dhanpat Rai Publications, New Delhi.

**Web References:**

1. http://www.mindtools.com
2. http://www.letstalk.com.in
3. http://www.englishlearning.com
4. http://learnenglish.britishcouncil.org/en/
5. http://swayam.gov.in

Mapping with Programme Outcomes:

| **Mapping with Programmers outcomes*** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | L | L | M | S | M | S | L | S | S | M |
| CO2 | S | M | L | M | L | L | M | S | M | S |
| CO3 | M | S | S | L | M | S | L | M | S | M |
| CO4 | S | L | S | M | S | L | L | M | M | S |
| CO5 | S | M | L | S | L | M | S | L | M | S |

S-Strong M-Medium L-Low

| Title of the Course/Paper | **Team Project** | | |
|---|---|---|---|
| Soft Skill - | Year - Semester | | Credit: 2 |

**Objectives:**

- Understand programming language concepts, particularly object-oriented concepts or go through research activities.
- Plan, analyze, design and implement a software project or gather knowledge over the field of research and design or plan about the proposed work.
- Learn to work as a team and to focus on getting a working project done on time with each student being held accountable for their part of the project.
- Learn about and go through the software development cycle with emphasis on different processes - requirements, design, and implementation phases.

**Outcomes:**

- Demonstrate the ability to locate and use technical information from multiple sources.
- Demonstrate the ability to communicate effectively in speech and writing.
- To demonstrate a depth of knowledge of modern technology.
- To do the Project Scheduling, tracking, Risk analysis, Quality management and Project Cost estimation using different techniques.
- To complete an independent research project, resulting in at least a thesis publication, and research outputs in terms of publications in high impact factor journals, conference proceedings.

**Project:**

- Any Computer related project has to be developed using latest software as a team.
- The project must be presented for viva-voce at the end of the semester.
- Students will write up a project report, which is an essay to provide a complete record of all the work carried out in their projects.
- The student project reports will be assessed solely according to academic marking guidelines by the supervisor(s) of the student project.
- If the work of the candidate is found to be insufficient and plagiarism, the supervisor(s) will decide the further process.

- Mapping with Programme Outcomes:

| Mapping with Programmers outcomes* | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | L | L | M | S | M | S | L | S | S | M |
| CO2 | S | M | L | M | L | S | M | L | M | S |
| CO3 | L | S | S | L | M | L | M | S | S | M |
| CO4 | S | L | S | M | S | L | L | M | M | S |
| CO5 | S | M | L | S | L | M | S | L | M | S |

- S-Strong M-Medium L-Low

*****

**S.A.C. SEPT'2022**

**APPENDIX – (i)35(R)**
**UNIVERSITY OF MADRAS**
**LOCF for CBCS**
**(For Affiliated Colleges, with Effect From 2022-23)**

**M.Sc. VISUAL COMMUNICATION**

## PROGRAMME EDUCATIONAL OBJECTIVES

1. To develop skills required to meet the demands of media and entertainment industry
2. To gain meaningful employment in wide range of entertainment and creative industries
3. To develop creative and innovative ways to generate, and design effective messages
4. across media platforms
5. To gain procedural knowledge, to work as individual and in teams to fulfilworkflows and tasks in media organisations
6. To gain academic and scholarly knowledge to become effective researchers, teachers and mentors in the discipline of communication
7. Learns will develop entrepreneurial skills to work independently or find gainful employment in the established entertainment industry
8. To engage in ethically and socially responsible media practices and sever as a change agent
9. To inculcate the values of truth-seeking, truth-telling, intellectual honesty and respect for view-point diversity.

## PROGRAM OUTCOME

1. Ability to design, develop and produce media content on a wide range of topic
2. Demonstrate mastery over a range of skill sets and techniques to work onmultiple platforms and formats
3. To become an enterprising, enthusiastic and creative media professional
4. To become an active and adaptive leader, to keep phase with the rapid changes in media industry
5. Ability to conduct independent academic and commercial research withappropriate scientific attitude and commitment
6. Ability to make ethical and socially conscious decisions in professional media practices.

**MAPPING OF PROGRAMME EDUCATIONAL OBJECTIVES WITH PROGRAMME OUTCOMES**

A broad relation between the programme educational objective and the programme outcome is given in the following table.

| **Program Educational Objectives (PEO)** | **Program Objectives (PO)** | | | | | |
|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
| PEO1 | YES | YES | YES | YES | YES | YES |
| PEO2 | YES | YES | YES | YES | YES | YES |
| PEO3 | YES | YES | YES | YES | YES | YES |
| PEO4 | YES | YES | YES | YES | YES | YES |
| PEO5 | YES | YES | YES | YES | YES | YES |
| PEO6 | YES | YES | YES | YES | YES | YES |
| PEO7 | YES | YES | YES | YES | YES | YES |
| PEO8 | -- | -- | -- | -- | YES | YES |
| YES=Match Between PEO and PO | | | | | | |

**PROGRAMME SPECIFIC OUTCOMES (PSOs)**

By the completion of the M.Sc. Visual Communication programme, the students will have the following programme-specific outcomes.

1. Learners will gain procedural knowledge to practice a wide range of skills the domain of computer graphics, multimedia design and visual effects
2. Learners will have developed competency in designing professional quality multimedia packages and adapted to multiple platforms

3.Learners will be adept at producing fictional, non-fictional and information-oriented content using cutting-edge tools and creative strategies

4. Learns gain the ability to create objects, models, elements and properties for extended reality content such as Virtual reality, Augmented reality and game design

5Learns will develop entrepreneurial skills to work independently and adaptive enough for gainful employment in established media organizations

6. Learns will be able adhere to high ethical standards and social commitment for holistic professional practices
7. Learns will gain in-depth knowledge of scientific theories underpinning communication discipline and carryout scholarly and commercial research with scientific attitude and integrity

## SCHEME OF EXAMINATIONS:

## FIRST YEAR – FIRST SEMESTER

| Course Component | Subjects | L | T | P | Instruc-tion Hrs | Credits | Maximum Marks | | Total |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Int. | Ext. | |
| Core Paper-I | Understanding Human Communication | 4 | | | 5 | 4 | 25 | 75 | 100 |
| Core Paper-II | Graphic Arts and Animation | | | 4 | 6 | 4 | 40 | 60 | 100 |
| Core Paper-III | Computer Graphics-1 (3D Designs) (Practical) | | | 4 | 6 | 4 | 40 | 60 | 100 |
| Core Paper-IV | Creative Digital Illustration | | | 4 | 5 | 4 | 40 | 60 | 100 |
| Elective Paper-I | Contemporary Trends in Indian Media | 3 | | | 4 | 3 | 25 | 75 | 100 |
| Elective Paper-II | Media Aesthetics | 3 | | | 4 | 3 | 25 | 75 | 100 |
| Soft Skills | Soft Skills-I | 2 | | | | 2 | 40 | 60 | 100 |
| Total | | | | | 30 | 24 | | | |

## FIRST YEAR – SECOND SEMESTER

| Course Component | Subjects | L | T | P | Instruc-tion Hrs | Credits | Maximum Marks | | Total |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Int. | Ext. | |
| Core Paper-V | Mediated Communication | 4 | | | 5 | 4 | 25 | 75 | 100 |
| Core Paper-VI | Computer Graphics-2 (Camera and Lighting Techniques) (Practical) | | | 4 | 6 | 4 | 40 | 60 | 100 |
| Core Paper-VII | Digital Filmmaking | | | 4 | 6 | 4 | 40 | 60 | 100 |
| Core Paper-VIII | Design Thinking | | | 4 | 5 | 4 | 25 | 75 | 100 |
| Elective Paper-III | Writing for Media | 3 | | | 4 | 3 | 25 | 75 | 100 |
| Extra Disciplinary-I | Anchoring and Presentation Skills (Practical) | | | 3 | 4 | 3 | 40 | 60 | 100 |
| Soft Skills | Soft Skills-II | 2 | | | | 2 | 40 | 60 | 100 |
| Internship | | | | 2 | | 2 | 40 | 60 | 100 |
| Total | | | | | 30 | 26 | | | |
| Internship will be carried out during the summer vacation of the first year and marks should be sent to the University by the College and the same will be included in the Third Semester Mark Statement. | | | | | | | | | |

## SECOND YEAR – THIRD SEMESTER

| Course Component | Subjects | L | T | P | Instruction Hrs | Credits | Maximum Marks Int. | Maximum Marks Ext. | Total |
|---|---|---|---|---|---|---|---|---|---|
| Core Paper-IX | Communication Research Methods | 4 | | | 5 | 4 | 25 | 75 | 100 |
| Core Paper-X | UX and Interactive Media Design (Practical) | | | 4 | 6 | 4 | 40 | 60 | 100 |
| Core Paper-XI | Video Editing and Visual Effects (VFX) (Practical) | | | 4 | 6 | 4 | 40 | 60 | 100 |
| Core Paper-XII | Computer Graphics-3 (Advanced Techniques) (Practical) | | | 4 | 5 | 4 | 40 | 60 | 100 |
| Elective Paper-IV | Transmedia Storytelling | 3 | | | 4 | 3 | 25 | 75 | 100 |
| Extra Disciplinary-II | Advertising Strategies | 3 | | | 4 | 3 | 25 | 75 | 100 |
| Soft Skills | Soft Skills-III | 2 | | | | 2 | 40 | 60 | 100 |
| Total | | | | | 30 | 24 | | | |

## SECOND YEAR – FOURTH SEMESTER

| Course Component | Subjects | L | T | P | Instruction Hrs | Credits | Maximum Marks Int. | Maximum Marks Ext. | Total |
|---|---|---|---|---|---|---|---|---|---|
| Core Paper-XIII | Media Entrepreneurship and Innovation | 4 | | | 5 | 4 | 25 | 75 | 100 |
| Core Paper-XIV | Immersive Media Design | 4 | | | 6 | 4 | 25 | 75 | 100 |
| Core Paper-XV | Capstone Project and Portfolio OR Dissertation | | | 4 | 10 | 4 | 40 | 60 | 100 |
| Elective Paper-V | Digital Asset Management | 3 | | | 5 | 3 | 25 | 75 | 100 |
| Extra Disciplinary-III | Digital Marketing Communication | 3 | | | 4 | 3 | 25 | 75 | 100 |
| Soft Skills | Soft Skills-IV | 2 | | | | 2 | 40 | 60 | 100 |
| Total | | | | | 30 | 20 | | | |

The above amendment to the Regulations takes effect from the academic year 2022-2023 and thereafter.

| Semesters | Hours | Credits |
|---|---|---|
| I | 30 | 24 |
| II | 30 | 26 |
| III | 30 | 24 |
| IV | 30 | 20 |
| **Total** | **120** | **94** |

| Papers | No. of Papers X Credits | Total Credits |
|---|---|---|
| **Core Papers** | $15 \times 4$ | 60 |
| **Electives** | 5X3 | 15 |
| **Extra Disciplinary** | 3X3 | 9 |
| **Soft skills** | $4 \times 2$ | 8 |
| **Internship** | $1 \times 2$ | 2 |
| **Total** | | 94 |

Points to be noted

1. Distribution of marks between Theory and Internal Assessment is 75:25

Question paper pattern remains same for all papers.

**S.SENATE. SEPT'2022**

**APPENDIX – 35(S)**
**UNIVERSITY OF MADRAS**
**LOCF for CBCS**
**(For Affiliated Colleges, with Effect From 2022-23)**

**M.Sc. Visual Communication**

SYLLABUS

**Core Paper- I : Understanding Human Communication – Theory**

| S. No | Course Objectives |
|---|---|
| 1 | To impart knowledge of the fundamentals of human communication. |
| 2 | To raise awareness of the evolutionary and biological foundations of human communication among students. |
| 3 | To be able to recognize various modes of communication and techniques for analysing them. |
| 4 | To understand the differences between various levels of communication and define them. |
| 5 | To introduce learners to the nature, origins, evolution, and spread of communication at different levels of society. |

| Topic No | Understanding Human Communication |
|---|---|
| **Unit 1** | **Human Communication Basic Theories and Concepts** |
| 1 | Fundamentals of Communication - Elements of Communication. Functions of Communication. Purposes of Communication. Barriers to Communication. |
| 2 | Role of Perception, Emotion, and Cognition in Communication. Generic Models of Communication. |
| 3 | Key Concepts in Message Processing - Media and Communicative Codes. |
| 4 | Traditional Models of Human Communication. |
| 5. | The Inferential Model of Human Communication. |
| 6. | Principles of Good Communication. |
| **Unit 2** | **Evolutionary Communication** |
| 1 | Signalling Theory of Communication. Pointing as Communication. |
| 2 | Evolutionary Communication-Basics Concepts-Cooperative Behaviour, Reciprocal Altruism. |
| 3 | Evolution of Language and Spoken Communication. Language Instinct. Language and thought. Speech Community. Speech Act. |
| 4 | Concept of Cultural Evolution and Criteria for Cross-cultural Comparison. |
| 5 | A Very Brief Overview of Biological and Neurological Basis of Communication. |
| **Unit 3** | **Modes of Communication** |
| 1 | Key Concepts in Nonverbal Communication (NVC). Proxemics. Digital NVC |
| 2 | Speech, Spoken-Oral Communication |

| | |
|---|---|
| 3 | Visual Communication- Semiotics- Social Semiotics. |
| 4 | Written Forms of Communication. Literacy and Orality. |
| 5 | Writing and Reading as a Technology and Practice. |
| **Unit 4** | **Levels of Communication** |
| 1 | Intrapersonal Communication-Concept of Self and Related Themes. |
| 2 | Overview of Interpersonal Communication, Group Communication. Organizational Communication, and Public Communication -Rhetoric Model. |
| 3 | Theories of Interpersonal Communication. |
| 4 | Ethical and Non-violent Communication. |
| 5 | Communication Apprehension, Competence, and Skills. |
| **Unit 5** | **Persuasion** |
| 1 | Key Concepts in Persuasion-Propaganda Attitude, Values |
| 2 | Theories of Persuasion-Attribution and Judgement, Social Judgement Theory |
| 3 | Elaboration Likelihood Model, Cognitive Dissonance/Balance Theory and Cialdini' Influence- Social Learning Model |
| 4 | Principles of Good Communication and Non-violent Communication |

**Course Outcomes**

| S. No | Course Outcomes |
|---|---|
| 1 | Analyse various aspects of communication and articulate good communication principles. |
| 2 | Analyse and interpret signals, language, and signs as well as other aspects of human communication. |
| 3 | Demonstrate various modes of communication using message design principles. |
| 4 | Determine criteria for appropriate message design by distinguishing multi-level communication flows. |
| 5 | Analyse and interpret the behaviour of information, communication systems, and the spread of ideas in contemporary mediums. |

**Mapping Course Objectives (CO) and Program Specific Objectives (PSO)**

| Course Objectives (CO) | Program Specific Objectives (PSO) | | | | | | |
|---|---|---|---|---|---|---|---|
| | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** | **PSO6** | **PSO7** |
| **CO1** | S | S | S | S | L | S | S |
| **CO2** | S | S | S | S | L | S | S |
| **CO3** | S | S | S | S | L | S | S |
| **CO4** | S | S | S | S | L | S | S |
| **CO5** | S | S | S | S | L | S | S |
| **S=Strong, M=Medium, L=Low** | | | | | | | |

**References**


1. Heath, Robert L., and Jennings Bryant. 2013. *Human Communication Theory and Research: Concepts, Contexts, and Challenges*. Routledge.
2. Knapp, Mark L., and John A. Daly. 2002. *Handbook of Interpersonal Communication*. SAGE.
3. 2011. *The SAGE Handbook of Interpersonal Communication*. SAGE Publications.
4. Various. 2021. *Communication Yearbooks Vols 6-33 Set*. Routledge.
5. West, Richard, and Lynn H. Turner. 2010. *Understanding Interpersonal Communication: Making Choices in Changing Times Enhanced Edition*. Cengage Learning.


**Core Paper – II : Graphic Arts and Animation**

| S. No | Course Objectives |
|---|---|
| 1 | To Define the importance of Aesthetic of Design and Art |
| 2 | To Illustrate the need and usage of Principles of Design |
| 3 | To Develop animated images for Visual Presentation |
| 4 | To Discover the workflow of White board Animation |
| 5 | To Construct a Participatory visual method using Photograph |

| Topic No | Graphic Arts and Animation |
|---|---|
| **Unit 1** | **Unit I: Aesthetics of Design and Art** |
| 1 | Elements and Principles of Design |
| 2 | Introduction to Adobe Animate Software, Workspace and Workflow overview |
| 3 | Using the Stage and Tools Panel, Understanding timeline |
| 4 | Drawing using pencil, line and brush tools - About overlapping shapes – Snapping, Working with colour, strokes and fills. |
| 5. | Types of File formats and File Compression and Conversion (Handbrake) |
| **Unit 2** | **Principles of 2D Animations** |
| 1 | Squash, Stretch, Staging, and Anticipation |
| 2 | Straight Ahead Action, Pose-to-Pose Ease In and Ease Out |
| 3 | Follow Through, Overlapping Action and Arcs, |
| 4 | Secondary Action, Timing and Exaggeration |
| **Unit 3** | **The Process of Animation** |
| 1 | Process of Animation-Storyboard, Time line, Movement. |
| 2 | Animating still images (PixaMotion. Price, Movepic, StoryZ, Gif maker) |
| 3 | Visual Composition and Integration of Various Design Elements |
| 4 | Future Development of Still Image-Image Enhancement using Artificial Intelligence |
| **Unit 4** | **White Board Animation** |
| 1 | Purpose and Scope of White Board Animation |
| 2 | Animated Objects, Background, Characters Design |
| 3 | Audio synchronization and Output |
| 4 | Voice Over and Dialogue Synchronization |
| **Unit 5** | **Photo voice and Explainer video** |
| 1 | Community-based, Participatory Visual Technique, Photography needs and Usage in Community Development |
| 2 | Illustration of Modern Implementation and International Development of Photo Voice |
| 3 | Exercise on Slideshow with Sound |
| 4 | Making Explainer video using whiteboard Animation |

| S. No | Course Outcomes |
|---|---|
| 1 | Identify and demonstrate the knowledge in 2D Animation and the software |
| 2 | To build basic ideas and be familiar with important principles of animations |
| 3 | Utilize knowledge on how to generate a still and image processing in animations |
| 4 | Develop the fundamentals and various techniques in White board animations |

| | |
|---|---|
| 5 | Analyse the practical knowledge and understand the Photo voice methods and process. |

**Mapping Course Objectives (CO) and Program Specific Objectives (PSO)**

| Course Objectives (CO) | Program Specific Objectives (PSO) | | | | | | |
|---|---|---|---|---|---|---|---|
| | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** | **PSO6** | **PSO7** |
| **CO1** | S | S | S | S | L | S | S |
| **CO2** | S | S | S | S | L | S | S |
| **CO3** | S | S | S | S | L | S | S |
| **CO4** | S | S | S | S | L | S | S |
| **CO5** | S | S | S | S | L | S | S |
| **S=Strong, M=Medium, L=Low** | | | | | | | |

**References**


1. Richard William (2012). The Animator's Survival Kit. Farrar, Straus and Giroux

2. Taylor & Francis (2006) Animation from pencils to pixels: classical techniques for digital animators. Taylor & Francis

3. Tony White (2013) How to Make Animated Films. Routledge

4. Tracie S Rollins (2013) A Beginners Guide to Whiteboard Animation. CreateSpace.

5. Melvin Delgado · 2015 Urban Youth and Photovoice Visual Ethnography in Action. Oxford University Press.

Core Paper – III: **Computer Graphics – 1- 3D Designs (Practical)**

| S. No | Course Objectives |
|---|---|
| 1 | Basics of 3D design, Modelling |
| 2 | Nurbs & Splines modelling |
| 3 | Polygon Modelling, Boolean, mesh. |
| 4 | Texturing and Material |
| 5 | Rendering |

| Topic No | Computer Graphics – 1 - 3D Designs (Practical) |
|---|---|
| **Unit 1** | **Introduction to 3D Design** |
| 1 | Difference between 2D & 3D, Concepts of 3D |
| 2 | Grids & coordinates, Axis, Objects & Pivots |
| 3 | Navigation, Tools, Menu Bar |
| 4 | Introduction to Basic modelling tools |
| **5** | Comparison of Commercial an open source and commercial Applications |
| **Unit 2** | **Polygon modelling** |
| 5 | Concepts & Problems. Interfaces. |
| 6 | Creating polygons. |
| 7 | Editing poly models |
| 8 | Booleans, mesh, mirror. |
| **Unit 3** | **Nurbs and Splines** |
| 9 | Nurbs curve, EP curve, CV curve. |
| 10 | Spline, Spline tools. |
| 11 | Sculpting, creating surfaces. |
| 12 | Learning to create 3D text. |
| **Unit 4** | **Texturing and Material** |
| 13 | Concepts, Basic attributes, shading |
| 14 | Transparency, reflection, refraction |
| 15 | Materials, Bump maps, Basic wrapping |
| 16 | Uvs, Hardware texturing, shaders. |
| **Unit 5** | **Basic Lighting & Rendering** |
| 17 | Basic Concepts of Lighting & its types. |
| 18 | Basic principles of rendering, Rendering setup |

| | |
|---|---|
| 19 | Types of renderers |
| 20 | Frame rendering options |

| S. No | Course Outcomes |
|---|---|
| 1 | Skills to create 3d designs |
| 2 | Skills to create Nurbs & Splines |
| 3 | Skills to create polygon modelling |
| 4 | Skills to add Textures & material to models |
| 5 | Skills to take Render output |

**Mapping Course Objectives (CO) and Program Specific Objectives (PSO)**

| Course Objectives (CO) | Program Specific Objectives (PSO) | | | | | | |
|---|---|---|---|---|---|---|---|
| | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** | **PSO6** | **PSO7** |
| **CO1** | S | S | S | S | L | S | S |
| **CO2** | S | S | S | S | L | S | S |
| **CO3** | S | S | S | S | L | S | S |
| **CO4** | S | S | S | S | L | S | S |
| **CO5** | S | S | S | S | L | S | S |
| **S=Strong, M=Medium, L=Low** | | | | | | | |

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**Core Paper – IV: Creative Digital Illustration-**

| S. No | Course Objectives |
|---|---|
| 1 | To make them understand the skills in illustration, drawing |
| 2 | To equip the students with digital illustration and its techniques |
| 3 | To make the students with creative aspects in visualizing objects |
| 4 | To make them understand the digital techniques in image making |
| 5 | To make them learn image making software's and tools |

| Topic No | Digital Creative Illustration(Practical) |
|---|---|
| **Unit 1** | **Line Art** |
| **1** | Line sketching, |
| **2** | outdoor drawing |
| **3** | Portrait sketching |
| **4** | Techniques in light and shade |
| **Unit 2** | **Concept Art** |
| **5** | Visualising Content and concept in Art |
| **6** | Creative aspects of conceptual art |
| **7** | Understanding image and imagination |
| **8** | Visual Travelogue and Storytelling |
| **Unit 3** | **Cartoon And Caricature** |
| **9** | Comic culture in India, Mario Miranda |
| **10** | Cartoonist RK Lakshman, Gopulu, Bapu |
| **11** | Making of Cartoon and Caricature |
| **12** | Caricature techniques and tools |
| **Unit 4** | **Storyboarding** |
| **13** | The Art of Storyboarding, its importance |
| **14** | Techniques involved in Storyboarding |
| **15** | Digital Storyboard Techniques |
| **16** | Storyboarding and Film Pre-Production |
| **Unit 5** | **Illustration in Print Media** |
| **17** | The concept of Print on Demand, Magazine Illustrator, |

| | |
|---|---|
| **18** | Cartoonist in Newspapers and Magazines |
| **19** | Cover Page designing for Magazines |
| **20** | Digital Posters with Creative Illustrations |

**Course Outcomes**

| S. No | Course Outcomes |
|---|---|
| 1 | Job profile as Professionals in Visualization, Creative Illustration, Cartoon and Caricature artist |
| 2 | Job profile as political Cartoonist, Magazine layout artist, Film Title designers |
| 3 | Professionals as Visual Analyser, Graphic designers, Special visual effects designer |
| 4 | Professionalism in Animation design, 2D animation artist |
| 5 | Job description as Concept Artist, Game Designer,3D Animator |

**Submission for Practical's:** Minimum 5 categories of art works must be produced-Magazine Cover Page design, Digital Illustration posters, Caricature art, Political Cartoons for Magazine, Concept art illustrations

**Mapping Course Objectives (CO) and Program Specific Objectives (PSO)**

| Course Objectives (CO) | Program Specific Objectives (PSO) | | | | | | |
|---|---|---|---|---|---|---|---|
| | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** | **PSO6** | **PSO7** |
| **CO1** | S | S | S | S | L | S | S |
| **CO2** | S | S | S | S | L | S | S |
| **CO3** | S | S | S | S | L | S | S |
| **CO4** | S | S | S | S | L | S | S |
| **CO5** | S | S | S | S | L | S | S |
| **S=Strong, M=Medium, L=Low** | | | | | | | |

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**Elective Paper – I :Contemporary Trends in Indian Media - Theory**

**Course Objectives:**

| S. No | Course Objectives |
|---|---|
| 1 | To help learners understand the role of media in contemporary Indian society. |
| 2 | To help learners acquire media literacy skills. |
| 3 | To enable learners to critically access media representations of marginalized communities and people. |
| 4 | To enable learners to develop “close” reading skills. |
| 5 | To develop in-depth knowledge about new media theories. |

| Topic No | Contemporary Trends In Indian Media |
|---|---|
| **Unit 1** | **New Media** |
| 1 | Nature and scope of new media, Elements, and Characteristics of new media |
| 2 | A Comparison of Traditional Mainstream Media and New Media |
| 3 | Media convergence and Media Divergence |
| 4 | Knowledge Society and Surveillance Capitalism- Privacy Issues |
| **Unit 2** | **News And Indian Media Business** |
| 1 | News and Indian Society |

| | |
|---|---|
| 2 | Indian Media Business |
| 3 | Media economic and public policy-Market Vs public Sphere Model |
| 4 | The neoclassical theory of the firm- Market Place of Ideas |
| 5 | Political Economy of Indian Media |
| **Unit 3** | **Media Evaluation And Trends** |
| 1 | Media and globalization |
| 2 | Dennis McQuail -Media Performance Theory |
| 3 | Social Media in India |
| 4 | Youth, Digital Media and Indian Society |
| **Unit 4** | **Media And Social Issues** |
| 1 | Media and Environment |
| 2 | Media and Gender |
| 3 | Media and Consumerism |
| 4 | Media and Marginality |
| **Unit 5** | **Emerging Issues In Indian Media** |
| 1 | Henry Jenkins- Remix and Convergence Culture |
| 2 | Identity and Media Culture |
| 3 | Alternative and Community Media |
| 4 | Mobile, and Social Media influence on Rural and Urban Indian Society |

**Course Outcomes**

| S.No | Course Outcomes |
|---|---|
| 1 | Critically assess the use of rhetoric in an array of advertising and media materials, as demonstrated through successful completion of quizzes and critical analyses and Online critique of advertising and media campaign materials |
| 2 | Learners can become script writers content writers and program producers for mass media productions. |

| | |
|---|---|
| 3 | Learners will be able to write and develop the content for new media. |
| 4 | Learners will understand the ethics and basic principles in writing materials for advertisements. |

**Mapping Course Objectives (CO) and Program Specific Objectives (PSO)**

| Course Objectives (CO) | Program Specific Objectives (PSO) | | | | | | |
|---|---|---|---|---|---|---|---|
| | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 | PSO7 |
| CO1 | S | S | S | S | L | S | S |
| CO2 | S | S | S | S | L | S | S |
| CO3 | S | S | S | S | L | S | S |
| CO4 | S | S | S | S | L | S | S |
| CO5 | S | S | S | S | L | S | S |
| S=Strong, M=Medium, L=Low | | | | | | | |

**References**


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8. Kumar, a. (2021). Truth or conspiracy: untold story by Indian media. Notion press.

**Mapping Course Objectives (CO) and Program Specific Objectives (PSO)**

| Course Objectives (CO) | Program Specific Objectives (PSO) | | | | | | |
|---|---|---|---|---|---|---|---|
| | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** | **PSO6** | **PSO7** |
| **CO1** | S | S | S | S | L | S | S |
| **CO2** | S | S | S | S | L | S | S |
| **CO3** | S | S | S | S | L | S | S |
| **CO4** | S | S | S | S | L | S | S |
| **CO5** | S | S | S | S | L | S | S |
| **S=Strong, M=Medium, L=Low** | | | | | | | |

**Elective Paper – II :Media Aesthetics- Theory**

| S. No | Course Objectives |
|---|---|
| 1 | To make Learners understand the applied aesthetics and its functions |
| 2 | To enhance the knowledge of lighting techniques and their application |
| 3 | To make them understand the 2D and 3D fields in media applications |
| 4 | To make them understand the role of colour in the media applications |
| 5 | To make them understand the semiotic applications in media |

| Topic No | **Media Aesthetics** |
|---|---|
| **Unit 1** | **Basics Of Lighting** |
| 1 | Structuring the first Aesthetic field |
| 2 | Cameo and Silhouette, |
| 3 | Rembrandt Lighting, Multi Camera Lighting |
| 4 | Media Generated Lighting |
| **Unit 2** | **2d &3d Concepts** |
| 1 | Two-Dimensional Field, object size, image Size |
| 2 | Three-Dimensional Field, Screen Volume, and effects |
| 3 | Volume Duality, Z-axis articulation & blocking |
| 4 | Graphic Depth factors |
| **Unit 3** | **Colour And Its Functions** |
| 1 | Colour -Values, Energy, and feelings |
| 2 | Color psychology & Perceptions |
| 3 | The compositional function of Colour |
| 4 | Informational functions of Colour |
| **Unit 4** | **Frames, Depth, And Volume** |
| 1 | The magnetism of the Frame. Asymmetry of the Frame |
| 2 | Figure and Ground, Psychological Closure |
| 3 | Building Screen Space, |
| 4 | The Three-dimensional Field: Depth and Volume. |
| **Unit 5** | **Semiotics** |
| 1 | Semiotic Communication |
| 2 | Sign- Icon, Index, and Symbol |

| | |
|---|---|
| 3 | Colour Symbolism, Social Semiotics, |
| 4 | Visual Social Semiotics, |

| S. No | Course Outcomes |
|---|---|
| 1 | Learners are exposed to Television channels, news reporting |
| 2 | Learners are trained as cinematographers, Designers, Visualizers |
| 3 | Learners become program producers, photojournalists |
| 4 | Learners are trained as social media experts in the media profession |
| 5 | Learners are experts in Television management production |

**Mapping Course Objectives (CO) and Program Specific Objectives (PSO)**

| Course Objectives (CO) | Program Specific Objectives (PSO) | | | | | | |
|---|---|---|---|---|---|---|---|
| | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** | **PSO6** | **PSO7** |
| **CO1** | S | S | S | S | L | S | S |
| **CO2** | S | S | S | S | L | S | S |
| **CO3** | S | S | S | S | L | S | S |
| **CO4** | S | S | S | S | L | S | S |
| **CO5** | S | S | S | S | L | S | S |
| **S=Strong, M=Medium, L=Low** | | | | | | | |

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**Core Paper – V:Mediated Communication - Theory**

| S.No | Course Objectives |
|---|---|
| 1 | To orient learners to classical and emerging theories of mediated communication |
| 2 | To comprehend the role and function of media in public opinion formation |
| 3 | To distinguish between various effects of mediated communication |
| 4 | To help learners track and appraise emerging trends in communication theories and research |
| 5 | To help learners understand theories of persuasion and persuasive technologies |

| Topic No | Mediated Communication |
|---|---|
| **Unit 1** | **Media And CMC Effects Tradition** |
| 1 | Functions of Mass and Mediated Communication- Brief History of Computer Mediated Communication (CMC) |
| 2 | Characteristics of New Media-Uses and Gratification of Social Media- Expectancy- |
| | Value Theory-Media Richness.Competence Model |
| 3 | Media and CMC Effects Theories-Personal Influence, Selective Perception, and Limited Effects- Cultivation theory. |
| 4 | An Overview of Psychological Effects of Social and Mobile Media |
| **Unit 2** | **Communication Ecology Perspectives** |
| 1 | Marshall McLuhan's Medium Theory-Media and Communication Ecology Perspective |
| 2 | Media and Socialization- Media Dependency |
| 3 | Ball-Rokeach's Communication Infrastructure Theory |
| 4 | Media Multiplicity Theory (Caroline Haythornthwaite) |
| **Unit 3** | **Cognitive, Memory And Emotional Effects Of Media** |
| 1 | Communication and Cognition- Social Information Processing Theory (Walther). Presentation of Self Online |
| 2 | Cognitive Approach to Mass Communication- Social Cognitive Theory |
| 3 | Memory and Emotional Effects of Mediated Communication |
| 4 | Emergence of Media Neuroscience |
| **Unit 4** | **(Re) Emerging Theoretical Perspective** |
| 1 | Digital Play and Media Transference. Media Transformations (Mark Poster) |
| 2 | Theory of Interactive Media Effects.Social Expectations Theory. Media Equations. |
| 3 | Social Informatics Approach to Mediated Communication |

| | |
|---|---|
| 4 | Persuasive Technology Design-Attention, Dependencies and Distraction |
| **Unit 5** | **Communication Systems And Networks** |
| 1 | Social Systems Approach to Communication-Cybernetics and Self- organization. Latané'S Dynamic Social Impact Theory |
| 2 | Media-Influence Diffusion of Innovation and I Theories. Information Flow Models |
| 3 | Castells' and van Dijk's Network Society |
| 4 | How ideas Spread- Contagion, Jenkins' Spreadable Media Theory Mimetics- Memes, Virality and Infodemiology |

**Course Outcomes**

| S.No | Course Outcomes |
|---|---|
| 1 | Analyse and interpret systems of mediated communication |
| 2 | Critically evaluate public opinion surveys and polls |
| 3 | Outline and write a reflexive essay on the effects of media on self and the other |
| 4 | Analyze and interpret developments in mediated communication using multiple theoretical lenses |
| 5 | Identify key factors driving the spread of information and virality |

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| S. No | Course Outcomes |
|---|---|
| 1 | Analyse and interpret systems of mediated communication |
| 2 | Critically evaluate public opinion surveys and polls |
| 3 | Outline and write a reflexive essay on the effects of media on self and the other |
| 4 | Analyse and interpret developments in mediated communication using multiple theoretical Lenses. |
| 5 | Identify design features of communication technologies that influence individual behaviour. |

**Mapping Course Objectives (CO) and Program Specific Objectives (PSO)**

| Course Objectives (CO) | Program Specific Objectives (PSO) | | | | | | |
|---|---|---|---|---|---|---|---|
| | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 | PSO7 |
| CO1 | S | S | S | S | L | S | S |
| CO2 | S | S | S | S | L | S | S |
| CO3 | S | S | S | S | L | S | S |
| CO4 | S | S | S | S | L | S | S |
| CO5 | S | S | S | S | L | S | S |
| S=Strong, M=Medium, L=Low | | | | | | | |

**References**


1. Stacks, D. W., Salwen, M. B., & Eichhorn, K. C. (2019). An Integrated Approach to Communication Theory and Research. Routledge.
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7. Konijn, E. A., Utz, S., Tanis, M., & Barnes, S. B. (2008). Mediated Interpersonal Communication. Routledge.
8. Carr, C. T. (2021). Computer-Mediated Communication: A Theoretical and Practical Introduction to Online Human Communication. Rowman & Littlefield.
9. de Mooij, M. (2013). Human and Mediated Communication around the World: A Comprehensive Review and Analysis. Springer Science & Business Media.
10. Gunter, B. (2015). The Cognitive Impact of Television News: Production Attributes and Information Reception eBook: Gunter, B.: Amazon.in: Kindle Store
11. McCombs, M., Holbert, L., Kiousis, S., & Wanta, W. (2011). The News and Public Opinion: Media Effects on Civic Life. Polity.
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16. Fogg, B. J. (2003). Persuasive Technology: Using Computers to Change What We Think and Do. Elsevier.

**Core Paper – VI Computer Graphics – 2 (Camera and Lighting Techniques) (Practical)**

| S. No | Course Objectives |
|---|---|
| 1 | To learn basics of lighting |
| 2 | To learn types of lights & lighting, Techniques |
| 3 | To learn interior and exterior lighting |
| 4 | To learn camera, types of cameras, camera movements |
| 5 | To learn Rendering options |

| Topic No | Computer Graphics – 2 (Camera and Lighting Techniques) (Practical) |
|---|---|
| **Unit 1** | **Stimulated Camera and Lighting Techniques** |
| 1 | Shot based, Scene based Lighting |
| 2 | Usage of different lights |
| 3 | Natural light source, Direct light source |
| 4 | Colour theory |
| **Unit 2** | **Types of Lights & Lighting** |
| 5 | Digital Lighting theory |
| 6 | Working with lights |
| 7 | Working with shadows |
| 8 | Mapping Shadows. |
| **Unit 3** | **Interior & Exterior Lighting** |
| 9 | Concepts & challenges |
| 10 | Lighting an Interior scene |
| 11 | Lighting an exterior scene |
| 12 | Environmental Lighting |
| **Unit 4** | **Camera & camera movements** |
| 13 | Concepts, Basic attributes |
| 14 | Camera types |
| 15 | Camera movements & path |
| 16 | Camera animation (keyframe) |
| **Unit 5** | **Rendering Options** |
| 17 | Concepts, principles of rendering. |
| 18 | Setup to render with Camera movements |
| 19 | Advanced rendering options |
| 20 | Output types (import/ export), uses and its methods. |

| S. No | Course Outcomes |
|---|---|
| 1 | Skills to do basic lighting |
| 2 | Skills to add types of lights & lighting |
| 3 | Skills to add interior and exterior lighting |
| 4 | Skills to add camera & camera movements |
| 5 | Skills to Render with camera movements |

**Mapping Course Objectives (CO) and Program Specific Objectives (PSO)**

| Course Objectives (CO) | Program Specific Objectives (PSO) | | | | | | |
|---|---|---|---|---|---|---|---|
| | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** | **PSO6** | **PSO7** |
| **CO1** | S | S | S | S | L | S | S |
| **CO2** | S | S | S | S | L | S | S |
| **CO3** | S | S | S | S | L | S | S |
| **CO4** | S | S | S | S | L | S | S |
| **CO5** | S | S | S | S | L | S | S |
| **S=Strong, M=Medium, L=Low** | | | | | | | |

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**Core Paper – VII : Digital Filmmaking (Theory)**

| S. No | Course Objectives |
|---|---|
| 1 | Students will be able to identify and demonstrate knowledge of digital platforms. |
| 2 | Students will be able to examine and critique a variety of tool, techniques and media products. |
| 3 | Students will be able to demonstrate an understanding of ethical issues related to digital platforms. |
| 4 | To Collaborate as a member or leader of a OTT team |
| 5 | To develop skills in the context of digital platform challenges and opportunities in order to develop career goals |

| Topic No | Digital Filmmaking |
|---|---|
| **Unit 1** | **Digital Cinematic Tools and Techniques** |
| 1 | Ideal Use and Components of Digital Video |
| 2 | Advanced Camera Rigging and Supports |
| 3 | Viewing Video on the Set |
| 4 | Multi-camera setup |
| 5 | Interchangeable lens, |
| 6 | Camera as Storyteller |
| **Unit 2** | **Execution of Script to Screen** |
| 1 | Developing a shooting plan |
| 2 | Script Breakdown & Beat sheet |
| 3 | Floor plan and Storyboard |
| 4 | Function of Staging |
| **5** | Shaping the scene –Blocking Action and Camera |
| **Unit 3** | **Directing Actors, Technical Crew and Budgeting** |
| 1 | The Need for People Skills |
| 2 | Budget the Idea |
| 3 | The Production Crew |
| 4 | Directors Development Strategy |
| 5 | Alternative Story Sources |
| 6 | Director In Relation To Actors |
| **Unit 4** | **Managing Digital Distribution (OTT)** |
| 13 | Media Planning-OTT platforms (History, Emergence, Convergence) |

| | |
|---|---|
| 14 | Pitching with Pilot Episode |
| 15 | Content Management |
| 16 | Digital Policy, Regulation and Governance |
| **Unit 5** | **Uploading and Streaming Platform** |
| 17 | Streaming Software and Live Show |
| 18 | Open-Source Broadcasting (OBS) |
| 19 | Video Thumbnail |
| 20 | Commercial Issues |
| 21 | Digital Rights Management, and Licensing |
| 22 | Putting Video on the Web |

| S.No | Course Outcomes |
|---|---|
| 1 | Identify business opportunities and platforms for digital platforms |
| 2 | Critically appraise the opportunities and economic risks in digital platforms. |
| 3 | Develop a business plan and online collaboration workspace for entrepreneurship. |
| 4 | Prepare a low-cost budget and revenue model for independent filmmaking |

**Mapping Course Objectives (CO) and Program Specific Objectives (PSO)**

| Course Objectives (CO) | Program Specific Objectives (PSO) | | | | | | |
|---|---|---|---|---|---|---|---|
| | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** | **PSO6** | **PSO7** |
| **CO1** | S | S | S | S | L | S | S |
| **CO2** | S | S | S | S | L | S | S |
| **CO3** | S | S | S | S | L | S | S |
| **CO4** | S | S | S | S | L | S | S |
| **CO5** | S | S | S | S | L | S | S |
| **S=Strong, M=Medium, L=Low** | | | | | | | |

**References:**


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**Core Paper – VIII Design Thinking-Theory**

**Course Objectives**

| S.No | Course Objectives |
|---|---|
| 1 | Describe design thinking, its approaches and mindset |
| 2 | Explain fundamental Concepts, Resources and processes involved in design thinking |
| 3 | Comprehend stages of Design thinking for growth, |
| 4 | To explain strength and weakness of different design thinking tools and methods |
| 5 | Understand various applications of design thinking |

| Topic No | Introduction to Design Thinking |
|---|---|
| **Unit 1** | **Design Thinking Background** |
| 1 | Definition of Design Thinking. Business uses of Design Thinking |
| 2 | Variety within the Design Thinking Discipline |
| 3 | Design Thinking Mindset-Problem Salving Approach |
| 4 | Fundamental Concepts: Empathy, Ethnography |
| 5 | Divergent Thinking, Convergent Thinking, Visual Thinking, |
| **Unit 2** | **Design Mechanics and Resources** |
| 6 | Assumption Testing- Design Criteria, Curator, Design Brief. Designing for Growth Process- Process Stages of Designing for Growth |
| 7 | Overview of Prototyping-, Wireframing |
| 8 | Resources (People, Place, Materials, Organizational Fit) |
| **Unit** | **Varies of Design Thinking Approach** |
| 9 | Disruptive Solution. Double Diamond Process |
| 10 | Stage School Process- Human-Centered Design, Stanford School 5-Stage Approach, User-Centered Design |
| 11 | Affordances and Usability |
| **Unit 3** | **Design Thinking Tools** |
| 12 | What Wows? What Works? What Is?, What If ? |
| 13 | Purposeful Use of Tools and Alignment with Process |
| 14 | Visualization-Aesthetics Principles for Designers |
| **Unit 4** | **Design Thinking Methods** |
| 15 | Journey Mapping. Archetype Mapping Matrix, Archetype Persona. |
| 16 | Value Chain Analysis, Customer Co-creation. Competitive Advantage |

| | |
|---|---|
| 17 | Concept Development, Mind Mapping- Brainstorming |
| **Unit 5** | **Design Thinking Practices** |
| 18 | Role of Project Management in Design Process-Aids. Minimal Marketable Feature (MMF), Minimal Viable Ecosystem (MVE), Minimal Viable Product (MVP), Napkin Pitch |
| 19 | Design Thinking Application and Execution-User Interface(UI) as Communication. Basic Principles of UI Design |
| 20 | Apps for Prototyping, Rapid Prototyping and Wireframing-Communicating Results Effectively. |

**Course Outcomes**

| S.No | Course Outcomes | K-1-6 |
|---|---|---|
| 1 | Adopt a problem solving mindset to reframe design challenges | |
| 2 | Enumerate and select appropriate design thinking approach for specific design problem | |
| 3 | Use design thinking tools and methods to solve real-world problems | |
| 4 | Apply design thinking principles to develop plan of action and wireframe for specific problem domain | |
| 5 | To create prototypes for specific design problem using available design tools and apps | |

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**Elective Paper –III : Writing for Media :Theory**

| S. No | Course Objectives |
|---|---|
| 1 | To prepare learners to think critically about writing for the media (specifically new media, broadcast journalism, public relations, and advertising) |
| 2 | To equip learners with a knowledge and understanding of the general principles of the media plan. |
| 3 | To help learners develop and apply the media writing skills |

| Topic No | **Writing For Media** |
|---|---|
| **Unit 1** | **Understanding The Media Language** |
| 1 | Writing language – Descriptive, Narrative, Persuasive |
| 2 | New trends in media writing |
| 3 | ABCD for Media writing |
| 4 | Art of putting words together |
| **Unit 2** | **Content Writing For New Media** |
| 1 | Types of content |
| 2 | Plagiarism |
| 3 | Content creation process- Layout and Design |
| 4 | Strategies of content writing |
| **Unit 3** | **English Grammar Review** |
| 1 | English Language Grammar test |
| 2 | Headline and Lead Writing |
| 3 | Copy editing and Proof reading |
| 4 | Using Grammar Checkers- Risk and Opportunities |
| **Unit 4** | **Elements Of Effective Writing** |
| 1 | Basic principles of writing |
| 2 | Writing for Audio and Visual Content- Writing Captions |
| 3 | Writing for social media |
| 4 | Writing as a Citizens Reporter |
| **Unit 5** | **Persuasive Writing** |
| 1 | Persuasive copywriting |
| 2 | Building Vocabulary |
| 3 | Choosing Appropriate Words for Different Contexts |
| 4 | Professional Writing- Challenges and Opportunities |

| S. No | Course Outcomes |
|---|---|
| 1 | Understand the basic concepts of writing techniques for media. |
| 2 | Learners can become news writers, content writers, and program producers for mass media productions. |
| 3 | Learners will be able to write and develop the content for New media. |
| 4 | Plans |
| 5 | The course provides Learners with an understanding of the importance of writing for the media. |

**Mapping Course Objectives (CO) and Program Specific Objectives (PSO)**

| Course Objectives (CO) | Program Specific Objectives (PSO) | | | | | | |
|---|---|---|---|---|---|---|---|
| | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** | **PSO6** | **PSO7** |
| **CO1** | S | S | S | S | L | S | S |
| **CO2** | S | S | S | S | L | S | S |
| **CO3** | S | S | S | S | L | S | S |
| **CO4** | S | S | S | S | L | S | S |
| **CO5** | S | S | S | S | L | S | S |
| **S=Strong, M=Medium, L=Low** | | | | | | | |

**References**


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2. Marshall, Carrie. 2018. *Writing for social media*. BCS Learning & Development Limited.
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4. Stovall, James G. 2015. *Writing for the Mass Media*. Pearson Education, Incorporated.
5. Wheeler, Adrian. 2019. *Writing for the Media*. Emerald Group Publishing.

**Extra Disciplinary-I : Anchoring and Presentation Skills- Practical**

| S. No | Course Objectives |
|---|---|
| 1 | Understanding the various elements of television anchoring. |
| 2 | Developing presentation skills |
| 3 | Developing news presentation skills |
| 4 | Providing hands-on training |
| 5 | Understanding the various elements of television anchoring. |

| Topic No | Anchoring And Presentation Skills |
|---|---|
| **Unit 1** | **Anchoring Skills** |
| 1 | Understanding the various roles of live and recorded television presenters' Body language. |
| 2 | Do's and Don'ts for the presenter. |
| 3 | Developing language skills. |
| 4 | Correcting voice, speech, and breathing exercises. |
| **Unit 2** | **Presentation Skills** |
| 1 | Creating a bond with the unseen audience, Overcoming glitches. |
| 2 | Preparing and researching for your subjects |
| 3 | Interview skills, Live to report |
| 4 | Grooming and makeup |
| **Unit 3** | **News Reading** |
| 1 | News reading skills |
| 2 | Voice, Pronunciation |
| 3 | Speech and Posture. |
| **Unit 4** | **Practice** |
| 1 | Practice at positions including anchoring, interviewing, and narrating. |
| **Unit 5** | **Activities** |
| 1 | Compering / Phone in the program. |
| 2 | Television News Anchoring. |
| 3 | Presentation of a program (Example - Top 10 movies, Movie review, etc.) |

| S. No | Course Outcomes |
|---|---|
| 1 | Learners will gain knowledge about the do's and don't of the presenter |
| 2 | They will present the program artistically. |
| 3 | They can present programs and news. |
| 4 | They come to know the importance of voice, speech, make-up, etc. |
| 5 | They can face the technical aspects such as camera, lighting, sound, etc. |

**Mapping Course Objectives (CO) and Program Specific Objectives (PSO)**

| Course Objectives (CO) | Program Specific Objectives (PSO) | | | | | | |
|---|---|---|---|---|---|---|---|
| | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** | **PSO6** | **PSO7** |
| **CO1** | S | S | S | S | L | S | S |
| **CO2** | S | S | S | S | L | S | S |
| **CO3** | S | S | S | S | L | S | S |
| **CO4** | S | S | S | S | L | S | S |
| **CO5** | S | S | S | S | L | S | S |
| **S=Strong, M=Medium, L=Low** | | | | | | | |

**References**


1. Reardon.N., & Flynn, T. (2014), On Camera: How to Report, Anchor and Interview. Oxfordshire, England: Taylor & Francis.
2. Kalra, R. J. (n.d.). *The ABC of News Anchoring*. Pearson Education India.
3. Mdoe, S. (2019). *TV News Anchoring: A Guide to Professional Newscasting*. Swaleh Mdoe.
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**Core Paper – IX : Communication Research Methods - Theory**

| S. No | Course Objectives |
|---|---|
| 1 | To explain the nature of social reality and the role of communication research |
| 2 | Explain the concept of social measurement and causal modelling in communication research |
| 3 | To provide a detailed description of the method of content analysis of news |
| 4 | To ground learners into the logic of qualitative research |
| 5 | To understand major steps in survey methods |

| Topic No | Communication Research Methods |
|---|---|
| **Unit 1** | **Foundations Of Research** |
| 1 | Nature of Reality-Modes of Knowing |
| 2 | Introduction to Communications Research. |
| 3 | Research Process and Research Design |
| **Unit 2** | **Social Measurement And Causal Inferences** |
| 1 | Language of Research-Theory, Concepts, Variables, |
| 2 | Causal Inferences and Modelling |
| 3 | Operationalization and Social Measurement-Levels of Measurement |
| 4 | Propositions and Hypothesis Development |
| 5 | Overview of Experimentation and Randomized Control Trials (A/B Testing) |
| **Unit 3** | **Content Analysis and Text Analytics** |
| 1 | Foundations of Content Analysis |
| 2 | Developing Coding Scheme and Framework |
| 3 | Computer-Aided Content Analysis |
| **Unit 4** | **The Logic of Qualitative Research** |
| 1 | Theory in Qualitative Research. |
| 2 | Methods for Qualitative Data Collection |
| 3 | Grounded Theory Methodology |
| 4 | Qualitative Data Analysis |
| 5 | Using Computer-Assisted Qualitative Data Analysis Software |
| **Unit 5** | **Survey Method** |
| 1 | Steps in Survey Research and Audience Survey Design |

| | |
|---|---|
| 2 | Scales Development-Types of Scales |
| 3 | Sampling Design-Probability and Non-Probability Sampling |
| 4 | Data Cleaning, Coding and Exploratory Data Analysis-Overview of Descriptive and Inferential Statistics |
| 5 | Using Computer-Assisted Quantitative Data Analysis Software (SPSS) |

| S. No | Course Outcomes |
|---|---|
| 1 | Outline various steps involved in conducting communication research and identify a researchable topic |
| 2 | Diagram a communication problem with a causal model and present operational definitions of key constructs |
| 3 | Prepare a coding framework for analysis coverage of major current news events and apply CATA |
| 4 | Apply qualitative methods like in-depth interviewing for journalism practices |
| 5 | Design questionnaire for audience and audience measurement |

**Mapping Course Objectives (CO) and Program Specific Objectives (PSO)**

| Course Objectives (CO) | Program Specific Objectives (PSO) | | | | | | |
|---|---|---|---|---|---|---|---|
| | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 | PSO7 |
| CO1 | S | S | S | S | L | S | S |
| CO2 | S | S | S | S | L | S | S |
| CO3 | S | S | S | S | L | S | S |
| CO4 | S | S | S | S | L | S | S |
| CO5 | S | S | S | S | L | S | S |
| S=Strong, M=Medium, L=Low | | | | | | | |

**References**


1. Allen, M. (2017). The SAGE Encyclopaedia of Communication Research Methods. SAGE Publications.
2. Altheide, D. L., & Schneider, C. J. (2012). Qualitative Media Analysis (Second edition, Vol. 1). SAGE Publications Inc.
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11. Lindlof, T. R., & Taylor, B. C. (2017). Qualitative Communication Research Methods. SAGE Publication.

**Core Paper X: UX and Interactive Media Design**

| S. No | Course Objectives |
|---|---|
| 1 | To learn basics of UI/UX design |
| 2 | To learn Colour theory and colour sense |
| 3 | To learn to create Buttons and icons |
| 4 | To learn to protype the pages |
| 5 | To learn to get output for UI/UX developing |

| Topic No | Interactive Media Design |
|---|---|
| **Unit 1** | **Basics of UI/UX design** |
| 1 | Conept of layout for UI/UX |
| 2 | Designing for Mobile, Tab, PC & laptop |
| 3 | Tools and menu |
| 4 | Different Layout & pages |
| **Unit 2** | **Colour theory and colour sense** |
| 5 | Colour theory |
| 6 | Usage of colour for different fields |
| 7 | Colour sense for various UI/UX |
| 8 | Colour temperature for screen lighting |
| **Unit 3** | **Buttons and icons** |
| 9 | Buttons |
| 10 | Icons |
| 11 | Text box and check box |
| 12 | Input box |
| **Unit 4** | **Prototype** |
| 13 | Concepts, Basic attributes |
| 14 | Prototyping the button |
| 15 | Prototyping the icon |
| 16 | Prototyping other applications in the device |
| **Unit 5** | ***Rendering output*** |
| 17 | Concepts, Basic attributes |
| 18 | Output setup |
| 19 | UI/UX developing concepts |
| 20 | UI/UX development using Figma Or ADOBE XD |

| S. No | Course Outcomes | K-1-6 |
|---|---|---|
| 1 | Skills to do basics of UI/UX design | |
| 2 | Skills to do Colouring for UI/UX | |
| 3 | Skills to create buttons & icons | |
| 4 | Skills to do prototyping | |
| 5 | Skills to render an output for UI/UX developing | |

**Mapping Course Objectives (CO) and Program Specific Objectives (PSO)**

| Course Objectives (CO) | Program Specific Objectives (PSO) | | | | | | |
|---|---|---|---|---|---|---|---|
| | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 | PSO7 |
| CO1 | S | S | S | S | L | S | S |
| CO2 | S | S | S | S | L | S | S |
| CO3 | S | S | S | S | L | S | S |
| CO4 | S | S | S | S | L | S | S |
| CO5 | S | S | S | S | L | S | S |
| S=Strong, M=Medium, L=Low | | | | | | | |

**References**


1. Allenwood, Gavin, and Peter Beare. 2015. *Basics Interactive Design: User Experience Design: Creating Designs Users Really Love*. Bloomsbury Publishing.
2. Benyon, David. 2019. *Designing User Experience*. Pearson UK.
3. Platt, David S. 2016. *The Joy of UX: User Experience and Interactive Design for Developers*. Addison-Wesley.

**Core XI: Video Editing and Visual Effects (VFX) - Practical**

| S. No | Course Objectives |
|---|---|
| 1 | To learn the basics of Editing & Techniques |
| 2 | To learn the process of Editing |
| 3 | To learn how to remove wire, rigging, tracking methods and clean plate. |
| 4 | To learn basics of Rotoscopy & Techniques |
| 5 | To learn the basics of Composting & Techniques |

| Topic No | Video Editing andVisual Effects (VFX) - Practical |
|---|---|
| **Unit 1** | **The basics of editing: Overview** |
| 1 | Importing and Exporting – File format and file managing |
| 2 | Edit, manipulate and arrange these elements in visual timeline |
| 3 | understand all Tools on toolbox for editing clips |
| 4 | Text Animation, Titling and superimposing, Transitions and Effects |
| 5 | Comparison of open source of apps for video editing & VFX. |
| **Unit 2** | **Process of Editing** |
| 6 | Digital Editing—Editing Preparation, Process of Editing, Continuity, relational |
| 7 | Aesthetics Principles of continuity editing |
| 8 | Mental maps, Vectors, On-off screen positions and Complexity Editing |
| 9 | Synchronizing audio/dialogues with video, Audio Effects and Rendering |
| **Unit 3** | ***Wire Removal*** |
| 10 | Paint |
| 11 | Tracking Methods – one point, four-point, Manual |
| 12 | Clone method, Rig Removal, Object removal |
| 13 | Clean plate |
| **Unit 4** | **Rotoscopy** |
| 14 | Character Roto |
| 15 | Matte Extraction |
| 15 | Keying Techniques (chroma/Luma) |
| 16 | Layers and Masking |
| **Unit 5** | ***Compositing*** |
| 17 | Principles and pipelines – 2D & 3D |
| 18 | Match move concept, Colour correction |

| | |
|---|---|
| 19 | 3D particles, effects, Rendering |
| 20 | Creating VFX portfolio |

| S. No | Course Outcomes |
|---|---|
| 1 | Skills to do Editing |
| 2 | Skills to do Editing and advanced techniques in Editing |
| 3 | Skills to remove wire, rigging, tracking methods and clean plate. |
| 4 | Skills to do Rotoscopy |
| 5 | Skills to do Composting |

**Mapping Course Objectives (CO) and Program Specific Objectives (PSO)**

| Course Objectives (CO) | Program Specific Objectives (PSO) | | | | | | |
|---|---|---|---|---|---|---|---|
| | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 | PSO7 |
| CO1 | S | S | S | S | L | S | S |
| CO2 | S | S | S | S | L | S | S |
| CO3 | S | S | S | S | L | S | S |
| CO4 | S | S | S | S | L | S | S |
| CO5 | S | S | S | S | L | S | S |
| S=Strong, M=Medium, L=Low | | | | | | | |

**References**


1. Dinur, Eran. 2017. *The Filmmaker's Guide to Visual Effects: The Art and Techniques of VFX for Directors, Producers, Editors and Cinematographers*. Taylor & Francis.
2. ———. 2021. *The Complete Guide to Photorealism for Visual Effects, Visualization and Games*. Routledge.
3. Gress, Jon. 2015. *Digital Visual Effects and Compositing*. New Riders.
4. Jeffrey A. Okun, V. E. S., and V. E. S. Susan Zwerman. 2020. *The VES Handbook of Visual Effects: Industry Standard VFX Practices and Procedures*. Routledge.
5. Zettl, Hebert; Video Basics. Wadsworth. Thompson Learning, 2015

**Core Paper XII: Computer Graphics– 3 (Advanced Techniques) (Practical)**

| S. No | Course Objectives |
|---|---|
| 1 | To learn basics of Character Modelling |
| 2 | To learn Rigging and Parenting |
| 3 | To learn Biped animation |
| 4 | To learn Keyframe animation |
| 5 | To learn Dynamics |

| Topic No | Computer Graphics– 3 (Advanced Techniques) (Practical) |
|---|---|
| **Unit 1** | **Basics of Character Modelling** |
| 1 | Concept of Editable poly |
| 2 | Concept of Editable Mesh |
| 3 | Texturing & material |
| 4 | Study of Bone structure |
| **Unit 2** | **Rigging and Parenting** |
| 5 | Bones and Joints |
| 6 | Binding Kinematics |
| 7 | Rigid Binding & Smooth binding |
| 8 | Influencing objects |
| **Unit 3** | **Principles of Animation** |
| 9 | Action Generic Walks/Cycle, Runs/Cycles |
| 10 | Working with Bones & Joints |
| 11 | Facial Expressions, Laughter |
| 12 | Graph Editor (types of Tangents) & looping an action |
| **Unit 4** | ***Biped animation*** |
| 13 | Building a Biped |
| 14 | Concept of Skeleton |
| 15 | Animating a Biped, importing Motion capture files. |

| | |
|---|---|
| 16 | IK & FK, Joints & Hierarchies concept |
| **Unit 5** | **Keyframe animation** |
| 17 | Concepts, Basic attributes |
| 18 | Autokey & Set key |
| 19 | Time frame animation |
| 20 | Key poses & Blend shapes |

| **S. No** | **Course Outcomes** |
|---|---|
| 1 | Skills to do basic Character Modelling |
| 2 | Skills to do Rigging and Parenting |
| 3 | Skills to do *Biped animation* |
| 4 | Skills to do Keyframe animation |
| 5 | Skills to add *Dynamics* |

**Mapping Course Objectives (CO) and Program Specific Objectives (PSO)**

| **Course Objectives (CO)** | **Program Specific Objectives (PSO)** | | | | | | |
|---|---|---|---|---|---|---|---|
| | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** | **PSO6** | **PSO7** |
| **CO1** | **S** | **S** | **S** | **S** | **L** | **S** | **S** |
| **CO2** | **S** | **S** | **S** | **S** | **L** | **S** | **S** |
| **CO3** | **S** | **S** | **S** | **S** | **L** | **S** | **S** |
| **CO4** | **S** | **S** | **S** | **S** | **L** | **S** | **S** |
| **CO5** | **S** | **S** | **S** | **S** | **L** | **S** | **S** |
| **S=Strong, M=Medium, L=Low** | | | | | | | |

**References**


1. The Animators Survival Kit by Richard Williams
2. 2. Autodesk 3ds Max 2021 Fundamentals, Published August 18, 2020, By ASCENT

**Elective Paper IV: Transmedia Storytelling-Elective (Theory)**

**Course Objectives**

| S.No | Course Objectives |
|---|---|
| 1 | Learns will be able to critically evaluate the pros and cons of transmedia strategies |
| 2 | Learners will be able to analyse components and structure of transmedia storytelling in the context of Over the Top (OTT) Platforms |
| 3 | Learns will be able to demonstrate competency in transmedia communication strategies |
| 4 | Learns will gain hands-on training on transmedia production process |
| 5 | Learns will gain procedural knowledge on transmedia project development for OTT Platforms |

| Topic No | Transmedia Storytelling-Elective (Theory) |
|---|---|
| **Unit 1** | **Transmedia Storytelling** |
| 1 | Defining Transmedia-Traditional Narrative Texts Vs Transmedia Storytelling. Over the Top (OTT) as Transmedia Storytelling. |
| 2 | How Are the Internet and Social Media Affecting Visual Storytelling. |
| 3 | The Four Creative Purposes for Transmedia Storytelling, Basics of Traditional Storytelling |
| 4 | Transmedia Storytelling in Entertainment, Journalism, Marketing, and Strategic Communications |
| 5 | Writing for Transmedia Is Different-Covering Actions Multiple Platforms |
| **Unit 2** | **Other The Top (OTT) Services as Transmedia Storytelling** |
| 6 | Netflix, Amazon, and Other OTT Streaming Services. Access, Popularity and Audience Reception. SWOT Analysis of Netflix |
| 7 | Analyzing Transmedia Storytelling Strategies in Web Series and Online Television. Web Documentaries (e.g., Social Dilemma) |
| 8 | Understanding the Complexity of OTT Production Process. People, Resources and Strategies Employed in Production of Web Series. |
| 9 | Mediations of Hashtags Within Transmedia OTT Programming |
| **Unit 3** | **Transmedia Strategies** |
| **10** | Immersive Media Design Within a Transmedia Space |
| 11 | Integrating social media in Transmedia Projects |
| 12 | Can Transmedia Strategy Revitalise Television, Entertainment and Media Industry? |
| 13 | Strategies for Promoting Transmedia Content. Lessons from OTT Popular Platforms |
| **Unit 4** | **Transmedia Production** |
| 14 | Technical Review: Composition Sound Design. Visual Montage |

| | |
|---|---|
| 15 | Transmedia Storytelling Structure. Codifying Story Elements- Story Structure |
| 16 | Transmedia Script for Nonfictional Narratives. Interactive Narratives. |
| 17 | Scriptwriting and Storyboarding for Transmedia Project. Scripting for Web Series. Adding Interactivity to Script |
| **Unit 5** | **Transmedia Journalism Practices** |
| 18 | Transmedia Project Management-Working with Tech Team. Roles and Responsibilities in Web Series Production Team |
| 19 | Designing Transmedia Journalism Projects for Web and OTT Platforms |
| 20 | Design Practice in Transmedia Fiction and Non-fiction Content |
| 21 | The Business of Transmedia Storytelling-Funding Issues. Business of OTT |

**Course Outcomes**

| S.No | Course Outcomes |
|---|---|
| 1 | Critically evaluate popular, on-going transmedia projects |
| 2 | Explain the decision-making process for adopting a transmedia storytelling in marketing or journalism context |
| 3 | Prepare a strategic plan and budget for transmedia storytelling for OTT platform on entertainment or strategic communication content |
| 4 | Demonstrate an ability to prepare a script and storyboard for transmedia project and a web series for OTT |
| 5 | Apply multimedia skills to produce a short project for transmedia distribution. |

**Mapping Course Objectives (CO) and Program Specific Objectives (PSO)**

| Course Objectives (CO) | Program Specific Objectives (PSO) | | | | | | |
|---|---|---|---|---|---|---|---|
| | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 | PSO7 |
| CO1 | S | S | S | S | L | S | S |
| CO2 | S | S | S | S | L | S | S |
| CO3 | S | S | S | S | L | S | S |
| CO4 | S | S | S | S | L | S | S |
| CO5 | S | S | S | S | L | S | S |
| S=Strong, M=Medium, L=Low | | | | | | | |

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4. Kellison, Cathrine, Dustin Morrow, and Kacey Morrow. 2013. *Producing for TV and New Media: A Real-World Approach for Producers*. CRC Press.
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**Extra Disciplinary-II - Advertising Strategies**

| S No | Course Objectives |
|---|---|
| 1 | To provide a contemporary and comprehensive understanding of the of Advertising |
| 2 | To elucidate the importance of knowing the target audience |
| 3 | To outline the Creative Aspects of Advertising |
| 4 | To illustrate the new horizons in online Advertising |
| 5 | To portray certain areas in Digital Transformation |

| Topic No | Advertising Strategies |
|---|---|
| **Unit 1** | **Advertising- An Introduction** |
| 1 | History of Advertising- Definition and Types; Role and Functions of Advertising- Role of Advertising in Marketing Mix |
| 2 | Changing Nature of Advertising in Digital Era-Conventional Vs Online Advertising. Data-driven Advertising |
| 3 | From Audience Segmentation to Audience Engagement-Target Audiences, Positioning-Traditional and Digital Approaches |
| 4 | Social and Economic Issues Related to Traditional and Online advertising |
| **Unit 2** | **Content and Brand Strategies** |
| 5 | Content is the King: The Content Matrix: Magnetic, Immersive, Smart and Practical; |
| 6 | Advertising Dynamics of Creating and Executing the Complete Campaign |
| | Strategy |
| 7 | Branding: Identity And Image Strategy. Brand Identity Elements. |
| 8 | Projecting A Unified Message. Projecting Brand Identity. The Identity Strategy |
| **Unit 3** | **Creative Strategies** |
| 9 | Creativity Defined. The New Creative Inspiration. Inspiration from Consumers. The Creative Challenges |
| 10 | Print Layout: Functions of Design. Design Principles. Gestalt Theory. Negative, or White, ‘Space |
| 11 | Television and Videos Advertising: Telling stories. Visual Elements. |
| 12 | Web Advertising. Various Types of Online Advertising -Native Ads, SEM (Search Engine Marketing) Display Advertising/ Banners Pop-Up Ads, Mobile Advertising, Social Ads Retargeting and Remarketing, Email Marketing, Digital Signage, Video Marketing |
| **Unit 4** | **Critical Aspects of Advertising** |
| 13 | Advertising across cultural borders.Convergence or Divergence- Cultural Differences and Values in Advertising. |
| 14 | Cultural Differences and Values in Advertising-Brand Perceptions Across Cultures |

| | |
|---|---|
| 15 | Psychological Aspects of Advertising-What works. Insights from Behavioural Economics |
| 16 | Economic Aspects- Business of Advertising. Financial Considerations. Budget |
| **Unit 5** | **Challenges and Trends** |
| 17 | Designing Advertising for Cross-platform Distribution-Maintaining Consistency across Divergent Media |
| 18 | Online Advertising as Intrusion and Adblockers and strategies for non-invasive advertising |
| 19 | A Brief Overview of Google Analytics |
| 20 | Emerging Approaches. Programmatic and Computational Advertising– Overview of Advertising Research |

| S No | Course Outcomes |
|---|---|
| 1 | Apply creative strategies to develop a brand promotion plan |
| 2 | Interpret data and conduct audience analysis for a advertising campaign |
| 3 | To produce an original public service advertising for cross platform distribution |
| 4 | Design banner advertising for websites and embed them a website or a blog |
| 5 | Demonstrate procedural knowledge on online advertising strategies |

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**Core Paper – XIII- Media Entrepreneurship and Innovation- Theory**

**Course Objectives:**

| S. No | Course Objectives |
|---|---|
| 1 | To prepare learners to become independent media entrepreneurs |
| 2 | To understand the economic and financial aspects of the news media business |
| 3 | To explain the attitude and approaches required to become a media entrepreneur |
| 4 | To describe and identify the requirements for establishing a media business |
| 5 | To locate sources of capital and revenue models for media enterprise |

| Topic No | Media Entrepreneurship And Innovation |
|---|---|
| **Unit 1** | **Emerging Opportunities in Digital Media Business** |
| 1 | Changing Media Business Landscape-Sharing Economy- How News Organizations Build Digital Loyalty and Generate Revenue Through the "Original Platform" |
| 2 | Concepts of Entrepreneurship, Media Entrepreneurship |
| 3 | Creative Industries- Freelancing and building your brand |
| **Unit 2** | **Economics of Information and Media** |
| 1 | Economics of Information and Media-New Economics of Journalism- The business of networked journalism |
| 2 | Media Market Analysis. Media Sustainability. |
| 3 | Economics of New Media and Creative Industries |
| 4 | Political Economic Perspective on Digital Media-Digital Labour |
| **Unit 3** | **Entrepreneurship and Innovation** |
| 1 | Digital Entrepreneurship- Start-up Ecosystem in India |
| 2 | Media Enterprise as Social Entrepreneurship. |
| 3 | Becoming a Media Entrepreneur. Critical Business and Entrepreneurial Skills for Success-Collaboration. |
| 4 | Innovation in Media Business-AI Driven Business Models |
| **Unit 4** | **Building Online Media Business** |
| 1 | Establishing Online and Social Media Business |
| 2 | Business Plan for Implementing Media Enterprise. |

| | |
|---|---|
| 3 | No-code Apps Development Process. Types of Apps. App users, App Development, Design, coding and testing Embedding social media, App stores, Digital editions, News aggregators, Apps for wearables |
| 4 | Project Management for Digital Media |
| 5 | Strategic Media Management-Security Risks. Copyright, Creative Commons License Royalties, Contracts |
| **Unit 5** | **Financing Online Media Business** |
| 1 | Financial Management for Media Enterprise. Revenue Models and Revenue Streams-Crowdsourcing and Fund Raising. Monetisation |
| 2 | Financial Management for Media Enterprise |
| 3 | Blockchain, Cryptocurrency and Non-Fungible Tokens (NFT) for Media enterprise |
| 4 | Marketing and Promoting Media Enterprises. |

**Course Outcomes**

| S. No | Course Outcomes |
|---|---|
| 1 | Identify business opportunities and platforms for media entrepreneurship |
| 2 | Critically appraise the opportunities and economic risks in media entrepreneurship |
| 3 | Develop a business plan and online collaboration workspace for media start-ups |
| 4 | Prepare a detailed proposal and strategic vision for establishing a media start-up. |
| 5 | Prepare a low-cost budget and revenue model for a multimedia news package for a freelance assignment |

**References**


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**Core Paper – XIV: Immersive Media Design (VR/AR/ Game Design) (Theory)**

| S. No | Course Objectives |
|---|---|
| 1 | To Construct the impact of immersive Media Design |
| 2 | Develop the sensory influence of Virtual Reality |
| 3 | Identify the importance of Augmented Reality Environment |
| 4 | Analyse the Applications of mixed reality and metaverse. |
| 5 | Interpret the different sectors of Game Design |

| Topic No | Immersive Media Design (VR/AR/ Game Design) (Theory) |
|---|---|
| **Unit 1** | ***Immersive Media Design*** |
| 1 | Introduction to Immersive Media Design. Metaverse? Extending Reality |
| 2 | Fundamentals of Immersive Innovation |
| 3 | Principle of Interactive Design |
| 4 | Overview of VR, AR and Emerging Technologies. Sound Design Extended Reality |
| **Unit 2** | ***Virtual Reality (VR)*** |
| 5 | The history of VR |
| 6 | Types of VR technology and Terminology |
| 7 | Interface overview and navigation |
| 8 | Sensory Influence, GHOST and virtual environments. |
| **Unit 3** | ***Augmented Reality (AR):*** |
| 9 | Defining augmented reality, Augmented Reality Hardware – Displays – Audio Displays. |
| 10 | Tracking & Sensors, Mobile Sensors |
| 11 | VR Headsets-Oculus, Google Glass, HoloLens. |
| 12 | See-through vs screens vs projection |
| **Unit 4** | ***Mixed Reality (MR) and Metaverse*** |
| 13 | Applications of mixed reality |
| 14 | Simultaneous localization and mapping (SLAM) |
| 15 | Dense tracking and mapping (DTAM), |
| 16 | PTAM and Metaverse environment |
| **Unit 5** | **Game Design** |
| 17 | Game Idea and Visualisation |
| 18 | Mobile/Social Game Design and Game Interface Design |

| | |
|---|---|
| 19 | Introducing Unity and unity Interface |
| 20 | Real time rendering and future development in technology |

| S. No | Course Outcomes |
|---|---|
| 1 | Adapt the use of Immersive Technology |
| 2 | Applied the technology of Virtual reality |
| 3 | Compare the mobile technology usage combined with Augmented reality |
| 4 | Evaluate the different immersive Technology of Mixed reality |
| 5 | Plan to organize the game design |

**Mapping Course Objectives (CO) and Program Specific Objectives (PSO)**

| Course Objectives (CO) | Program Specific Objectives (PSO) | | | | | | |
|---|---|---|---|---|---|---|---|
| | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 | PSO7 |
| CO1 | S | S | S | S | L | S | S |
| CO2 | S | S | S | S | L | S | S |
| CO3 | S | S | S | S | L | S | S |
| CO4 | S | S | S | S | L | S | S |
| CO5 | S | S | S | S | L | S | S |
| S=Strong, M=Medium, L=Low | | | | | | | |

**References**


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**Core Paper – XV Option 1: Capstone Project and Portfolio OR Dissertation - Practical**

| S. No | Course Objectives |
|---|---|
| 1 | To develop in-depth understanding of the media industry |
| 2 | To augment their media skills to professional standards |
| 3 | To develop the ability to work with media teams and also take initiatives to design media projects |
| 4 | To acquire the ability to design and execute media projects |
| 5 | To acquire the ability to work independently in media houses and produce publishable content. |
| 6 | To enable students to design and execute independent projects covering contemporary themes/issues. |
| 7 | An independent original academic or commercial research on UI/UX or audience survey or a visual content analysis. |

| Topic No | Capstone Project And Portfolio(Option 1) |
|---|---|
| | **Suggested Projects (Any one)** *Learners can work individually or as teams choosing any one of the following* |
| 1. | Animated short film fiction / nonfiction. |
| 2. | A short fiction film demonstrates VFX skills. |
| 3. | A documentary film and upload the same on you tube – promote using Digital marketing techniques. |
| **4.** | Create a short walk through with AR/VR techniques using tools like Unity, Unreal Engine. |
| 5. | A website landing page design with interactive features using UI/UX principles in best practices. |
| 6. | UI/UX design for a web app – using low/no code apps (like bubble.io, Flutter). |
| 7. | Conduct an original scholarly or commercial research meeting academic standards as presented in Dissertation Syllabus in Option 2 |

**Course Outcomes**

| S. No | Course Outcomes |
|---|---|
| 1 | Ability to understand the trends and demands of the media industry |
| 2 | Ability to fine tune their media skills and prepare to be industry-ready |
| 3 | Ability to generate, analyse content/data from various sources and convert them to publishable media content |
| 4 | Ability to work seamlessly with experienced media professionals meeting the rigours of the industry. |
| 5 | To learn to work independently in assigned projects |
| 6 | To produce an independent project as the culmination of their training and knowledge showcasing their specialization and specific interest covering contemporary themes/issues. |

**Mapping Course Objectives (CO) and Program Specific Objectives (PSO)**

| Course Objectives (CO) | Program Specific Objectives (PSO) | | | | | | |
|---|---|---|---|---|---|---|---|
| | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** | **PSO6** | **PSO7** |
| **CO1** | S | S | S | S | L | S | S |
| **CO2** | S | S | S | S | L | S | S |
| **CO3** | S | S | S | S | L | S | S |
| **CO4** | S | S | S | S | L | S | S |
| **CO5** | S | S | S | S | L | S | S |
| **S=Strong, M=Medium, L=Low** | | | | | | | |

**OR**

**ore Paper – XV:Option 2: Dissertation– (Practical)**

| S. No | Course Objectives |
|---|---|
| 1 | To develop skills necessary to undertake academic research |
| 2 | To enhance competency in source-based academic writing skills |
| 3 | To construct an outline of a thesis using referencing, citation, and note-taking |
| 4 | To describe criteria for evaluating standard methods in social research |
| 5 | To engage in ethical practices and intellectual virtues for undertaking academic research |

| Topic No | Research Project |
|---|---|
| **Unit 1** | **Literature Review** |
| 1 | Thinking Critically About Research. |
| 2 | Traditional Reviews and Systematic Reviews |
| 3 | Other Types of Literature Review |
| 4 | Apps for Literature |
| **Unit 2** | **Using Academic Sources** |
| 1 | Literature Search |
| 2 | Using Reference Manager Apps |
| 3 | Annotated Bibliography. |
| 4 | Avoiding Plagiarism |
| **Unit 3** | **Referencing And Citation** |
| 1 | Formats of the Research Paper and Thesis |
| 2 | Writing Literature Reviews |
| 3 | Academic Writing Style |
| 4 | Publish or Perish App |
| **Unit 4** | **Evaluating Research** |
| 1 | Evaluating Experimental Research. |
| 2 | Evaluating Quantitative Research. |
| 3 | Evaluating Survey Research |
| 4 | Evaluating Qualitative Research |
| **Unit 5** | **Presentation Of Thesis And Research Ethics** |

| | |
|---|---|
| 1 | Developing an Argument |
| 2 | Evaluating an Argument |
| 3 | Research Ethics-Key Issues and Guidelines for Responsible Research Best Practices |
| 4 | Publication Process, Metrics and Publication Ethics |

**Course Outcomes**

| S. No | Course Outcomes |
|---|---|
| 1 | Perform literature search and scoping study on selected topics |
| 2 | Set-up digital workspace for research using applications like Zotero and Qiqqa and Publish or Perish |
| 3 | Prepare an annotated bibliography following the APA style guide |
| 4 | Read and summarize academic research articles and evaluate quality based on protocols |
| 5 | Produce a news story based on academic research following best practices in academic journalism |

**Mapping Course Objectives (CO) and Program Specific Objectives (PSO)**

| Course Objectives (CO) | Program Specific Objectives (PSO) | | | | | | |
|---|---|---|---|---|---|---|---|
| | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 | PSO7 |
| CO1 | S | S | S | S | L | S | S |
| CO2 | S | S | S | S | L | S | S |
| CO3 | S | S | S | S | L | S | S |
| CO4 | S | S | S | S | L | S | S |
| CO5 | S | S | S | S | L | S | S |
| S=Strong, M=Medium, L=Low | | | | | | | |

**References**


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9. Krause, S. D. (2020). The Process of Research Writing.

**Elective Paper –V-Digital Asset Management - Theory**

**Course Objectives**

| S. No | Course Objectives |
|---|---|
| 1 | To describe content management and its relevance in the digital age. |
| 2 | To define Digital Asset Management and identify the need for DAM systems in any organization |
| 3 | To understand the unique and significant storage needs and staffing requirements of a DAM system. |
| 4 | To explain the Digital Asset Life cycle from creation to archiving and retrieval |
| 5 | To illustrate how DAMs function in both brand management and rights management initiatives. |

| Topic No | **Digital Asset Management** |
|---|---|
| **Unit 1** | **Content Management System** |
| 1 | Content, Essence, and Metadata |
| 2 | Content and Intellectual Property Rights |
| 3 | Content Management - Media and Essence Handling, Meta Data Creation, and Handling. Multimedia Database |
| 4 | Content - Access, Search and Retrieval, Workflows, Distribution. |
| 5 | Representation of content - Essence Formats and Meta Data: Description of content |
| **Unit 2** | **Digital Asset And Dam** |
| 1 | Digital Asset - File Types (Asset Types: Image, Document, Video, Audio, Web Code), Data Packages, User Data, User Accounts, Crypto Currency Tokens, Bit Coins |
| 2 | DAM -MAM, BAM, DM, ECM, CMS vs DAM |
| 3 | Types - Commercial, Home Brew, Open Source, Needs Assessment |
| 4 | DAM Software and Support- Case Study. |
| **Unit 3** | **Storage Requirements And Staffing For Dam** |

| | |
|---|---|
| 1 | DAM Servers - Onsite, DAM Vendor, Hosting Specialist |
| 2 | Hosting - collocation, dedicated, managed, shared |
| 3 | Storage - Active and Inactive. |
| 4 | Staffing - Digital Asset Managers, Roles and responsibilities, Opportunities. |
| **Unit 4** | **Dam - Life Cycle** |
| 1 | Creating and maintaining access control lists (ACLs) |
| 2 | Uploading assets |
| 3 | Arranging and describing assets, via either a mass upload or one-by-on |
| 4 | Maintaining access to the DAM and its portal |
| 5 | Reference services for users - User Training |
| 6 | Finding Assets - Types of Searches - Meta Data Dictionary, Keywording and Keyword Dictionaries |
| 7 | DAM Workflows |
| **Unit 5** | **Digital Preservation And Brand & Rights Management** |
| 1 | Technology Preservation - Digital Archaeology - Migration |
| 2 | Intellectual Property Rights |
| 3 | Copyrights Law-Contracts for Creative Workers |
| 4 | Creative Commons Rights-Patenting Design-Royalties |
| 5 | Future of DAMs |

**Course Outcomes**

| S. No | Course Outcomes |
|---|---|
| 1 | Recognize the Importance of Content Management |
| 2 | Acquire knowledge of Digital Assets and their Management |
| 3 | Understand the requirements of storage and staffing for a successful DAM |
| 4 | Comprehend the workflows and life cycle of the Digital Assets in DAM |
| 5 | Appreciate the role of DAMs in Brands and Rights |

**Mapping Course Objectives (CO) and Program Specific Objectives (PSO)**

| Course Objectives (CO) | Program Specific Objectives (PSO) | | | | | | |
|---|---|---|---|---|---|---|---|
| | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 | PSO7 |
| CO1 | S | S | S | S | L | S | S |
| CO2 | S | S | S | S | L | S | S |
| CO3 | S | S | S | S | L | S | S |
| CO4 | S | S | S | S | L | S | S |
| CO5 | S | S | S | S | L | S | S |
| S=Strong, M=Medium, L=Low | | | | | | | |

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**Extra Disciplinary-III- Digital Marketing Communication - Theory**

| S. No | Course Objectives |
|---|---|
| 1 | To introduce Content Marketing and its significance today |
| 2 | To illustrate the nuances and methodology of Content Curation |
| 3 | To help students understand the dynamics of Social Media Marketing |
| 4 | To equip students with skills in Social Media Marketing Analytics |
| 5 | To outline nuances in mobile media marketing on social networks |

| Topic No | Digital Marketing Communication (Theory) |
|---|---|
| **Unit 1** | **The Digital Environment** |
| 1 | Marketing in the digital world, Digital transformation. What is digital marketing? A history of digital marketing. Digital Media and Alternatives, Non-marketing digital marketers. |
| 2 | The Ps of marketing, Porter's five forces. Brand or perceptual positioning map, Customer lifetime value, Segmentation. Boston Consulting Group matrix |
| 3 | Varieties of Digital Marketing: Social Media Marketing, Programmatic Marketing and Advertising. Artificial Intelligence, Virtual and Augmented Reality. Gaming as a Digital Marketing Tool |
| 4 | Digital customers, Online buying behaviour. Legal considerations, Regulation, Privacy. Barriers and considerations, Technology, Skills, Budget and resources, Business priorities |
| **Unit 2** | **Digital Marketing and Business Strategy** |
| 5 | Aligning with business strategy, Customer centricity, Business model, Global strategy, Brand, Vision, Culture, Research and insight, KPIs |

| | |
|---|---|
| 6 | Personalization, True personalization, User-defined personalization, Behavioural personalization, Tactical personalization, Single customer view. Viral marketing, Paid, Earned, Owned, |
| 7 | Influencers, Affiliate marketing, Attribution. Public relations and reputation management, Integrated marketing communications |
| 8 | Planning, The planning process, The phased approach, Goals, Objectives and strategies, Action plans, Controls, People, Budgeting and forecasting, Operational digital marketing |
| **Unit 3** | **Search Engine Optimization** |
| 9 | Defining SEO. A history of SEO. How search engines work. Search engine optimization, Keyword selection, On-site optimization, Off-site optimization. |
| 10 | Strategic search engine optimization, Third-party search engine ranking. Researching your SEO strategy, Technical SEO, Site structure, Content, Mobile, Location, Penalties, |
| 11 | Organizational structure and SEO. Website development, Web presence ownership, management and development. Usability, The basics, Content development. The BB website, The global web presence |
| 12 | Wed Design for Search Engine Optimization: SEO (or SEM=SEO+SEA), , Search Engine Results Page, Indexation, Guidelines for SEO, Off-Page-On-Site SEO Improvements, On-Page SEO Improvements, Off-Site or External SEO Improvements, SEO Improvements Related to User Experience. Ad words. |
| **Unit 4** | **Digital Marketing and ECommerce** |
| 13 | Multi-channel retailing, Fulfilment, Comparison shopping engines, e-marketplaces and third-party shopping websites, The e-commerce website. |
| 14 | Paid search, Setting up a campaign, Measurement and optimization. Managing paid search campaigns – humans versus robots. |
| 15 | Customer service, Customer service principles, Service channels, Social customer service |
| 16 | Defining CRM.CRM. retention, and retention, Contact strategy, Cross-selling and up-selling, CRM systems, Social CRM (SCRM), Brand Loyalty |
| **Unit 5** | **Social Media Marketing** |

| | |
|---|---|
| 17 | The Role of Social Media Marketing-Goals and Strategies-Identifying Target Audiences. Rules of Engagement for SMM. Social Media Marketing Plan. Social Media Management Tools for Scheduling and Publishing. Influencer Marketing. |
| 18 | What is content marketing? Content strategy. Content types. People and process for creating content, Distribution, Measuring the value of content, international content, Audit checklist. Email Marketing |
| 19 | Mobile Marketing Strategy - Creation of Mobile Buyer Personas, Goals, KPI, Local SEO, Geo-Fencing, Vertical Video Content, Geo-Location Marketing |
| 20 | Social Media Monitoring vs Social Listening-Tools for Managing the Social Media Marketing Effort. Native Analytical Tools - Twitter Analytics, Meta Business Suite-Reach vs Impressions, Audience Growth Rate. Engagement Rate, Amplification rate, Virality. Mobile Metrics |

**Course Outcomes**

| S. No | Course Outcomes |
|---|---|
| 1 | Acquire knowledge of Content Marketing and its development |
| 2 | Learn the nuances of Content curation |
| 3 | Understand the functions of Social Media Marketing |
| 4 | Acquire skills in Social Media Marketing Analytics |
| 5 | Deepen knowledge of Mobile Media Marketing through social networks |

**Mapping Course Objectives (CO) and Program Specific Objectives (PSO)**

| Course Objectives (CO) | Program Specific Objectives (PSO) | | | | | | |
|---|---|---|---|---|---|---|---|
| | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 | PSO7 |
| CO1 | S | S | S | S | L | S | S |
| CO2 | S | S | S | S | L | S | S |
| CO3 | S | S | S | S | L | S | S |
| CO4 | S | S | S | S | L | S | S |
| CO5 | S | S | S | S | L | S | S |
| S=Strong, M=Medium, L=Low | | | | | | | |

**References**


1. Charlesworth, A. (2014). Digital Marketing: A Practical Approach. Routledge.
2. Kingsnorth, S. (2016). *Digital Marketing Strategy: An Integrated Approach to Online Marketing*. Kogan Page Publishers.
3. Barry, J. M. (2014). Social Content Marketing for Entrepreneurs. Business Expert Press.
4. Chaffey, D., & Ellis-Chadwick, F. (2015). Digital Marketing PDF eBook. Pearson Education.
5. Charlesworth, A. (2020). Absolute Essentials of Digital Marketing. Routledge.
6. Funk, T. (2014). Advanced Social Media Marketing: How to Lead, Launch, and Manage a Successful Social Media Program. Apress.
7. Hanlon, A. (2019). Digital Marketing: .
8. Strategic Planning & Integration. SAGE.
9. Kingsnorth, S. (2019). Digital Marketing Strategy: An Integrated Approach to Online Marketing. Kogan Page Publishers.
10. Kingsnorth, S. (2022). The Digital Marketing Handbook: Deliver Powerful Digital Campaigns. Kogan Page.
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**S.A.C. SEPT'2022**

**APPENDIX – (i)27(R)**
**UNIVERSITY OF MADRAS**
**M.Sc. COMPUTER SCIENCE**
**CHOICE BASED CREDIT SYSTEM**

**REGULATIONS**

With effect from 2022-2023

## Programme Outcomes:

- To possess advanced knowledge of Computing, Mathematical basics for contemporary Computing Specialization and Knowledge of defined problem domain
- To identify a prospective domain, review research literature and analyze the problems using mathematical methods and suggest
- To have the Ability to use design tools, design software as per needs and specifications
- To apply acquired knowledge of the domain in investigating the software design, from design of experiments, analysis of data to provision of valid conclusions.
- To possess the skills to use modern software and hardware tools to analyze problems.
- To possess the knowledge of ethical and legal principles and cyber regulations
- To Possess ability for self-education and attitude for life-long learning in the broadest context of technological change
- To possess the skill and acumen for innovative research and be aware of publishing their work in reputed journals
- To possess the ability to communicate scientific facts effectively in both verbal and written form to the society
- To possess the ability to understand the impact of IT solutions in a global and societal context
- To possess the skill to find out the right opportunity for entrepreneurship for the betterment of an individual and society at large

## Programme Specific Outcomes:

- Implement the concept of theory and technology with classical and modern techniques for solving the complex problems in Computer Science.
- Be more curious towards learning new and emerging technologies that adapt quickly to changes.
- Design, execute and evaluate computing projects in academia and industries using appropriate technologies.
- Know the contextual knowledge in computing science research and communicate effectively with stakeholders with the society at large for enhancing the quality of life.
- Be honest in upholding the ethical principles and social responsibilities along with socio-economic innovations.

**Scheme of Examinations**

| S.NO | Course | SUBJECT NAME | Ins. Hours | Credits | MAXIMUM MARKS | | |
|---|---|---|---|---|---|---|---|
| | | | | | Int. | Ext. | Total |
| **SEMESTER I** | | | | | | | |
| 1 | Core - 1 | Advanced Data Structure and Algorithms | 5 | 4 | 25 | 75 | 100 |
| 2 | Core - 2 | Advanced PYTHON Programming | 5 | 4 | 25 | 75 | 100 |
| 3 | Core - 3 | Artificial Intelligence | 5 | 4 | 25 | 75 | 100 |
| 4 | Core - 4 | Practical - 1: Data Structure and Algorithms Lab | 4 | 2 | 40 | 60 | 100 |
| 5 | Core - 5 | Practical - 2 : Advanced PYTHON Programming Lab | 4 | 2 | 40 | 60 | 100 |
| 6 | Extra Disciplinary | Theory of Computations | 5 | 3 | 25 | 75 | 100 |
| 7 | Soft Skill-1 | Choose from the List Given at the end | 2 | 2 | 40 | 60 | 100 |
| | | **Total Credits** | | **21** | | | |
| **SEMESTER II** | | | | | | | |
| 8 | Core - 6 | Machine Learning | 5 | 4 | 25 | 75 | 100 |
| 9 | Core - 7 | Advanced Networks | 5 | 4 | 25 | 75 | 100 |
| 10 | Core - 8 | Practical - 3: Machine Learning Lab | 4 | 2 | 40 | 60 | 100 |
| 11 | Core - 9 | Practical - 4 : Elective II based Lab | 4 | 2 | 40 | 60 | 100 |
| | Core- 9A | Practical - 4: Full stack web development Lab (Elective II based Lab) | | | | | |
| | Core- 9B | Practical - 4: Natural Language Processing Lab (Elective II based Lab) | | | | | |
| | Core- 9C | Practical - 4: Digital Image Processing Lab (Elective II based Lab) | | | | | |
| 12 | Extra Disciplinary | Principles of Compiler Design | 4 | 3 | 25 | 75 | 100 |
| 13 | Elective-1 | List given below | 3 | 3 | 25 | 75 | 100 |
| | Elective-2 | List given below | 3 | 3 | 25 | 75 | 100 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 14 | Soft Skill-2 | Choose from the List Given at the end | 2 | 2 | 40 | 60 | 100 |
| | Internship | 4 to 5 weeks of internship during summer vacation of I year | | | | | |
| | | **Total Credits** | | **23** | | | |
| **SEMESTER III** | | | | | | | |
| 16 | Core - 10 | Parallel And Distributed Computing | 5 | 4 | 25 | 75 | 100 |
| 17 | Core - 11 | Deep Learning and Neural Networks | 5 | 4 | 25 | 75 | 100 |
| 18 | Core - 12 | Cryptography | 5 | 4 | 25 | 75 | 100 |
| 19 | Core - 13 | Practical - 5: Deep learning Lab | 5 | 2 | 40 | 60 | 100 |
| 20 | Elective-3 | List given below | 3 | 3 | 25 | 75 | 100 |
| 21 | Elective-4 | List given below | 3 | 3 | 25 | 75 | 100 |
| 15 | Soft Skill-3 | Choose from the List Given at the end | 2 | 2 | 40 | 60 | 100 |
| 22 | Soft Skill-4 | Choose from the List Given at the end | 2 | 2 | 40 | 60 | 100 |
| 23 | Internship | Evaluation of 4 to 5 weeks of internship during summer vacation of I year | | 2 | | | |
| | | **Total Credits** | | **26** | | | |
| **SEMESTER IV** | | | | | | | |
| 24 | Core - 14 | Project and Viva-Voce | | 20 | 20 | 60 +20 | 100 |

**ELECTIVE 1**
Cloud Computing
Internet of things
Data Analytics

**ELECTIVE 2**
Full stack web development
Natural Language Processing
Digital Image Processing

**ELECTIVE 3**
Cyber Security
Advanced Computer Architecture
Distributed Database Systems

**ELECTIVE 4**
Human Computer Interaction
Agile Software Engineering
Computer vision

**List of Soft Skill Courses**

1. Communication Skills for Software Engineers – I
2. Communication Skills for Software Engineers – II
3. Personality Development and other Soft Skills for Software Engineers
4. Document Preparation and Interview skills for Software Engineers
5. Team Project

Learning Outcome Index: Mapping of program outcome with courses

Table 1

| Program Outcomes | Core Courses | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CO 1 | CO 2 | CO 3 | CO 4 | CO 5 | CO 6 | CO 7 | CO 8 | CO 9 | CO10 | CO11 | CO12 | CO13 | CO14 |
| Outcomes 1 | X | | X | | | X | | | | | X | | | X |
| Outcomes 2 | X | X | | | X | X | | X | X | | | X | | X |
| Outcomes3 | | X | X | X | | | X | | | X | X | | X | |
| Outcomes 4 | | X | | | X | X | | X | X | | | X | | X |
| Outcomes 5 | X | | X | X | | | X | | | | X | | X | |
| Outcomes 6 | | X | | X | X | | | X | | X | | X | | X |
| Outcomes 7 | X | | | | | X | X | | X | | X | | X | X |
| Outcomes 8 | X | | | X | | X | X | | | X | | X | | |
| Outcomes 9 | | X | X | X | X | | | X | X | | X | | X | X |

CO i – i$^{th}$ Core Course

| Table 2 | | |
|---|---|---|
| Program Outcomes | Extra-Disciplinary Courses | |
| | Course 1 | Course 2 |
| Outcomes 1 | X | |
| Outcomes 2 | | X |
| Outcomes3 | X | |
| Outcomes 4 | | X |
| Outcomes 5 | | X |
| Outcomes 6 | X | |
| Outcomes 7 | X | |
| Outcomes 8 | | X |
| Outcomes 9 | X | X |

| Table 3 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Program Outcomes | Elective Courses | | | | | | | | | | | |
| | CO 1 | CO 2 | CO 3 | CO 4 | CO 5 | CO 6 | CO 7 | CO 8 | CO 9 | CO10 | CO11 | CO12 |
| Outcomes 1 | X | | X | | | X | | | | | X | |
| Outcomes 2 | | X | | | X | | | X | X | | X | X |
| Outcomes3 | X | | X | X | | | X | | | X | X | |
| Outcomes 4 | | X | X | | X | | | X | X | | | |
| Outcomes 5 | X | | X | | | X | X | | | X | X | |
| Outcomes 6 | | X | | X | X | | | X | | X | | X |
| Outcomes 7 | X | | | | | X | X | | X | X | | X |
| Outcomes 8 | | | | X | | X | X | | | | | X |
| Outcomes 9 | | X | X | X | X | | | X | X | | X | |

CO i – $i^{th}$ Elective Course

| Table 4 | | | | | |
|---|---|---|---|---|---|
| Program Outcomes | Soft Skill Courses | | | | |
| | Course 1 | Course 2 | Course 3 | Course 4 | Course 5 |
| Outcomes 1 | X | | X | X | |
| Outcomes 2 | | X | | X | X |
| Outcomes3 | | X | | | |
| Outcomes 4 | X | | | | X |
| Outcomes 5 | | X | X | | |
| Outcomes 6 | X | | | X | X |
| Outcomes 7 | X | | X | | |
| Outcomes 8 | | X | | X | X |
| Outcomes 9 | X | X | X | | |

**S.SENATE.SEPT.'2022**

**APPENDIX – 27(S)**
**UNIVERSITY OF MADRAS**
**M.Sc. COMPUTER SCIENCE**
**CHOICE BASED CREDIT SYSTEM**

SYLLABUS

(w.e.f.2022-23)

| Title of the Course/ Paper | Advanced Data Structure and Algorithms | | |
|---|---|---|---|
| Core – 1 | I Year - I Semester | Credit: 4 | |

**Objectives:**

- Define the basic concepts of algorithms and analyze the performance of algorithms.
- Discuss various algorithm design techniques for developing algorithms.
- Discuss various searching, sorting and graph traversal algorithms.
- Understand NP completeness and identify different NP complete problems.
- Discuss various advanced topics on algorithms.

**Outcomes:**

- Analyze programming problem statements.
- Comprehend and select algorithm design approaches in a problem specific manner.
- Choose appropriate data structures for a specific problem
- Utilize necessary mathematical abstractions to solve problems
- Come up with analysis of efficiency and proofs of correctness

UNIT I: Introduction: Algorithm, Pseudo code for expressing algorithms, Performance Analysis-Space complexity, Time complexity, Asymptotic Notation- Big oh notation, Omega notation, Theta notation and Little oh notation, Probabilistic analysis, Amortized analysis.

UNIT II: Insertion and deletion and merging with 1) binary search tree, 2) AVL tree, 3) Red Black tree, 4) B tree, 5) B+ tree and Comparison of previous tree structures . Fibonacci Heap, Fibonacci Heap Operations: Find minimum, merge, insert, extract minimum, decrease key and delete, Complexity analysis of the above data structure operations.

UNIT III: Representations of Graphs, Minimum Spanning Trees: Growing a Minimum Spanning Tree – Kruskal and Prim- Single-Source Shortest Paths: The Bellman-Ford algorithm – Single-Source Shortest paths in Directed Acyclic Graphs – Dijkstra 's Algorithm, Divide and conquer: General method, applications - Quick sort, Merge sort, Strassen's matrix multiplication, External Sort: External merge sort, K-Way Merge sorting

UNIT IV: Greedy method: General method, applications-Job sequencing with deadlines, 0/1, knapsack problem, Huffman Codes, Dynamic Programming: General method, applications-Matrix chain multiplication, 0/1 knapsack problem, Traveling salesperson problem, Reliability design.

UNIT V: Backtracking: General method, applications-n-queen problem, sum of subsets problem, graph coloring, Hamiltonian cycles. Branch and Bound: General method,

applications - Traveling salesperson problem, 0/1 knapsack problem- LC Branch and Bound solution, FIFO Branch and Bound solution. NP-Hard and NP-Complete problems

**Recommended Texts:**


1. Peter Brass; Advanced Data Structures; CAMBRIDGE UNIVERSITY PRESS;2008
2. S. Dasgupta, C. Papadimitrou, U Vazirani; Algorithms; Mc Graw Hill;2022
3. J. Klienberg and E. Tardos, Algorithm Design, Pearson Education Limited;2013


**Reference Books:**


1. Sartaj Sahni, Data Structures Algorithms and Applications in C++, 2nd Edition, Universities Press, 2007.
2. Ellis Horowitz, Sartaj Sahni, Rajasekharan, Fundamentals of Algorithms, 2nd Edition, Universities Press, 2009.
3. Aho V Alfred, Hapcroft E John, Ullman D Jeffry, Data Structures and Algorithms, Pearson Education, 2001.
4. Adam Drozdek, Thomson, Data Structures and Algorithms in JAVA, 3rd Edition, Cengage Learning, 2008.
5. Horowitz, Sahni, Mehta, Fundamentals of Data Structures in C++, 2nd Edition, Universities Press, 2007.


**Web References:**

1. https://nptel.ac.in/courses/106102064

Mapping with Programme Outcomes:

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | S | M | M | S | M | S | S | S | L | M |
| CO 2 | S | L | S | M | S | L | M | M | S | S |
| CO 3 | M | S | L | M | M | S | L | S | L | S |
| CO 4 | L | S | S | L | S | M | S | L | S | M |
| CO 5 | S | M | M | S | L | S | M | S | S | S |

S-Strong M-Medium L-Low

| Title of the Course/ Paper | Advanced PYTHON Programming | | |
|---|---|---|---|
| Core – 2 | I Year - I Semester | Credit: 4 | |

**Objectives:**

- To Provide advanced programming knowledge in python environment
- To Make interactive Python programs.
- To develop GUI based applications
- To utilise libraries and APIs for rapid application development
- To use python as an analytical tool for different mathematical models

**Outcomes:**

- Be able to program decorators, closures, lambda, iterators and generators comprehensions with in OOP.
- Learn modern data structures to include collections, array, and queues
- Use platform independent file manipulation, file pattern matching using CSV, HTML, XML, JASON
- Be able to set up a client-server program and also multiprocess applications.
- Be able to use python as an analytical and presentation tool

UNIT I: Object Oriented Python – Class, Objects. member types (public. Private, protected) self ,__init method ,method overloading. Inheritance, method overriding, Polymorphism, Encapsulation, Assertion, Decorators, Generators, Iterators.

UNIT Threading in Python: Thread ,Starting a Thread, Daemon Threads, join() a Thread, Working With Many Threads, Using a Thread Pool Executor, Race Conditions, Basic Synchronization Using Lock, Deadlock, Producer-Consumer Threading, Producer-Consumer Using Lock, Producer-Consumer Using Queue, Threading Objects, Semaphore, Timer

UNIT III: Database programming using Python: Connecting to a database (sqlite, mysql) using Python, Sending DML and DDL queries and processing the result from a Python Program. Network programming using Python: An introduction to client-server programming, Basics of TCP and UDP protocols, Introduction to socket programming, Building an HTTP client and server

UNIT IV: GUI in Python: Introduction to GUI building libraries, Widgets: Button - Canvas - Check button -Entry - Frame -Label – List box – Menu button - Menu - Message –Radio button - Scale - Scrollbar - Text – Top level – Spin box- Paned Window – Label Frame – Message Box Basic image processing using Python: Introduction to digital image processing, Basic operations on an image: Crop - Scale - Rotate - Flip - Changing contrast, brightness and color - Edge detection, blur, sharpening

UNIT V:Basic numerical processing using Python: Introduction to numpy , Creation of vectors and matrices, Matrix manipulation Basic data analysis using Python: Introduction to Pandas ,Pandas data structures – Series and DataFrame , Data wrangling using pandas : Loading a dataset into a dataframe- Selecting Columns from a dataframe - Selecting Rows from a dataframe - Adding new data in a dataframe - Deleting data from a dataframe Basic data visualization using : Introduction to Matplotlib, Scatter plot , Line plot,Bar chart ,

Histogram , Box plot.

**Recommended Texts:**

1. John Hunt; Advanced Guide to Python 3 Programming; Springer Nature Switzerland AG; 2019

**Reference Books:**

1. Eric Matthes, Python Crash Course: A Hands-On, Project-Based Introduction to Programming, 2nd Edition, No starch Press, 2019.
2. Mark Lutz; Learning Python, 5th Edition; O'Reilly Media, 2013
3. Mark Lutz, "Programming Python", 4th edition, O'Reilly Media, 2010.

**Web References:**

1. https://realpython.com/tutorials/advanced/

Mapping with Programme Outcomes:

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | S | M | M | S | M | S | S | S | L | M |
| CO 2 | S | L | S | M | S | L | M | M | S | S |
| CO 3 | M | S | L | M | M | S | L | S | L | S |
| CO 4 | L | S | S | L | S | M | S | L | S | M |
| CO 5 | S | M | M | S | L | S | M | S | S | S |

S-Strong M-Medium L-Low

| Title of the Course/ Paper | Artificial Intelligence | | |
|---|---|---|---|
| Core – 3 | I Year - I Semester | Credit: 4 | |

**Objectives:**

- To impart knowledge about Artificial Intelligence.
- To give understanding of the main abstractions and reasoning for intelligent systems.
- To enable the students to understand the basic principles of Artificial Intelligence in various applications.
- To identify the scope of Artificial Intelligence in real life applications
- To enable decoding of human thinking process and find the ways of making the machine decide intelligently in lieu of number crunching

**Outcomes:**

- Solve basic AI based problems.
- Define the concept of Artificial Intelligence.
- Apply AI techniques to real-world problems to develop intelligent systems.
- Select appropriately from a range of techniques when implementing intelligent systems.
- Possess the basic knowledge of different machine learning techniques.

Unit- I: AI problems, foundation of AI and history of AI intelligent agents: Agents and Environments, the concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation.

Unit -II Searching- Searching for solutions, uniformed search strategies – Breadth first search, depth first Search. Search with partial information (Heuristic search) Hill climbing, A*, AO* Algorithms, Problem reduction, Game Playing- adversarial search, Games, mini-max algorithm, optimal decisions in multiplayer games, Problem in Game playing, Alpha-Beta pruning, Evaluation functions.

Unit -III Knowledge representation issues, predicate logic- logic programming, semantic nets- frames and inheritance, constraint propagation, representing knowledge using rules, rules-based deduction systems. Reasoning under uncertainty, review of probability, Baye's probabilistic interferences and dumpster Shafer theory.

Unit - IV First order logic. Inference in first order logic, propositional vs. first order inference, unification & lifts forward chaining, Backward chaining, Resolution, learning from observation Inductive learning, Decision trees, Explanation based learning, Statistical Learning methods, Reinforcement Learning.

Unit - V Expert systems:- Introduction, basic concepts, structure of expert systems, the human element in expert systems how expert systems works, problem areas addressed by expert systems, expert systems success factors, types of expert systems, expert systems and the internet interacts web, knowledge engineering, scope of knowledge, difficulties, in knowledge acquisition methods of knowledge acquisition, machine learning, intelligent agents, selecting an appropriate knowledge acquisition method, societal impacts reasoning in artificial intelligence, inference with rules, with frames: model based reasoning, case based reasoning, explanation & meta knowledge inference with uncertainty representing uncertainty.

**Recommended Texts:**

1. Elaine Rich, Kevin Knight and Shivshankar Nair; Artificial Intelligence ; McGraw Hill; Third Edition;2017
2. S. Russel and P. Norvig, "Artificial Intelligence – A Modern Approach", Third Edition, Pearson Education;2010.

**Reference Books:**

1. David Poole, Alan Mackworth, Randy Goebel, "Computational Intelligence : a logical approach", Oxford University Press, 1998.
2. G. Luger, "Artificial Intelligence: Structures and Strategies for complex problem solving", Fourth Edition, Pearson Education,2001.
3. J. Nilsson, "Artificial Intelligence: A new Synthesis", Elsevier Publishers,1998.
4. Dan W. Patterson, Introduction to Artificial Intelligence and Expert Systems by Pearson Education, 1995

**Web References:**

1. https://artint.info/index.html

Mapping with Programme Outcomes:

| **Mapping with Programmers outcomes*** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | S | M | S | S | M | M | L | S | L | L |
| CO2 | S | M | S | M | S | S | M | L | M | L |
| CO3 | M | S | S | S | M | S | L | M | L | M |
| CO4 | S | L | M | M | S | L | L | M | M | S |
| CO5 | S | S | M | S | L | M | M | L | M | L |

S-Strong M-Medium L-Low

| Title of the Course/ Paper | Practical - 1: Data Structure and Algorithms Lab | | |
|---|---|---|---|
| Core – 4 | I Year - I Semester | Credit: 2 | |

**Objectives:**

- To provide the foundations of the practical implementation and usage of Algorithms and Data Structures.
- To ensure that the student evolves into a competent programmer capable of designing and analyzing implementations of algorithms and data structures for different kinds of problems.
- To expose the student to the algorithm analysis techniques,
- To make the students understand the theory of reductions, and to the classification of problems.
- To make the students to be sure of complexity classes like NP.

**Outcomes:**

- Design and analyze programming problem statements.
- Choose appropriate data structures and algorithms, understand the ADT/libraries, and use it to design algorithms for a specific problem.
- Be familiar with programming language constructs available for rapid application development,
- Understand the necessary programmatic abstraction to solve problems.
- Gain the capacity to solve real life problems by matching to the available algorithms.

**Implement the following using Java**

1. Write a program to perform the following operations on a heterogeneous singly linked list. i) Creation ii) Insertion iii) Deletion iv) Traversal.
2. Write a program to perform the following operations on a heterogeneous doubly linked list. i) Creation ii) Insertion iii) Deletion iv) Traversal in both ways
3. Write a program that implements using java generic class, the stack (its operations)
4. Write a program that implements using java generic class, the queue (its operations)
5. Write a program that implements the Quick sort method.
6. Write a program that implement the Merge sort method.
7. Write a program that implement the SHELL sort method.
8. Write a program to perform the following: i) Creating a Binary Tree of integers ii) Traversing the above binary tree in preorder, inorder and postorder.
9. Write a program to perform the following: i) Creating a AVL Tree ii) insertion iii)deletion iv) Traversing the above AVL tree in preorder, inorder and postorder.
10. Write a program that uses functions to perform the following: i) Creating a SplayTree ii) traverse
11. Write a program to perform the following: i) Creating a B-Tree of integers ii) insertion iii)deletion
12. Write a program that implements Kruskal's algorithm using a disjoint set data structure. The program takes as input a file (data.txt), in which each line either represents a vertex or an edge. For the edge lines, the first integer on that line representing the starting

vertex, the second the ending vertex, and the third the weight of the edge. Use this file to construct, line by line, the graph upon which Kruskal's algorithm will be run (do NOT hardcode this graph!).

13. Write a program to simulate various graph traversing algorithms.
14. Write a program to find the minimal spanning tree of a graph using the Prim's algorithm.
15. Write a program to find shortest path using Bellman Ford's Algorithm

**Recommended Texts:**


1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C++:Pearson Education; 4th Edition,


**Reference Books:**


1. Sartaj Sahni, Data Structures Algorithms and Applications in C++, 2nd Edition, Universities Press, 2007.
2. Ellis Horowitz, Sartaj Sahni, Rajasekharan, Fundamentals of Algorithms, 2nd Edition, Universities Press, 2009.
3. Aho V Alfred, Hapcroft E John, Ullman D Jeffry, Data Structures and Algorithms, 1st Edition, Pearson Education, 2002.
4. Adam Drozdek, Thomson, Data Structures and Algorithms in JAVA, 3rd Edition, Cengage Learning, 2008.
5. Horowitz, Sahni, Mehta, Fundamentals of Data Structures in C++, 2nd Edition, Universities Press, 2007.


**Web References:**

1. https://nptel.ac.in/courses/106102064

Mapping with Programme Outcomes:

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | S | M | M | S | M | S | L | S | L | M |
| CO 2 | S | L | S | M | S | L | M | M | S | S |
| CO 3 | M | S | L | M | M | S | L | S | L | S |
| CO 4 | L | S | S | L | S | M | S | L | S | M |
| CO 5 | S | M | M | S | L | S | M | S | L | S |

S-Strong M-Medium L-Low

| Title of the Course/ Paper | Practical - 2: Advanced PYTHON Programming Lab | | |
|---|---|---|---|
| Core – 5 | I Year - I Semester | Credit: 2 | |

**Objectives:**

- Design, implement and test readable, efficient programs that take advantage of Python built-in capabilities and follow Python best practices.
- Understand implementation differences and performance tradeoffs associated with various Python data structures.
- Develop Python applications using the modules and packages available in the Python standard library.
- Develop Python applications using third party libraries.
- Design, implement and test Python programs that include a graphical user interface, data analysis and visualization, web data extraction and web applications.

**Outcomes:**

- Apply exception handling and user defined exception(s) Develop Module(s) and Package(s) in python
- Possess an ability to write database applications in Python
- Implement Object Oriented concepts in programming Apply Collection modules for the data types
- Possess the Object-oriented programming skills in Python. and the skill of to design graphical-user interfaces (GUI) in Python.
- Make use of Pandas and Numpy Libraries

1) Exception

a) Write a python program to catch following exception i) Value Error ii) Index Error iii) Name Error iv) Type Error v) DivideZero Error

b) Write a python program to create user defined exceptions.

c) Write a python program to understand the use of else and finally block with try block.

d) Write a python program that uses raise and exception class to throw an exception.

2) Numpy Library

a) Create a numpy array from list, tuple with float type

b) Python program to demonstrate slicing, integer and boolean array indexing

c) Write a python program to find min, max, sum, cumulative sum of array.

d) Write a python program to demonstrate use of ndim, shape, size, dtype.

3) Numpy Library: Linear Algebra

a) Write a python program to find rank, determinant, and trace of an array.

b) Write a python program to find eigenvalues of matrices

c) Write a python program to find matrix and vector products (dot, inner, outer, product), matrix exponentiation.

d) Write a python program to solve a linear matrix equation, or system of linear scalar equations.

e) Create a white image using NumPy in Python and

f) Convert a NumPy array to an image and Convert images to NumPy array?

g) Perform Sorting, Searching and Counting using Numpy methods.

h) Write a program to demonstrate the use of the reshape() method.

4) Pandas Library

a) Write a python program to implement Pandas Series with labels.

b) Create a Pandas Series from a dictionary.

c) Creating a Pandas DataFrame.

d) Write a program which make use of following Pandas methods i) describe() ii) head() iii) tail()

e) Write a program that converts Pandas DataFrame and Series into numpy.array.

f) Write a program that demonstrates the column selection, column addition, and column deletion.

g) Write a program that demonstrates the row selection, row addition, and row deletion.

h) Get n-largest and n-smallest values from a particular column in Pandas dataFrame

5) Visualization

a) Write a program which use pandas inbuilt visualization to plot following graphs: i. Bar plots ii. Histograms iii. Line plots iv. Scatter plots

b) Write a program to demonstrate use of groupby() method.

c) Write a program to demonstrate pandas Merging, Joining and Concatenating

d) Creating dataframes from csv and excel files.

6) Object Oriented Programming:

a) Write a Python class named Person with attributes name, age, weight (kgs), height (ft) and takes them through the constructor and exposes a method get_bmi_result() which returns one of "underweight", "healthy", "obese"

b) Write a python program to demonstrate various kinds of inheritance.

c) Write a python program to demonstrate operator overloading.

b) Write a python program to create abstract classes and abstract methods.

7) MULTITHREADING

a. Write a python program to create two threads to keep a count of number of even numbers entered by the user.

b. Write a JAVA program that creates threads by extending Thread class .First thread display “Good Morning “every 1 sec, the second thread displays “Hello “every 2 seconds and the third display “Welcome” every 3 seconds.

**Recommended Texts:**

1. Martin C. Brown (Author), “Python: The Complete Reference” McGraw Hill Education, Fourth edition , 2018

**Reference Books:**

1. R. Nageswara Rao , “Core Python Programming” Dreamtech Press India Pvt Ltd 2018.

**Web References:**

1. https://realpython.com/tutorials/advanced/
2. https://onlinecourses.nptel.ac.in/noc19_cs40/preview
3. https://onlinecourses.nptel.ac.in/noc19_cs41/preview

Mapping with Programme Outcomes:

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | S | M | M | S | M | L | S | S | L | M |
| CO 2 | S | L | S | L | S | L | M | M | M | S |
| CO 3 | M | S | L | M | M | S | L | S | L | S |
| CO 4 | L | S | S | L | S | M | S | L | S | M |
| CO 5 | S | M | M | S | L | S | M | S | S | S |

S-Strong M-Medium L-Low

| Title of the Course/ Paper | Theory of Computation | | |
|---|---|---|---|
| Extra Disciplinary | I Year - I Semester | Credit: 3 | |

**Objectives:**

- To give an overview of the theoretical foundations of computer science from the perspective of formal languages
- To illustrate finite state machines to solve problems in computing
- To explain the hierarchy of problems arising in the computer sciences.
- To familiarize Regular grammars, context frees grammar.
- To use basic concepts of formal languages of finite automata techniques

**Outcomes:**

- Use the concepts and techniques of discrete mathematics for theoretical computer science
- Design Finite Automata for different Regular Expressions and Languages
- Identify and use different formal languages and their relationship.
- To solve various problems of applying normal form techniques, push down automata and Turing Machines
- Analyze various concepts of undecidability and Computable Function and Discuss nalytically and intuitively for problem-solving situation

Unit I: Review of Mathematical Theory

Combinatorics: Review of Permutation and Combination - Mathematical Induction - Pigeon hole principle - Principle of Inclusion and Exclusion - generating function - Recurrence relations. Statements – Connectives – Truth Tables – Normal forms – Predicate calculus – Inference – Theory for Statement Calculus and Predicate Calculus

Unit-II: Regular Languages and Finite Automata

Regular Expressions, Regular Languages, Application of Finite Automata, Automata with output - Moore machine & Mealy machine, Finite Automata, Memory requirement in a recognizer, Definitions, union- intersection and complement of regular languages, Non Deterministic Finite Automata, Conversion from NFA to FA, ??- Non Deterministic Finite Automata, Conversion of NFA- ? to NFA, Kleene's Theorem, Minimization of Finite automata, Regular And Non Regular Languages – pumping lemma.?

Unit-III: Context free grammar (CFG)

Definitions and Examples, Unions Concatenations And Kleene's of Context free language, Regular Grammar for Regular Language, Derivations and Ambiguity , Unambiguous CFG and Algebraic Expressions, Backus Naur Form (BNF), Normal Form – CNF.

Unit-IV: Pushdown Automata, CFL And NCFL

Definitions, Deterministic PDA, Equivalence of CFG and PDA & Conversion, Pumping lemma for CFL, Intersections and Complements of CFL, Non-CFL.

Unit-V: Turing Machine (TM)

TM Definition, Model Of Computation, Turing Machine as Language Acceptor, TM that Compute Partial Function, Church Turing Thesis, Combining TM, Variations Of TM, Non Deterministic TM, Universal TM, Recursively and Enumerable Languages, Context sensitive languages and Chomsky hierarchy.

**Recommended Texts:**

1. John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman ; Introduction to Automata Theory Languages andComputation; Pearson Education, India; 3rd edition;2008
2. KENNETH H. ROSEN ; Discrete Mathematics and Its Applications (SIE) 8th Edition ;2021

**Reference Books:**

1. K. L. P Mishra, N. Chandrashekaran (2003), Theory of Computer Science-Automata Languages and Computation, 2nd edition, Prentice Hall of India, India.

**Web References:**

1. https://www.youtube.com/playlist?list=PLbtzT1TYeoMjNOGEiaRmm_vMIwUAidnQz
2. https://nptel.ac.in/courses/106106049

Mapping with Programme Outcomes:

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | S | M | M | S | M | L | S | S | L | M |
| CO 2 | S | M | S | L | S | L | M | L | M | S |
| CO 3 | M | S | L | M | M | S | L | S | L | S |
| CO 4 | L | S | S | L | S | M | S | L | S | M |
| CO 5 | S | L | M | S | L | L | M | S | M | S |

S-Strong M-Medium L-Low

| Title of the Course/ Paper | Machine Learning | | |
|---|---|---|---|
| Core – 6 | I Year - II Semester | Credit: 4 | |

**Objectives:**

- To provide mathematical base for Machine learning
- To provide theoretical knowledge on setting hypothesis for pattern recognition.
- To impart Knowledge of machine learning techniques for data handling
- To provide the skill to evaluate the performance of algorithms and to provide solution for various real-world applications.
- To impart the knowledge of identifying similarities and differences in various patterns of data

**Outcomes:**

- Recognize the characteristics of machine learning strategies.
- Apply various supervised learning methods to appropriate problems.
- Identify and integrate more than one technique to enhance the performance of learning.
- Create probabilistic and unsupervised learning models for handling unknown pattern.
- Analyze the co-occurrence of data to find interesting frequent patterns.
- Preprocess the data before applying to any real-world problem and can evaluate its performance.

Unit I: BASIC MATHEMATICS FOR MACHINE LEARNING: Regression Correlation and Regression, types of correlation – Pearson's, Spearman's correlations –Ordinary Least Squares, Fitting a regression line, logistic regression, Rank Correlation Partial and Multiple correlation- Multiple regression, multicollinearity. Gradient descent methods, Newton method, interior point methods, active set, proximity methods, accelerated gradient methods, coordinate descent, cutting planes, stochastic gradient descent. Discriminant analysis, Principal component analysis, Factor analysis, k means.

Unit II: INTRODUCTION TO MACHINE LEARNING: Introduction, Examples of various Learning Paradigms, Perspectives and Issues, Version Spaces, Finite and Infinite Hypothesis Spaces, PAC Learning, VC Dimension.

Unit III: SUPERVISED LEARNING ALGORITHMS Learning a Class from Examples, Linear, Non-linear, Multi-class and Multi-label classification, Decision Trees: ID3, Classification and Regression Trees (CART), Regression: Linear Regression, Multiple Linear Regression, Logistic Regression. Neural Networks: Introduction, Perceptron, Multilayer Perceptron, Support vector machines: Linear and Nonlinear, Kernel Functions, K-Nearest Neighbors

Unit IV: ENSEMBLE LEARNING: Ensemble Learning Model Combination Schemes, Voting, Error-Correcting Output Codes, Bagging: RandomForest Trees, Boosting: Adaboost, Stacking: UNSUPERVISED LEARNING: Introduction to clustering, Hierarchical: AGNES, DIANA, Partitional: K-means clustering, K-Mode Clustering, Self-Organizing Map, Expectation Maximization, Gaussian Mixture Models, Principal

Component Analysis (PCA), Locally Linear Embedding (LLE), Factor Analysis
Unit V: PROBABILISTIC LEARNING: Bayesian Learning, Bayes Optimal Classifier, Naïve Bayes Classifier, Bayesian Belief Networks, Mining Frequent Patterns: MACHINE LEARNING IN PRACTICE: Design, Analysis and Evaluation of Machine Learning Experiments, Other Issues: Handling imbalanced data sets

**Recommended Texts:**


1. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, Prentice Hall of India, Third Edition 2014.
2. Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar "Foundations of Machine Learning", MIT Press, 2012.


**Reference Books:**


1. Tom Mitchell, "Machine Learning", McGraw Hill, 3 rd Edition,1997.
2. Charu C. Aggarwal, "Data Classification Algorithms and Applications", CRC Press, 2014.
3. Stephen Marsland, "Machine Learning – An Algorithmic Perspective", 2 nd Edition, CRC Press, 2015.
4. Kevin P. Murphy "Machine Learning: A Probabilistic Perspective", The MIT Press, 2012
5. Jiawei Han and MichelineKambers and Jian Pei, "Data Mining –Concepts and Techniques", 3 rd Edition,Morgan Kaufman Publications, 2012.
6. Marc Peter Deisenroth, A. Aldo Faisal, Cheng Soon Ong, "Mathematics for Machine Learning", Cambridge University Press, 2019.


**Web References:**

1. https://www.youtube.com/watch?v=r4sgKrRL2Ys&list=PL1xHD4vteKYVpaIiy295pg6_SY5qznc77

Mapping with Programme Outcomes:

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | S | S | M | S | M | L | M | S | L | L |
| CO 2 | S | M | S | L | S | L | M | L | M | S |
| CO 3 | M | S | L | M | M | S | L | S | L | S |
| CO 4 | L | S | S | L | S | M | S | L | S | M |
| CO 5 | S | L | M | S | L | L | M | S | M | S |

S-Strong M-Medium L-Low

| Title of the Course/ Paper | Advanced Networks | | |
|---|---|---|---|
| Core – 7 | I Year - II Semester | Credit: 4 | |

**Objectives:**

- To uncover and understand the current directions of computer networks from literature readings.
- To expose students to the "full span" of the computer network's frontier.
- To encourage a performance perspective towards analysis of computer and communications networks.
- To "fill-in" gaps in students' networking knowledge.
- To plan the interworking of distributed application basing on Semantic Web technology

**Outcomes:**

- Differentiate between different LAN-based forwarding devices so that they can make thoughtful suggestions on how to build a network.
- Select appropriate transport protocol and quality of service mechanisms for a give computer network
- Write networking code that uses TCP and UDP in client-server applications.
- Design and implement networking protocols.
- Design and implement networking applications.

Unit I : Reliable Transmission – Multi access Network – Wireless network - Internetworking - Switching and Bridging- Basic Internetworking -Routing - Implementation -

Unit II : Advanced Internetworking - Global Internet – Multicast - Virtual Private Network - Multiprotocol Label Switching - Routing Among Mobile Devices

Unit III: End-to-End Protocols - Simple Demultiplexer (UDP) - Reliable Byte Stream (TCP) - Remote Procedure Call - Transport for Real-Time (RTP) - RTP Design - Control Protocol - HTTP is the New Narrow Waist

Unit IV: Congestion Control - Issues in Resource Allocation - Queuing Disciplines - TCP Congestion Control - Advanced Congestion Control - Approaches to QOS - Integrated services RSVP - Differentiated Services (EF & AF) - Equation based Congestion control.

Unit V: Network Security - Trust and Threats - Cryptographic Building Blocks - Key Predistribution - Authentication Protocols - Applications - Multimedia Applications - Infrastructure Applications - Name Service (DNS) - Overlay Networks - Peer to peer networks

**Recommended Texts:**

1. Larry L. Peterson , Bruce S. Davie; Computer Networks A Systems Approach; Morgan Kaufmann; 3rd Edition ;2022

**Reference Books:**

1. C. Kaufman, R. Perlman, M. Speciner , Network Security. Private Communication in a Public World, Prentice Hall PTR; Second Edition;2022
2. J. F. Kurose, K. W. Ross , Computer Networking. A Top-Down Approach;

Addison Wesley Longman; Fourth edition, 2008

**Web References:**

1. https://www.youtube.com/watch?v=O--rkQNKqls&list=PLEAYkSg4uSQ2NMmzNNsEK5RVbhxqx0BZF

Mapping with Programme Outcomes:

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
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| CO 1 | S | S | M | S | M | L | M | S | L | L |
| CO 2 | S | M | S | L | S | L | M | L | M | S |
| CO 3 | M | S | L | M | M | S | L | S | L | S |
| CO 4 | L | S | S | L | S | M | S | L | S | M |
| CO 5 | S | M | M | S | M | L | M | S | L | L |

S-Strong M-Medium L-Low

| Title of the Course/ Paper | Practical - 3: Machine Learning Lab | | |
|---|---|---|---|
| Core – 8 | I Year - II Semester | Credit: 2 | |

**Objectives:**

- Make use of Data sets in implementing the machine learning algorithms
- Implement the machine learning concepts and algorithms in any suitable language of choice.
- The programs can be implemented in either JAVA or Python.
- For Problems 1 to 6 and 10, programs are to be developed without using the builtin classes or APIs of Java/Python.
- Data sets can be taken from standard repositories (https://archive.ics.uci.edu/ml/datasets.html) or constructed by the students.

**Outcomes:**

- Understand the implementation procedures for the machine learning algorithms.
- Design Java/Python programs for various Learning algorithms.
- Apply appropriate data sets to the Machine Learning algorithms.
- Identify and apply Machine Learning algorithms to solve real world problems.
- be capable of confidently applying common Machine Learning algorithms in practice and implementing their own;

1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file

2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.

3. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
4. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.

5. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.

6. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.

7. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.

8. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.

9. Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.

10. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

**Recommended Texts:**

1. Dr. Kamlesh Namdev, LAP LAMBERT ; Lab manual of Machine Learning: Machine Learning Practicals in Python; Academic Publishing; 2021

**Reference Books:**

1. Introduction to Machine Learning with Python by Andreas C. Müller, Sarah Guido Released October 2016 Publisher(s): O'Reilly Media, Inc. ISBN: 9781449369415

**Web References:**

1. https://www.youtube.com/watch?v=RnFGwxJwx-0

Mapping with Programme Outcomes:

| **Mapping with Programmers outcomes*** | | | | | | | | | | |
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| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | S | M | S | L | S | M | L | M | L | L |
| CO2 | S | M | S | S | S | M | M | L | M | L |
| CO3 | M | S | M | M | S | S | L | L | L | M |
| CO4 | S | L | M | M | M | L | M | L | M | S |
| CO5 | S | S | M | S | L | M | M | L | M | L |

S-Strong M-Medium L-Low

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|---|---|---|---|
| Title of the Course/ Paper | Practical - 4: Full stack web development Lab (Elective II based Lab) | | |
| Core – 9A | I Year - II Semester | Credit: 2 | |

**Objectives:**

- To ensure responsiveness of applications
- To work alongside graphic designers for web design features
- To manage a project from conception to finished product
- To meet both technical and consumer needs for a web development project
- To learn to research new methods of development in web applications and programming languages

**Outcomes:**

- Structure and implement HTML/CSS.
- Apply intermediate and advanced web development practices.
- Develop a fully functioning website and deploy on a web server.
- Create webpages that function using external data.
- Identify mobile strategies and design for multiple operating systems.
- Distinguishing trends in multi-device implementation.

1. Create a Simple Login form with validations and verification using java script and PHP respectively

2. Create a student mark entry form with validation and verification using java script and PHP respectively

3. Create a employee payroll form with validation and verification using java script and PHP respectively

4. create a simple for count the number of visiters and number of times a single user visited the page.

5. Build a navigation menu that highlights the selected entry using Angular's directives

Create a simple inline editor - clicking a paragraph will show a tooltip with a text field using angularJS

6. Switch between different layout modes (grid or list) with a click of a button.

7. Create a simple application for online shopping using AngularJS and PHP session.

8. Create a Simple Login form with validations and verification using AngularJS PHP respectively

9. Create a student mark entry form with validation and verification using AngularJS and PHP respectively

10. Create a employee payroll form with validation and verification using AngularJS and PHP respectively

**Recommended Texts:**

1. Full Stack AngularJS for Java Developers: Build a Full-Featured Web Application from Scratch Using AngularJS with Spring RESTful, Ravi Kant Soni,Apress; 1st ed. edition ;2017

**Reference Books:**

1. Learning AngularJS: A Guide to AngularJS Development,Ken Williamson,O' Reilly ISBN: 9789352130702, 9352130707

**Web References:**

1. https://www.youtube.com/watch?v=9b9pLgaSQuI

Mapping with Programme Outcomes:

| **Mapping with Programmers outcomes*** | | | | | | | | | | |
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| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | M | S | S | L | S | M | L | M | L | L |
| CO2 | S | M | S | S | S | M | M | L | M | L |
| CO3 | S | S | L | M | S | S | L | M | L | M |
| CO4 | M | L | M | M | M | L | M | L | M | S |
| CO5 | S | S | M | S | L | M | M | L | M | L |

S-Strong M-Medium L-Low

| Title of the Course/ Paper | Practical - 4: Natural Language Processing Lab (Elective II based Lab) | | |
|---|---|---|---|
| Core – 9B | I Year - II Semester | Credit: 2 | |

**Objectives:**

- To understand the algorithms available for the processing of linguistic information and computational
- properties of natural languages.
- To conceive basic knowledge on various morphological, syntactic and semantic NLP tasks.
- To familiarize various NLP software libraries and datasets publicly available.
- To develop systems for various NLP problems with moderate complexity.
- To learn various strategies for NLP system evaluation and error analysis.

**Outcomes:**

- Describe the concepts of morphology, syntax, semantics, discourse & pragmatics of natural language.
- Demonstrate understanding of the relationship between NLP and statistics & machine learning.
- Discover various linguistic and statistical features relevant to the basic NLP task, namely, spelling
- correction, morphological analysis, parts-of-speech tagging, parsing and semantic analysis.
- Develop systems for various NLP problems with moderate complexity

**LIST OF EXERCISES**

1. How to tokenize a given text?
2. How to get the sentences of a text document?
3. How to tokenize text with stop words as delimiters?
4. How to remove stop words and punctuations in a text?
5. How to perform stemming?
6. How to lemmatize a given text?
7. How to extract usernames from emails?
8. How to find the most common words in the text excluding stop words?
9. How to do spell correction in a given text?
10. How to classify a text as positive/negative sentiment?
11. How to extract Noun and Verb phrases from a text?
12. How to find the ROOT word of any word in a sentence?
13. Write a Python program to load the iris data from a given csv file into a dataframe and print the shape of the data, type of the data and first 3 rows.
14. Write a Python NLTK program to find the sets of synonyms and antonyms of a given word.
15. Write a Python NLTK program to print the first 15 random combine labeled male and labeled female names from names corpus.

**Recommended Texts:**

1. Jurafsky Dan and Martin James H. "Speech and Language Processing" ,3rd Edition, 2018.

**Reference Books:**

1. Jurafsky D. and Martin J. H., "Speech and language processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition", 2nd Edition, Upper Saddle River, NJ: Prentice-Hall, 2008.
2. Goldberg Yoav "A Primer on Neural Network Models for Natural Language Processing".
3. Natural Language Processing with Python, Steven Bird, Ewan Klein, and Edward Loper

**Web References:**

1. https://www.youtube.com/watch?v=dIUTsFT2MeQ

Mapping with Programme Outcomes:

| **Mapping with Programmers outcomes*** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | M | S | S | L | S | M | L | M | L | L |
| CO2 | S | M | S | S | S | M | M | L | M | L |
| CO3 | S | S | L | M | S | S | L | M | L | M |
| CO4 | M | L | M | M | M | L | M | L | M | S |
| CO5 | S | S | M | S | L | M | M | L | M | L |

S-Strong M-Medium L-Low

| Title of the Course/ Paper | Practical - 4: Digital Image Processing Lab (Elective II based Lab) | | |
|---|---|---|---|
| Core – 9C | I Year - II Semester | Credit: 2 | |

**Objectives:**

- To use Java or Python or Scilab for reading and writing images.
- To understand programming tools for image processing
- To manipulate images.
- To analyse image statistics
- To apply image processing algorithms

**Outcomes:**

- Use image processing tools
- Perform image manipulation operations
- Perform image enhancement techniques
- Perform edge detection operations
- Possess ability to perform object recognition methods

1) Basic Manipulations
    a) Reading
    b) Writing
    c) Quantisation
    d) Subsampling
2) Basic intensity transformations
3) Histogram processing
4) Filtering in spatial domain Low pass and High pass filters
5) Frequency domain image enhancement 2D FFT
6) Color image enhancement - spatial sharpening
7) Convert a color image into grayscale image

**Recommended Texts:**


1. Rohit M. Thanki , Ashish M. Kothari, Digital Image Processing using SCILAB-Springer ;2018
2. Sandipan Dey; Image Processing Masterclass with Python; BPB Publications;2021


**Reference Books:**


1. Hands-On Image Processing with Python: Expert techniques for advanced image analysis and effective interpretation of image data by Sandipan Dey, bpb


**Web References:**

1. https://www.youtube.com/watch?v=oXlwWbU8l2o

Mapping with Programme Outcomes:

| **Mapping with Programmers outcomes*** | | | | | | | | | | |
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| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | M | S | S | L | S | M | L | M | L | L |
| CO2 | S | M | S | S | S | M | M | L | M | L |
| CO3 | S | S | L | M | S | S | L | M | L | M |
| CO4 | M | L | M | M | M | L | M | L | M | S |
| CO5 | S | S | M | S | L | M | M | L | M | L |

S-Strong M-Medium L-Low

| Title of the Course/ Paper | Principles of Compiler Design | | |
|---|---|---|---|
| Extra Disciplinary | I Year - II Semester | Credit: 3 | |

**Objectives:**

- To learn the various phases of compiler.
- To learn the various parsing techniques.
- To understand intermediate code generation and run-time environment.
- To learn to implement the front-end of the compiler.
- To learn to implement code generators.

**Outcomes:**

- Understand the different phases of the compiler.
- Design a lexical analyzer for a sample language.
- Apply different parsing algorithms to develop the parsers for a given grammar.
- Design and implement a scanner and a parser using LEX and YACC tools
- Learn to implement code optimization techniques and a simple code generator.

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UNIT I: INTRODUCTION TO COMPILERS: Structure of a compiler – Lexical Analysis – Role of Lexical Analyzer – Input Buffering – Specification of Tokens – Recognition of Tokens – Lex – Finite Automata – Regular Expressions to Automata – Minimizing DFA.
UNIT II: SYNTAX ANALYSIS: Role of Parser – Grammars – Error Handling – Context-free grammars – Writing a grammar – Top Down Parsing - General Strategies Recursive Descent Parser Predictive Parser-LL(1) Parser-Shift Reduce Parser-LR Parser- LR (0)Item Construction of SLR Parsing Table - Introduction to LALR Parser - Error Handling and Recovery in Syntax Analyzer-YACC.
UNIT III: INTERMEDIATE CODE GENERATION: Syntax Directed Definitions, Evaluation Orders for Syntax Directed Definitions, Intermediate Languages: Syntax Tree, Three Address Code, Types and Declarations, Translation of Expressions, Type Checking.
UNIT IV: RUN-TIME ENVIRONMENT AND CODE GENERATION: Storage Organization, Stack Allocation Space, Access to Non-local Data on the Stack, Heap Management - Issues in Code Generation - Design of a simple Code Generator.
UNIT V: CODE OPTIMIZATION: Principal Sources of Optimization – Peep-hole optimization - DAG- Optimization of Basic Blocks- Global Data Flow Analysis - Efficient Data Flow Algorithm.

**Recommended Texts:**

1. Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, Compilers: Principles, Techniques and Tools; Pearson Education; Second Edition; 2013

**Reference Books:**

1. Randy Allen, Ken Kennedy, Optimizing Compilers for Modern Architectures: A Dependence based Approach, Morgan Kaufmann Publishers, 2002.
2. Steven S. Muchnick, Advanced Compiler Design and Implementation, Morgan Kaufmann Publishers - Elsevier Science, India, Indian Reprint 2003.
3. Keith D Cooper and Linda Torczon, Engineering a Compiler, Morgan Kaufmann Publishers Elsevier Science, 2004.

4. V. Raghavan, Principles of Compiler Design, Tata McGraw Hill Education Publishers, 2010.
5. Allen I. Holub, Compiler Design in C, Prentice-Hall Software Series, 1993.

**Web References:**

1. https://www.youtube.com/watch?v=k4QXWFZZq1E&list=PLENQMW_c1dimxHUu6KjuBC2rOlAaoLozF

Mapping with Programme Outcomes:

| **Mapping with Programmers outcomes*** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | M | S | S | L | S | M | L | M | L | L |
| CO2 | S | M | S | S | S | M | M | L | M | L |
| CO3 | S | S | L | M | S | S | L | M | L | M |
| CO4 | M | L | S | M | M | L | S | L | M | S |
| CO5 | S | S | M | S | L | M | M | L | M | L |

S-Strong M-Medium L-Low

| Title of the Course/ Paper | Cloud Computing | | |
|---|---|---|---|
| Elective -1 | I Year - II Semester | Credit: 3 | |

**Objectives:**

- To introduce the cloud computing concepts and map reduce programming model.
- To provide skills and knowledge about operations and management in cloud technologies so as to implement large scale systems.
- To provide skills to design suitable cloud infrastructure that meets the business services and customer needs.
- To provide Knowledge of different CPU, memory and I/O virtualization techniques that serve in offering software, computation and storage services on the cloud; Software Defined Networks (SDN) and Software Defined Storage (SDS); cloud storage technologies and relevant distributed file systems, NoSQL databases and object storage;
- To introduce the variety of programming models and develop working experience in several of them.

**Outcomes:**

- Understand the evolution, principles, and benefits of Cloud Computing in order to assess existing cloud infrastructures to choose an appropriate architecture that meets business needs.
- Decide a suitable model to capture the business needs by interpreting different service delivery and deployment models.
- Understand virtualization foundations to cater the needs of elasticity, portability and resilience by cloud service providers.
- Infer architectural style, work flow of real-world applications and to implement the cloud applications using map reduce programming models.
- Compare operation and economic models of various trending cloud platforms prevailing in IT industry.

Unit I: Foundations of cloud: Inception and need for cloud computing: Motivations from distributed computing predecessors - Evolution - Characteristics - Business Benefits – Challenges in cloud computing - Exploring the Cloud Computing Stack - Fundamental Cloud Architectures – Advanced Cloud Architectures - Specialized Cloud Architectures

Unit II: Service Delivery and Deployment Models: Service Models (XaaS): Infrastructure as a Service (IaaS) - Platform as a Service (PaaS) - Software as a Service(SaaS) -

Deployment Models: Types of cloud - Public cloud - Private cloud - Hybrid cloud – Service level agreements - Types of SLA – Lifecycle of SLA- SLA Management

Unit III: Cloud Resource Virtualization: Virtualization as Foundation of Cloud – Understanding Hypervisors – Understanding Machine Image and Instances - Managing Instances – Virtual Machine Provisioning and Service Migrations Cloud Computing Applications and Paradigms: Existing Cloud Applications and Opportunities for New

Applications - Architectural Styles for Cloud Applications - Workflows: Coordination of Multiple Activities - Coordination Based on a State Machine Model: The ZooKeeper - The MapReduce Programming Model - A Case Study: The Grep The Web Application

Unit IV: Resource Management and Scheduling in Cloud: Policies and Mechanisms for Resource Management – Stability of a Two-Level Resource Allocation Architecture-Feedback Control Based on Dynamic Thresholds - Coordination of Specialized Autonomic Performance Managers - A Utility-Based Model for Cloud-Based Web Services - Resource Bundling: Combinatorial Auctions for Cloud Resources – Scheduling Algorithms for Computing Clouds - Resource Management and Dynamic Application Scaling

Unit V: Cloud Platforms and Application Development: Comparing Amazon web services, Google AppEngine, Microsoft Azure from the perspective of architecture (Compute, Storage Communication) services and cost models. Cloud application development using third party APIs, Working with EC2 API – Google App Engine API - Facebook API, Twitter API. Advances is Cloud: Media Clouds - Security Clouds - Computing Clouds - Mobile Clouds – Federated Clouds – Hybrid Clouds

**Recommended Texts:**


1. Rajkumar Buyya, James Broberg, Andrzej, M. Goscinski, Cloud Computing: Principles and Paradigms, Wiley, 1st Edition, 2013.
2. Sosinsk, Barrie, Cloud Computing Bible, John Wiley & Sons, 1st Edition, 2011.


**Reference Books:**


1. Marinescu, Dan C. Cloud Computing: Theory and Practice. Morgan Kaufmann, 2017.
2. Toby Velte, Anthony Velte, Robert Elsenpeter, Cloud Computing: A Practical Approach, Mc Graw Hill Education, 1st Edition, 2017.
3. Buyya, Rajkumar, Christian Vecchiola, and S. Thamarai Selvi. Mastering Cloud Computing: Foundations and Applications Programming, Tata Mcgraw Hill, 1st Edition, 2017.


**Web References:**

1. https://www.youtube.com/watch?v=-8O32k26RWA

Mapping with Programme Outcomes:

| **Mapping with Programmers outcomes*** | | | | | | | | | | |
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| CO2 | S | M | S | M | S | L | M | L | M | L |
| CO3 | S | S | L | M | S | S | L | M | L | M |
| CO4 | M | L | S | M | M | L | S | L | M | S |
| CO5 | S | S | M | S | L | M | L | M | M | L |

S-Strong M-Medium L-Low

| Title of the Course/ Paper | Internet of things | | |
|---|---|---|---|
| Elective -1 | I Year - II Semester | Credit: 3 | |

**Objectives:**

- To understand Smart Objects and IoT Architectures
- To learn about various IOT-related protocols
- To build simple IoT Systems using Arduino and Raspberry Pi.
- To understand data analytics and cloud in the context of IoT
- To develop IoT infrastructure for popular applications

**Outcomes:**

- Explain the concept of IoT.
- Analyze various protocols for IoT.
- Design a PoC of an IoT system using Raspberry Pi/Arduino
- Apply data analytics and use cloud offerings related to IoT.
- Analyze applications of IoT in real time scenario

Unit - I Introduction: Internet Layers - Protocols - Packets - Services - Performance parameters – Peer to peer networks - Sensor networks - Multimedia - IOT Definitions and Functional Requirements – Motivation – Architecture - Web 3.0 View of IoT– Ubiquitous IoT Applications – Four Pillars of IoT – DNA of IoT - The Toolkit Approach for End-user Participation in the Internet of Things. Middleware for IoT: Overview – Communication middleware for IoT –IoT Information Security.

Unit - II IoT protocols: Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and

RFID Protocols – Issues with IoT Standardization – Unified Data Standards – Protocols – IEEE 802.15.4 – BACNet Protocol – point-to-point protocols - Ethernet protocols -

cellular Internet access protocol - Machine-to-machine protocol - Modbus – KNX – Zigbee Architecture – Network layer – APS layer – Security.

Unit - III Web of Things: Web of Things versus Internet of Things – Two Pillars of the Web – Architecture Standardization for WoT– Platform Middleware for WoT – Unified Multitier WoT Architecture – WoT Portals and Business Intelligence. Cloud of Things: Grid/SOA and Cloud Computing – Cloud Middleware – Cloud Standards – Cloud Providers and Systems – Mobile Cloud Computing – The Cloud of Things Architecture.

Unit - IV Integrating IOT: Integrated Billing Solutions in the Internet of Things Business Models for the Internet of Things - Network Dynamics: Population Models – Information Cascades - Network Effects - Network Dynamics: Structural Models - Cascading Behavior in Networks - The Small World Phenomenon.

Unit - V Applications: The Role of the Internet of Things for Increased Autonomy and Agility in Collaborative Production Environments - Resource Management in the Internet of Things: Clustering, Synchronisation and Software Agents. Applications - Smart Grid – Electrical Vehicle Charging - Case studies: Sensor body-area-network and Control of a smart home.

**Recommended Texts:**

1. Honbo Zhou;The Internet of Things in the Cloud:A Middleware Perspective-CRC Press 2012.
2. Architecting the Internet of Things - Dieter Uckelmann; Mark Harrison; Florian Michahelles- (Eds.) – Springer – 2011

**Reference Books:**

1. David Easley and Jon Kleinberg; Networks, Crowds, and Markets: Reasoning About a Highly Connected World ; Cambridge University Press - 2010.
2. Olivier Hersent, Omar Elloumi and David Boswarthick ; The Internet of Things: Applications to the Smart Grid and Building Automation ; Wiley 2012
3. Olivier Hersent, David Boswarthick, Omar Elloumi , "The Internet of Things – Key applications and Protocols", Wiley, 2012

**Web References:**

1. https://www.youtube.com/watch?v=b7GC4Zr74M0

Mapping with Programme Outcomes:

| **Mapping with Programmers outcomes*** | | | | | | | | | | |
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| CO2 | S | M | S | S | M | L | M | L | M | S |
| CO3 | S | S | L | M | S | S | L | M | L | M |
| CO4 | M | L | S | M | M | L | S | L | M | S |
| CO5 | S | S | M | S | L | M | L | M | M | L |

S-Strong M-Medium L-Low

| Title of the Course/ Paper | Data Analytics | | |
|---|---|---|---|
| Elective -1 | I Year - II Semester | Credit: 3 | |

**Objectives:**

- To gives an overview of Big Data, i.e. storage, retrieval and processing of big data.
- To focus on the "technologies", i.e., the tools/algorithms that are available for storage, processing of Big Data.
- To help a student to perform a variety of "analytics" on different data sets and to arrive at positive conclusions.
- To introduce the tools required to manage and analyze big data like Hadoop,NoSql MapReduce.
- To teach the fundamental techniques and principles in achieving big data analytics with scalability and streaming capability

**Outcomes:**

- Understand Big Data and its analytics in the real world
- Analyze the Big Data framework like Hadoop and NOSQL to efficiently store and process Big Data to generate analytics
- Design of Algorithms to solve Data Intensive Problems using Map Reduce Paradigm
- Design and Implementation of Big Data Analytics using pig and spark to solve data intensive problems and to generate analytics
- To have skills that will help them to solve complex real-world problems in for decision support.

UNIT – I: ESSENTIALS OF BIG DATA AND ANALYTICS: Data, Characteristics of data and Types of digital data, Sources of data, Working with unstructured data, Evolution and Definition of big data, Characteristics and Need of big data, Challenges of big data; 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 –II: HADOOP: Introducing Hadoop, Need of Hadoop, limitations of RDBMS, RDBMS versus Hadoop, Distributed computing challenges, History of Hadoop, Hadoop overview, Use case of Hadoop, Hadoop distributors, HDFS (Hadoop Distributed File System) , Processing data with Hadoop, Managing resources and applications with Hadoop YARN (Yet another Resource Negotiator), Interacting with Hadoop Ecosystem.

UNIT – III: MAPREDUCE PROGRAMMING: Introduction, Mapper, Reducer, Combiner, Partitioner, Searching, Sorting, Compression, Real time applications using MapReduce, Data serialization and Working with common serialization formats, Big data serialization formats.

UNIT – IV: HIVE: Introduction to Hive, Hive architecture, Hive data types, Hive file format, Hive Query Language (HQL), User-Defined Function (UDF) in Hive;

UNIT – V: PIG: The anatomy of Pig , Pig on Hadoop, Pig Philosophy, Use case for Pig; ETL Processing , Pig Latin overview , Data types in Pig , Running Pig , Execution modes of Pig, HDFS commands, Relational operators, Piggy Bank , Word count example using Pig.

**Recommended Texts:**


1. Seema Acharya, Subhashini Chellappan, "Big Data Analytics", 2nd Edition, Wiley, 2019.


**Reference Books:**


1. Boris Lublinsky, Kevin T. Smith, Alexey Yakubovich, "Professional Hadoop Solutions",1st Edition, Wrox, 2013.
2. Chris Eaton, Dirk Deroos et. al., "Understanding Big data", Indian Edition, McGraw Hill, 2015.
3. Tom White, "HADOOP: The definitive Guide", 3rd Edition, O Reilly, 2012.
4. Vignesh Prajapati, "Big Data Analytics with R and Hadoop", 1st Edition, Packet Publishing Limited, 2013.


**Web References:**

1. https://www.youtube.com/watch?v=xvEKQefqQ7A

Mapping with Programme Outcomes:

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| CO3 | S | S | L | M | S | S | L | M | L | M |
| CO4 | M | L | S | M | M | L | S | L | M | S |
| CO5 | S | S | M | S | L | M | L | M | M | L |

S-Strong M-Medium L-Low

| Title of the Course/ Paper | Full Stack Web Development | | |
|---|---|---|---|
| Elective -2 | I Year - II Semester | Credit: 3 | |

**Objectives:**

- To provide knowledge and abilities to develop web sites for the internet
- To provide basic design principles to present ideas, information, products, and services on websites
- To induce basic programming principles to the construction of websites
- To make effectively manage website projects using available resources
- To inculcate full front end website architecture Knowledge

**Outcomes:**

- Design user interactions on web pages
- Develop back end website applications
- Create servers and databases for functionality
- Develop adaptive content for multiple devices (cell phone, tablets, etc.) Ensure cross-platform optimization for mobile phones
- Design and develop Application Programming Interfaces (APIs)

Unit I: Introduction to Dynamic Web Content-Three-tier architecture-architecture for client-server applications-Introduction to HTML5-Structural Elements-Paving the Way for Web Applications:HTML5 forms-The HTML5 Canvas-Audio and Video

Unit II: Introduction to CSS-Advanced CSS with CSS3-Accessing CSS from JavaScript-Exploring JavaScript-Expressions and Control Flow in JavaScript-JavaScript Functions, Objects, and Arrays.

Unit III: Introduction to PHP. -Expressions and Control Flow in PHP. -PHP Functions and Objects-PHP Arrays-Cookies, Sessions, and Authentication-Accessing MySQL Using PHP

Unit IV: Introduction to AngularJS, -AngularJS - Overview- Environment Setup- MVC Architecture- Directives- Expressions- Controllers – Filters - Tables

Unit V: HTML DOM – Modules – Forms – Includes – AJAX – Views – Scopes – Services -Dependency Injection - Custom Directives - Fetching Data From a PHP Server Running MySQL

**Recommended Texts:**

1. Robin Nixon; Learning PHP, MySQL, JavaScript, CSS & HTML5; O'Reilly; Fourth edition;2015
2. Ken Williamson; Learning AngularJS; O'Reilly Media;2015

**Reference Books:**

1. Full Stack AngularJS for Java Developers: Build a Full-Featured Web Application from Scratch Using AngularJS with Spring RESTful, Ravi Kant Soni, Apress; 1st ed. edition (4 December 2017)

**Web References:**

1. https://www.alvinisd.net/cms/lib03/TX01001897/Centricity/Domain/1077/beginning_html5_and_css3.pdf
2. https://www.tutorialspoint.com/angularjs/index.htm
3. https://www.youtube.com/watch?v=9b9pLgaSQuI

Mapping with Programme Outcomes:

| **Mapping with Programmers outcomes*** | | | | | | | | | | |
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| CO2 | S | M | M | L | M | L | M | L | M | S |
| CO3 | S | S | L | M | S | S | L | M | L | M |
| CO4 | M | L | S | M | M | L | S | L | M | S |
| CO5 | S | S | M | S | L | M | L | M | M | L |

S-Strong M-Medium L-Low

| Title of the Course/ Paper | Natural Language Processing | | |
|---|---|---|---|
| Elective -2 | I Year - II Semester | Credit: 3 | |

**Objectives:**

- To learn the fundamentals of natural language processing
- To understand the use of CFG and PCFG in NLP
- To understand the role of semantics of sentences and pragmatics
- To apply the NLP techniques to IR applications

**Outcomes:**

- To tag a given text with basic Language features
- To design an innovative application using NLP components
- To implement a rule-based system to tackle morphology/syntax of a language
- To design a tag set to be used for statistical processing for real-time applications
- To compare and contrast the use of different statistical approaches for different types of NLP applications.

UNIT I INTRODUCTION: Origins and challenges of NLP – Language Modeling: Grammar-based LM, Statistical LM - Regular Expressions, Finite-State Automata – English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance

UNIT II WORD LEVEL ANALYSIS: Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part-of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models.

UNIT III SYNTACTIC ANALYSIS: Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing – Shallow parsing – Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs - Feature structures, Unification of feature structures.

UNIT IV SEMANTICS AND PRAGMATICS: Requirements for representation, First-Order Logic, Description Logics – Syntax-Driven Semantic analysis, Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, selection restrictions – Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity using Thesaurus and Distributional methods.

UNIT V DISCOURSE ANALYSIS AND LEXICAL RESOURCES: Discourse segmentation, Coherence – Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm – Coreference Resolution – Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brill's Tagger, WordNet, PropBank, FrameNet, Brown Corpus, British National Corpus (BNC).

**Recommended Texts:**

1. Daniel Jurafsky, James H. Martin;Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech; Pearson Publication; 2014.
2. Steven Bird, Ewan Klein and Edward Loper, ―Natural Language Processing with Python , First Edition, OReilly Media, 2009.

**Reference Books:**

1. Breck Baldwin, ―Language Processing with Java and LingPipe Cookbook, Atlantic Publisher, 2015.
2. Richard M Reese, ―Natural Language Processing with Java , O_Reilly Media, 2015.
3. Nitin Indurkhya and Fred J. Damerau, ―Handbook of Natural Language Processing, Second Edition, Chapman and Hall/CRC Press, 2010.
4. Tanveer Siddiqui, U.S. Tiwary, ―Natural Language Processing and Information Retrieval, Oxford University Press, 2008.

**Web References:**

1. https://www.youtube.com/watch?v=oWsMIW-5xUc&list=PLLssT5z_DsK8HbD2sPcUIDfQ7zmBarMYv

Mapping with Programme Outcomes:

| **Mapping with Programmers outcomes*** | | | | | | | | | | |
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| CO2 | S | M | M | L | M | L | M | L | M | S |
| CO3 | S | S | L | M | S | S | L | M | L | M |
| CO4 | M | L | S | M | M | L | S | L | M | S |
| CO5 | S | S | M | S | L | M | L | M | M | L |

S-Strong M-Medium L-Low

| Title of the Course/ Paper | Digital Image Processing | | |
|---|---|---|---|
| Elective -2 | I Year - II Semester | Credit: 3 | |

**Objectives:**

- To become familiar with digital image fundamentals
- To get exposed to simple image enhancement techniques in Spatial and Frequency domain.
- To learn concepts of degradation function and restoration techniques.
- To study the image segmentation and representation techniques.
- To become familiar with image compression and recognition methods

**Outcomes:**

- Know and understand the basics and fundamentals of digital image processing, such as digitization, sampling, quantization, and 2D-transforms.
- Operate on images using the techniques of smoothing, sharpening and enhancement.
- Perform the restoration concepts and filtering techniques.
- Demonstrate the segmentation, features extraction, compression and recognition methods for color models.
- Compress images and use tools for image recognition.

UNIT I DIGITAL IMAGE FUNDAMENTALS: Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels - Color image fundamentals - RGB, HSI models, Two-dimensional mathematical preliminaries, 2D transforms - DFT, DCT.

UNIT II IMAGE ENHANCEMENT: Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering– Smoothing and Sharpening Spatial Filtering, Frequency Domain: Introduction to Fourier Transform– Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters, Homomorphic filtering, Color image enhancement.

UNIT III IMAGE RESTORATION: Image Restoration - degradation model, Properties, Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering

UNIT IV IMAGE SEGMENTATION: Edge detection, Edge linking via Hough transform – Thresholding - Region based segmentation – Region growing – Region splitting and merging – Morphological processing- erosion and dilation, Segmentation by morphological watersheds – basic concepts – Dam construction – Watershed segmentation algorithm.

UNIT V IMAGE COMPRESSION AND RECOGNITION: Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, JPEG standard, MPEG. Boundary representation, Boundary description, Fourier Descriptor, Regional Descriptors – Topological feature, Texture - Patterns and Pattern classes - Recognition based on matching.

**Recommended Texts:**

1. Rafael C. Gonzalez, Richard E. Woods; Digital Image Processing; Pearson, Fourth Edition;2018.
2. Anil K. Jain; Fundamentals of Digital Image Processing; Pearson;2015.

**Reference Books:**

1. Kenneth R. Castleman, Digital Image Processing ‘, Pearson, 2006.
2. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins,; Digital Image Processing using MATLAB ; Pearson Education, Inc., 2011.
3. D E. Dudgeon and RM. Mersereau; Multidimensional Digital Signal Processing; Prentice Hall; 1990.
4. William K. Pratt; Digital Image Processing ; John Wiley; 2002
5. Milan Sonka et al; Image processing, analysis and machine vision; Brookes/Cole, Vikas Publishing House; 2nd edition; 1999.

**Web References:**

1. https://www.youtube.com/watch?v=DSGHkvQBMbs&list=PLuv3GM6-gsE08DuaC6pFUvFaDZ7EnWGX8

Mapping with Programme Outcomes:

| **Mapping with Programmers outcomes*** | | | | | | | | | | |
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| CO2 | S | M | M | L | M | L | M | L | M | S |
| CO3 | S | S | L | M | S | S | L | M | L | M |
| CO4 | M | L | S | M | M | L | S | L | M | S |
| CO5 | S | S | M | S | L | M | L | M | M | L |

S-Strong M-Medium L-Low

| Title of the Course/ Paper | Parallel and Distributed Computing | | |
|---|---|---|---|
| Core - 10 | II Year - III Semester | Credit: 4 | |

**Objectives:**

- To analyze the current popular distributed systems such as peer-to-peer (P2P) systems will also be analyzed.
- To learn and apply knowledge of parallel and distributed computing techniques and methodologies
- To learn the architecture and parallel programming in graphics processing units (GPUs).
- To understand the memory hierarchy and cost-performance tradeoffs.
- To gain experience in the design, development, and performance analysis of parallel and distributed applications

**Outcomes:**

- Develop and apply knowledge of parallel and distributed computing techniques and methodologies.
- Apply design, development, and performance analysis of parallel and distributed applications.
- Use the application of fundamental Computer Science methods and algorithms in the development of parallel applications.
- Explain the design, testing, and performance analysis of a software system, and to be able to communicate that design to others.
- Understand the requirements for programming parallel systems and how they can be used to facilitate the programming of concurrent systems.

UNIT-I Introduction to Parallel Computing: The Idea of Parallelism, Power and potential of parallelism, examining sequential and parallel programs, Scope and issues of parallel and distributed computing, Goals of parallelism, Parallelism and concurrency using multiple instruction streams.

UNIT-II Parallel Architecture: Pipeline architecture, Array processor, Multi-processor architecture, Systolic architecture, Dataflow architecture, Architectural classification schemes, Memory access classification, Memory Issues: Shared vs. distributed, Symmetric multiprocessing (SMP), SIMD, Vector processing, GPU co-processing, Flynn's Taxonomy, Instruction Level support for parallel programming, Multiprocessor caches and Cache Coherence, Non-Uniform Memory Access (NUMA).

UNIT-III Parallel Algorithm Design Principles and Programming: Need for communication and coordination/synchronization, Scheduling and contention, Independence and partitioning, Task- Based Decomposition, Data Parallel Decomposition, Characteristics of task and interaction, Load balancing, Data Management, parallel algorithm models, Sources of overhead in parallel programs, Performance metrics for parallel algorithm implementations, Parallel algorithmic patterns like divide and conquer, Map and Reduce, Specific algorithms like parallel Merge Sort, Parallel graph Algorithms.

UNIT-IV : Architectures Of Distributed Systems - Architectural Styles - System

Architectures - Architectures Versus Middleware - Self-Management In Distributed Systems - Processes - Threads - Virtualization - Clients -Servers - Communication - Remote Procedure Call - Message-Oriented Communication - Stream-Oriented Communication - Multicast Communication

UNIT-V : Distributed Object Based Systems - Architecture - Processes - Communication - Naming - Synchronization - Fault Tolerance - Security - Distributed System Examples - File Systems And Web Based Systems

**Recommended Texts:**

1. Ananth Grama, Anshul Gupta, and George Karypis, Vipin Kumar; Introduction to Parallel Computing; Addition Wesley; 2nd Edition;2003
2. A.S. Tanenbaum; Distributed Operating Systems; Create Space Independent Publishing Platform; 3rd edition;2017

**Reference Books:**

1. Introduction To Parallel Programming, Steven Brawer, Academic Press
2. Introduction To Parallel Processing, M. Sasikumar, Dinesh Shikhare and P. Ravi Prakash,PHI
3. Randy Chow, T. Johnson, Distributed Operating Systems and Algorithms, Addison Wesley
4. Ian Foster: Designing and Building Parallel Programs – Concepts and tools for Parallel Software Engineering, Pearson Publisher, 1st Edition, 2019.
5. Parallel Programming in C with MPI and OpenMP Michael J. Quinn, McGrawHill Higher Education

**Web References:**

1. https://www.youtube.com/watch?v=qbQCQ0U6H0o&list=PLbMVogVj5nJQRvzENlvMKA9q70ScSRZBQ

Mapping with Programme Outcomes:

| **Mapping with Programmers outcomes*** | | | | | | | | | | |
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| CO2 | S | S | M | L | M | L | M | L | M | S |
| CO3 | S | S | L | M | S | S | L | M | L | M |
| CO4 | M | L | S | M | M | L | S | L | M | S |
| CO5 | S | S | M | S | L | M | L | M | M | L |

S-Strong M-Medium L-Low

| Title of the Course/ Paper | Deep Learning and Neural Networks | | |
|---|---|---|---|
| Core - 11 | II Year - III Semester | Credit: 4 | |

**Objectives:**

- To understand the theoretical foundations, algorithms and methodologies of Neural Network
- To design and develop an application using specific deep learning models
- To provide practical knowledge in handling and analyzing real world applications.
- To recognize the characteristics of deep learning models that are useful to solve real-world problems.
- To introduce Various paradigms of earning problems, Perspectives and Issues in deep learning framework, review of fundamental learning techniques.

**Outcomes:**

- Understand different methodologies to create applications using deep nets.
- Identify and apply appropriate deep learning algorithms for analyzing the data for a variety of problems.
- Implement different deep learning algorithms
- Design the test procedures to assess the efficacy of the developed model.
- Combine several models in to gain better results

Unit I: Basics of artificial neural networks (ANN): Artificial neurons, Computational models of neurons, Structure of neural networks, Functional units of ANN for pattern recognition tasks

Feedforward neural networks: Pattern classification using perceptron, Multilayer feedforward neural networks (MLFFNNs), Backpropagation learning, Empirical risk minimization, Regularization, Autoencoders

Unit II: Deep neural networks (DNNs): Difficulty of training DNNs, Greedy layer wise training, Optimization for training DNNs, Newer optimization methods for neural networks (AdaGrad, RMSProp, Adam), Second order methods for training, Regularization methods (dropout, drop connect, batch normalization)

Unit III: Convolution neural networks (CNNs): Introduction to CNNs – convolution, pooling, Deep CNNs, Different deep CNN architectures – LeNet, AlexNet, VGG, PlacesNet, training a CNNs: weights initialization, batch normalization, hyperparameter optimization, Understanding and visualizing CNNs.

Unit IV: Recurrent neural networks (RNNs): Sequence modeling using RNNs, Backpropagation through time, Long Short Term Memory (LSTM), Bidirectional LSTMs, Bidirectional RNNs, Gated RNN Architecture - Generative models: Restricted Boltzmann Machines (RBMs), Stacking RBMs, Belief nets.

Unit V: Learning sigmoid belief nets, Deep belief nets Under complete - Auto encoder, Regularized Auto encoder, stochastic Encoders and Decoders, Contractive Encoders.

Applications: Applications in vision, speech and natural language processing

**Recommended Texts:**

1. S. Haykin, Neural Networks and Learning Machines , Prentice Hall of India, 2016
2. Ian Goodfellow, Yoshua Bengio and Aaron Courville, " Deep Learning", MIT Press, 2017

**Reference Books:**

1. Satish Kumar, Neural Networks - A ClassRoom
2. B. Yegnanarayana, Artificial Neural Networks, Prentice- Hall of India, 1999
3. Giancarlo Zaccone, Md. RezaulKarim, Ahmed Menshawy "Deep Learning with TensorFlow: Explore neural networks with Python", Packt Publisher, 2017.
4. Antonio Gulli, Sujit Pal "Deep Learning with Keras", Packt Publishers, 2017.
5. Francois Chollet "Deep Learning with Python", Manning Publications, 2017.

**Web References:**

1. https://www.youtube.com/watch?v=aPfkYu_qiF4&list=PLEAYkSg4uSQ1r-2XrJ_GBzzS6I-f8yfRU

Mapping with Programme Outcomes:

| **Mapping with Programmers outcomes*** | | | | | | | | | | |
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| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | M | S | S | L | S | M | L | M | L | L |
| CO2 | S | S | M | L | M | L | M | L | M | S |
| CO3 | S | S | L | M | S | S | L | M | L | M |
| CO4 | M | L | S | M | M | L | S | L | M | S |
| CO5 | S | S | L | S | L | M | L | M | M | L |

S-Strong M-Medium L-Low

| Title of the Course/ Paper | Cryptography | | |
|---|---|---|---|
| Core - 12 | II Year - III Semester | Credit: 4 | |

**Objectives:**

- To learn the emerging concepts of cryptography and algorithms
- To defend the security attacks on information systems using secure algorithms and Authentication process
- To categorize and analyze the key concepts in network and wireless security
- To Infer the need of security to introduce strong cryptosystems.

**Outcomes:**

- Analyze the cryptographic algorithms for information security.
- Identify the authentication schemes for membership authorization.
- Identify computer and network security threats, classify the threats and develop a security model for detect and mitigate the attacks.
- Identify the requirements for secure communication and challenges related to the secure web services
- Ability to identify the need of ethical and professional practices, risk management Using emerging security solutions.

Unit I: Introduction and Symmetric Key Cryptographic Systems : Introduction to Cryptography, Types of Attacks, Symmetric Key Cryptography, Data Encryption Standard (DES), Differential and Linear cryptanalysis, Advanced Encryption Standard(AES), Modes of operation, Stream Ciphers: Feedback shift registers, Stream ciphers based on LFSRs.

Unit II: Asymmetric Key Cryptosystems: Applications of asymmetric Cryptosystems – RSA Rabin, Elgamal, Probabilistic Cryptosystems, Elliptic Curve Cryptography (ECC), Diffie-Hellman key exchange protocol, Chinese Remainder Theorem (CRT).

Unit III: Data Integrity and Authentication: Message Authentication Code (MAC), Hash function properties, General model for iterated hash functions -MD5, Secure Hash algorithms, HMAC, Attacks on hash functions.

Unit IV: Digital Signature algorithm, Public key infrastructure: X. 509 digital certificate, Kerberos, Zero-Knowledge Protocol.

Unit V: Advanced Cryptographic Techniques: Multiparty Computation and Secret Sharing, Introduction - Indistinguishability - Secret - Sharing Simulation - Based Security-Security against Active Corruption-BGW Protocol (Active, Honest Majority)- Homomorphic Encryption-Lattice Cryptography

**Recommended Texts:**


1. J. Katz and Y. Lindell, Introduction to Modern Cryptography. Chapman & Hall/CRC Press, 2014
2. W. Stallings, Cryptography and Network Security: Principles and Practice, 7th Ed. Pearson Publishers, 2017.

3. C. Paar and J Pelzl, Understanding Cryptography, Springer, 2010
4. Behrouz A. Forouzan, Cryptography and Network Security:6th Ed. McGraw-Hill,2017
5. Dan Boneh and Victor Shoup, A Graduate Course in Applied Cryptography, Jan 2020

**Reference Books:**

1. Kaufman, Perlman and Speciner. Network Security: Private Communication in a Public World., 2 nd edition,2002 , Pearson Publishers (ISBN No.:978-01-3-04601-96)
2. Alfred J. Menezes, Paul C. van Oorschot and Scott A. Vanstone,Handbook of Applied Cryptography,5th edition,2001,CRC Press,(ISBN No:0-8493-8523-7)
3. D. R. Stinson, Cryptography: Theory and Practice, 3 rd Ed. Boca Raton, FL: Chapman &Hall/CRC, 2005. (ISBN No.:978-1-58-488508-5)J. H. Silverman, A Friendly
4. Introduction to Number Theory, 4th Ed. Boston: Pearson, 2012. (ISBN No.:978-0-321- 81619-1)
5. Ronald Cramer, Ivan BjerreDamgård, JesperBuus Nielsen, "Secure MultipartyComputation and Secret Sharing", ISBN 9781107043053, Cambridge University Press, 2015
6. Philip N. Klein, "A Cryptography Primer-Secrets and Promises", ISBN 9781107603455, Cambridge University Press, 2014

**Web References:**

1. https://www.youtube.com/watch?v=iTVyKbDCJrA&list=PLgMDNELGJ1CbdGLyn7OrVAP-IKg-0q2U2

Mapping with Programme Outcomes:

| **Mapping with Programmers outcomes*** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | M | S | M | M | S | M | L | M | L | S |
| CO2 | S | S | M | L | M | L | M | L | M | S |
| CO3 | S | S | L | M | S | S | L | M | L | M |
| CO4 | M | L | S | M | M | L | S | L | M | S |
| CO5 | S | S | L | S | L | M | L | M | M | L |

S-Strong M-Medium L-Low

| Title of the Course/ Paper | Practical - 5: Deep learning Lab | | |
|---|---|---|---|
| Core - 13 | II Year - III Semester | Credit: 2 | |

**Objectives:**

- To provide the practical knowledge in handling and analysing real world applications.
- To recognize the characteristics of deep learning models that are useful to solve real-world problems.
- To introduce Various paradigms of earning problems, Perspectives and Issues in deep learning framework, review of fundamental learning techniques.

**Outcomes:**

- Understand different methodologies to create application using deep nets.
- Identify and apply appropriate deep learning algorithms for analyzing the data for variety of problems.
- Implement different deep learning algorithms
- Design the test procedures to assess the efficacy of the developed model.
- Combine several models in to gain better results

1. Write a program to generate XOR function using McCulloch-Pitts neuron and appropriate values for weights, bias and threshold.
2. Write a program for perceptron net for an AND function with bipolar inputs and targets.
3. Write a program to recognize the number from 0, 1, 2, 3, . . . , 9. A number is represented as a 5 × 3 matrix of 0 and 1. For any valid point it is taken as 1 and invalid point it is taken as 0. The net has to be trained to recognize all the numbers and when the test data is given. The file numbers. Mat has three components, as: input-data: The training data. Each column represents a number. output-data: A 10 × 10 matrix of desired outputs. test-data: Test data. Each column is a test vector.
4. Write a program (with a suitable example) to demonstrate how the hyperplane is changing in different iterations using the perceptron learning law with its decision regions. Give the output in graphical form.
5. Write a program to compress the data given in the data file alphabet. Mat using a multilayer feedforward neural network and back propagation. An alphabet is represented by a 9×7 matrix. Check the performance with different values of the learning rate parameter, and momentum factor. (Hint: The training input vector and the target output vectors are the same).

**Recommended Texts:**

1. Dr. S Lovelyn Rose, Dr. L Ashok Kumar, Dr. D Karthika Renuka;Deep Learning Using Python Wiley;Edition: 1, 2019

**Reference Books:**

1. Francois Chollet; Deep Learning with Python Paperback;Manning;2017

**Web References:**

1. https://www.youtube.com/watch?v=H-fzcFoBq44&list=PLkhxeo3AyR-xrggjA0DgWpbWZMTwBy3dV

Mapping with Programme Outcomes:

| **Mapping with Programmers outcomes*** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | M | S | M | S | S | M | L | M | L | S |
| CO2 | S | M | S | L | M | L | M | L | M | S |
| CO3 | S | S | L | M | S | S | L | M | L | M |
| CO4 | M | L | S | M | M | L | S | L | M | S |
| CO5 | S | M | M | S | L | M | L | M | S | L |

S-Strong M-Medium L-Low

| Title of the Course/ Paper | Project & Viva-Voce | | |
|---|---|---|---|
| Core- 14 | II Year & IV Semester | Credit: 20 | |

**Objectives:**

- To make the project an extended piece of individual work.
- To work on a topic that interests the student
- To have regular meetings with their supervisor and/or external project provider to discuss progress
- To produce dissertations that contain some element of original work.
- To encourage and reward individual inventiveness and application of effort

**Outcomes:**

- Construct a project from initial ideas;
- Plan, schedule, monitor and control their own work;
- Defend their ideas in discussions and presentations;
- Use libraries and other information resources;
- Apply tools and techniques from taught courses
- Communicate their findings through a written report.

Project: The project work is to be carried out either in a software industry or in an academic institution for the entire semester and the report of work done is to be submitted to the University.

Mapping with Programme Outcomes:

| **Mapping with Programmers outcomes*** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | M | S | M | S | S | M | L | M | L | S |
| CO2 | S | M | S | L | M | L | M | L | M | S |
| CO3 | S | S | L | M | S | S | L | M | L | M |
| CO4 | M | L | S | M | M | L | S | L | M | S |
| CO5 | S | S | M | S | L | M | L | M | S | L |

S-Strong M-Medium L-Low

| Title of the Course/ Paper | Cyber Security | | |
|---|---|---|---|
| Elective - 3 | II Year - III Semester | Credit: 3 | |

**Objectives:**

- To understand various types of cyber-attacks and cyber-crimes
- To learn threats and risks within context of the cyber security
- To have an overview of the cyber laws & concepts of cyber forensics
- To study the defensive techniques against these attacks
- To describe various legal responses to cybercrime

**Outcomes:**

- Analyze cyber-attacks, types of cybercrimes, cyber laws and also how to protect them self and ultimately the entire Internet community from such attacks.
- Interpret and forensically investigate security incidents
- Apply policies and procedures to manage Privacy issues
- Design and develop secure software modules
- Understand different forms of hacking techniques

**UNIT -I** Introduction to Cyber Security: Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., Comprehensive Cyber Security Policy.

**UNIT - II** Cyberspace and the Law & Cyber Forensics: Introduction, Cyber Security Regulations, Roles of International Law. The INDIAN Cyberspace, National Cyber Security Policy. Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics

**UNIT - III** Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Organizational security Policies and Measures in Mobile Computing Era, Laptops.

**UNIT- IV** Cyber Security: Organizational Implications: Introduction, cost of cybercrimes and IPR issues, web threats for organizations, security and privacy implications, social media marketing: security risks and perils for organizations, social computing and the associated challenges for organizations

**UNIT - V** Privacy Issues: Basic Data Privacy Concepts: Fundamental Concepts, Data Privacy Attacks, Datalinking and profiling, privacy policies and their specifications, privacy policy languages, privacy in different domains- medical, financial, etc Cybercrime: Case study on recent threats and attacks.

**Recommended Texts:**

1. Nina Godbole and Sunit Belpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley

**Reference Books:**

1. B.B. Gupta, D.P. Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives, CRC Press, ISBN 9780815371335,2018.
2. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson,CRC Press.
3. Introduction to Cyber Security, Chwan-Hwa(john) Wu,J. David Irwin, CRC Press T&F Group.

**Web References:**

1. https://www.youtube.com/watch?v=6wi5DI6du-4&list=PL_uaeekrhGzJlB8XQBxU3z_hDwT95xlk

Mapping with Programme Outcomes:

| **Mapping with Programmers outcomes*** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | M | S | M | S | S | M | L | M | L | S |
| CO2 | S | M | S | L | M | L | M | L | M | S |
| CO3 | S | S | L | M | S | S | L | M | L | M |
| CO4 | M | L | S | M | M | L | S | L | M | S |
| CO5 | S | S | M | S | L | M | L | M | S | L |

S-Strong M-Medium L-Low

| Title of the Course/ Paper | Advanced Computer Architecture | | |
|---|---|---|---|
| Elective - 3 | II Year - III Semester | Credit: 3 | |

**Objectives:**

- To introduce the students to the recent trends in the field of Computer Architecture and identify performance related parameters.
- To learn the different multiprocessor issues.
- To expose the different types of multicore architectures.
- To understand the design of the memory hierarchy.

**Outcomes:**

- Identify the limitations of Instruction-level parallelism (ILP).
- Discuss the issues related to multiprocessing and suggest solutions
- Point out the salient features of different multicore architectures and how they exploit parallelism.
- Discuss the various techniques used for optimizing the cache performance
- Design hierarchical memory system
- Point out how data level parallelism is exploited in architectures

UNIT I FUNDAMENTALS OF COMPUTER DESIGN AND ILP

Fundamentals of Computer Design – Measuring and Reporting Performance – Instruction Level Parallelism and its Exploitation – Concepts and Challenges –Exposing ILP - Advanced Branch Prediction - Dynamic Scheduling - Hardware-Based Speculation - Exploiting ILP - Instruction Delivery and Speculation - Limitations of ILP - Multithreading

UNIT II MEMORY HIERARCHY DESIGN

Introduction – Optimizations of Cache Performance – Memory Technology and Optimizations – Protection: Virtual Memory and Virtual Machines – Design of Memory Hierarchies – Case Studies.

UNIT III MULTIPROCESSOR ISSUES

Introduction- Centralized, Symmetric and Distributed Shared Memory Architectures – Cache Coherence Issues – Performance Issues – Synchronization – Models of Memory Consistency – Case Study-Interconnection Networks – Buses, Crossbar and Multi-stage Interconnection Networks

UNIT IV MULTICORE ARCHITECTURES

Homogeneous and Heterogeneous Multi-core Architectures – Intel Multicore Architectures – SUN CMP architecture – IBM Cell Architecture. Introduction to Warehouse-scale computers Architectures- Physical Infrastructure and Costs- Cloud Computing –Case Study- Google Warehouse-Scale Computer.

UNIT V VECTOR, SIMD AND GPU ARCHITECTURES

Introduction-Vector Architecture – SIMD Extensions for Multimedia – Graphics Processing Units – Case Studies – GPGPU Computing – Detecting and Enhancing Loop Level Parallelism-Case Studies.

**Recommended Texts:**

1. Darryl Gove ;Multicore Application Programming: For Windows, Linux, and Oracle Solaris, Pearson, 2011

**Reference Books:**

1. David B. Kirk, Wen-mei W. Hwu, ―Programming Massively Parallel Processors, Morgan Kauffman, 2010
2. David E. Culler, Jaswinder Pal Singh, ―Parallel computing architecture : A hardware/software approach , Morgan Kaufmann /Elsevier Publishers, 1999
3. John L. Hennessey and David A. Patterson, ―Computer Architecture – A Quantitative Approach, Morgan Kaufmann / Elsevier, 5th edition, 2012.
4. Kai Hwang and Zhi.Wei Xu, ―Scalable Parallel Computing, Tata McGraw Hill, NewDelhi, 2003

**Web References:**

1. https://www.youtube.com/watch?v=v7iefsovo9M&list=PLwdnzlV3ogoWJhBxBYu-K4l-q-nNHd24D

Mapping with Programme Outcomes:

| **Mapping with Programmers outcomes*** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | M | S | M | S | S | M | L | M | L | S |
| CO2 | S | M | S | L | M | L | M | L | M | S |
| CO3 | S | S | L | M | S | S | L | M | L | M |
| CO4 | M | L | S | M | M | L | S | L | M | S |
| CO5 | S | S | M | S | L | M | L | M | S | L |

S-Strong M-Medium L-Low

| Title of the Course/ Paper | Distributed Database Systems | | |
|---|---|---|---|
| Elective - 3 | II Year - III Semester | Credit: 3 | |

**Objectives:**

- To introduction students to Distributed DBMS and associated problems.
- To make students understand various algorithms and techniques for managing distributed database.
- To understand theoretical and practical aspects of distributed database systems.
- To study and identify various issues related to the development of distributed database system.
- To make students understand Transaction Management & Compare various approaches to concurrency control in Distributed database

**Outcomes:**

- Apply various fragmentation techniques given a problem
- Analyse and calculate the cost of enforcing semantic integrity control
- Use the steps of query processing
- Apply optimization techniques are applies to Distributed Database
- Apply effectively Query Optimization Algorithms

Unit-I: Introduction: Distributed Data Processing, Distributed Database Systems, Promises of DDBSs, Complicating factors, Problem areas Overview of RDBMS: Concepts, Integrity, Normalization - Distributed DBMS Architecture: Autonomy, Distribution, Heterogeneity DDBMS Architecture – Client/Server, Peer to peer, MDBS

Unit-II: Data Distribution Alternatives: Design Alternatives – localized data, distributed data Fragmentation – Vertical, Horizontal (primary & derived), hybrid, general guidelines, correctness rules Distribution transparency – location, fragmentation, replication Impact of distribution on user queries – No Global Data Dictionary (GDD), GDD containing location information Example on fragmentation

Unit-III: Semantic Data Control: View Management, Authentication – database authentication, OS authentication, Access Rights, Semantic Integrity Control – Centralized & Distributed , Cost of enforcing semantic integrity - : Query Processing: Query Processing Problem, Layers of Query Processing Query Processing in Centralized Systems – Parsing & Translation, Optimization, Code generation, Example Query Processing in Distributed Systems – Mapping global query to local, Optimization,

Unit-IV: Optimization of Distributed Queries: Query Optimization, Centralized Query Optimization, Join Ordering Distributed Query Optimization Algorithms - Distributed Transaction Management & Concurrency Control: Transaction concept, ACID property, Objectives of transaction management, Types of transactions, Objectives of Distributed Concurrency Control, Concurrency Control anomalies, Methods of concurrency control, Serializability and recoverability, Distributed Serializability, Enhanced lock based and

timestamp based protocols, Multiple granularity, Multi version schemes, Optimistic Concurrency Control techniques

Unit-V: Distributed Deadlock & Recovery: Deadlock concept, Deadlock in Centralized systems, Deadlock in Distributed Systems – Detection, Prevention, Avoidance, Wait-Die Algorithm, Wound-Wait algorithm Recovery in DBMS - Types of Failure, Methods to control failure, Different techniques of recoverability, Write- Ahead logging Protocol, Advanced recovery techniques- Shadow Paging, Fuzzy checkpoint, ARIES, RAID levels, Two Phase and Three Phase commit protocols

**Recommended Texts:**

1. Ozsu; Principles of Distributed Database Systems; Springer; 4th edition;2020

**Reference Books:**

1. Rahimi & Haug; Distributed Database Management Systems;Wiley;2010
2. Distributed Database Systems, Chanda Ray, Pearson Publication
3. Sachin Deshpande; Distributed Databases; Dreamtech;2014

**Web References:**

1. https://www.youtube.com/watch?v=dlBVWMdGhqw&list=PLUJ7JmcrTifBROWODSG8wgyl20XgBuE-N

Mapping with Programme Outcomes:

| **Mapping with Programmers outcomes*** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | M | S | M | S | S | M | L | M | L | S |
| CO2 | S | M | S | L | M | L | M | L | M | S |
| CO3 | S | S | L | M | S | S | L | M | L | M |
| CO4 | M | L | S | M | M | L | S | L | M | S |
| CO5 | S | S | M | S | L | M | L | M | S | L |

S-Strong M-Medium L-Low

| Title of the Course/ Paper | Human Computer Interaction | | |
|---|---|---|---|
| Elective - 4 | II Year - III Semester | Credit: 3 | |

**Objectives:**

- To learn the foundations of Human Computer Interaction.
- To become familiar with the design technologies for individuals and persons with disabilities.
- To be aware of mobile HCI.
- To learn the guidelines for user interface.
- To encourage to design certain tools for blind or differently abled people

**Outcomes:**

- Design effective dialog for HCI
- Design effective HCI for individuals and persons with disabilities.
- Assess the importance of user feedback.
- Explain the HCI implications for designing multimedia/ ecommerce/ e-learning Web sites.
- Develop a meaningful user interface.

**UNIT I** FOUNDATIONS OF HCI The Human: I/O channels – Memory – Reasoning and problem solving; The Computer: Devices – Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms. - Case Studies

**UNIT II** DESIGN & SOFTWARE PROCESS Interactive Design: Basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in software process: Software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules: principles, standards, guidelines, rules. Evaluation Techniques – Universal Design

**UNIT III** MODELS AND THEORIES HCI Models: Cognitive models: Socio-Organizational issues and stakeholder requirements – Communication and collaboration models-Hypertext, Multimedia and WWW.

**UNIT IV** MOBILE HCI Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools. - Case Studies

**UNIT V** WEB INTERFACE DESIGN Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow - Case Studies

**Recommended Texts:**

- Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale;Human Computer Interaction; Pearson Education; 3rd Edition; 2004
- Brian Fling;Mobile Design and Development;First Edition; O'Reilly Media Inc.;

2009

- Bill Scott and Theresa Neil;Designing Web Interfaces; First Edition; O'Reilly, 2009.

**Reference Books:**

- Designing the user interface. 3rd Edition Ben Shneidermann, Pearson Education Asia.
- Interaction Design Prece, Rogers, Sharps. Wiley Dreamtech.
- User Interface Design, Soren Lauesen , Pearson Education.
- Human –Computer Interaction, D. R. Olsen, Cengage Learning.
- Human –Computer Interaction, Smith - Atakan, Cengage Learning.

**Web References:**

- https://www.youtube.com/watch?v=q81KXc54Ozs&list=PLxtKZf9nLWO3d2a6M8l2BU8WTJKzHC4HJ

Mapping with Programme Outcomes:

| **Mapping with Programmers outcomes*** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | M | S | M | S | M | S | L | M | L | L |
| CO2 | S | M | M | S | M | M | S | L | M | L |
| CO3 | L | M | S | L | M | S | M | L | S | M |
| CO4 | S | L | L | M | M | L | L | S | M | S |
| CO5 | M | S | M | L | S | M | M | L | M | L |

S-Strong M-Medium L-Low

| Title of the Course/ Paper | Agile Software Engineering | | |
|---|---|---|---|
| Elective - 4 | II Year - III Semester | Credit: 3 | |

**Objectives:**

- To provide students with a theoretical as well as practical understanding of agile software development practices and how small teams can apply them to create high-quality software.
- To provide a good understanding of software design and a set of software technologies and APIs.
- To do a detailed examination and demonstration of Agile development and testing techniques.
- To understand the benefits and pitfalls of working in an Agile team.
- To understand Agile development and testing.

**Outcomes:**

- Upon completion of the course, the students will be able to:
- Realize the importance of interacting with business stakeholders in determining the requirements for a software system
- Perform iterative software development processes: how to plan them, how to execute them.
- Point out the impact of social aspects on software development success.
- Develop techniques and tools for improving team collaboration and software quality.
- Perform Software process improvement as an ongoing task for development teams.
- Show how agile approaches can be scaled up to the enterprise level.

UNIT I AGILE METHODOLOGY: Theories for Agile Management – Agile Software Development – Traditional Model vs. Agile Model - Classification of Agile Methods – Agile Manifesto and Principles – Agile Project Management – Agile Team Interactions – Ethics in Agile Teams - Agility in Design, Testing – Agile Documentations – Agile Drivers, Capabilities and Values

UNIT II AGILE PROCESSES: Lean Production - SCRUM, Crystal, Feature Driven Development- Adaptive Software Development - Extreme Programming: Method Overview – Lifecycle – Work Products, Roles and Practices.

UNIT III AGILITY AND KNOWLEDGE MANAGEMENT: Agile Information Systems – Agile Decision Making - Earl_ S Schools of KM – Institutional Knowledge Evolution Cycle – Development, Acquisition, Refinement, Distribution, Deployment, leveraging –

KM in Software Engineering – Managing Software Knowledge – Challenges of Migrating to Agile Methodologies – Agile Knowledge Sharing – Role of Story-Cards – Story-Card Maturity Model (SMM).

UNIT IV AGILITY AND REQUIREMENTS ENGINEERING: Impact of Agile Processes in RE–Current Agile Practices – Variance – Overview of RE Using Agile – Managing Unstable Requirements – Requirements Elicitation – Agile Requirements Abstraction Model – Requirements Management in Agile Environment, Agile Requirements Prioritization – Agile Requirements Modeling and Generation – Concurrency in Agile Requirements Generation.

UNIT V AGILITY AND QUALITY ASSURANCE: Agile Product Development – Agile Metrics – Feature Driven Development (FDD) – Financial and Production Metrics in FDD – Agile Approach to Quality Assurance - Test Driven Development – Agile Approach in Global Software Development.

**Recommended Texts:**

1. David J. Anderson and Eli Schragenheim; Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results; Prentice Hall; 2003.
2. Hazza and Dubinsky; Agile Software Engineering, Series: Undergraduate Topics in Computer Science ; Springer; 2009.

**Reference Books:**

1. Craig Larman, Agile and Iterative Development: A Managers Guide, Addison-Wesley, 2004.
2. Kevin C. Desouza, Agile Information Systems: Conceptualization, Construction, and Management, Butterworth-Heinemann, 2007.

**Web References:**

1. https://www.youtube.com/watch?v=x90kIAFGYKE&t=8s

Mapping with Programme Outcomes:

| **Mapping with Programmers outcomes*** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | M | S | M | S | M | S | L | M | L | L |
| CO2 | S | M | M | S | M | M | S | L | M | L |
| CO3 | L | M | S | L | M | S | M | L | S | M |
| CO4 | S | L | L | M | M | L | L | S | M | S |
| CO5 | M | S | M | L | S | M | M | L | M | L |

S-Strong M-Medium L-Low

| Title of the Course/ Paper | Computer vision | | |
|---|---|---|---|
| Elective - 4 | II Year - III Semester | Credit: 3 | |

**Objectives:**

- Understanding the Basics of Computer Vision.
- Acquiring skills to develop computer vision-based applications.To introduce students the fundamentals of image formation
- To introduce students the major ideas, methods, and techniques of computer vision and pattern recognition
- To develop an appreciation for various issues in the design of computer vision and object recognition systems
- To provide the student with programming experience from implementing computer vision and object recognition applications

**Outcomes:**

- Ability to understand the computer vision pipeline.
- Ability to build solutions using computer vision algorithms.
- Identify basic concepts, terminology, theories, models and methods in the field of computer vision
- Describe known principles of human visual system
- Describe basic methods of computer vision related to multi-scale representation, edge detection and detection of other primitives, stereo, motion and object recognition
- Suggest a design of a computer vision system for a specific problem

Unit I : Cameras - Pinhole Cameras - Cameras with Lenses - The Human Eye - Sensing Geometric Camera Models - Elements of Analytical Euclidean Geometry - Camera Parameters & Perspective projection - Affine Cameras and Affine Projection equations
Unit II : Geometric Camera Calibration - Least squares parameter estimation - A Linear Approach to Camera Calibration - Taking Radial Distortion into Account - Analytical Photogrammetry - Radiometry - Light in Space - Light at Surfaces -
Unit III : Sources, Shadows and shading - Qualitative Radiometry - Sources and Their Effects - Local Shading Model - Color- The Physics of Color - Human Color Perception - Representing Color - Surface Color from Image Color
Unit IV : Linear filters - Convolution - Shift Invariant Linear Systems - Spatial Frequency and Fourier Transforms- Sampling and Aliasing - Scale and Image Pyramids
Unit V : Edge detection - Noise - Detecting Edges - Texture - Representing Texture - Analysis (and Synthesis) Using Oriented Pyramids - Synthesizing Textures for Rendering - Shape from Texture for Planes

**Recommended Texts:**

1. D. Forsyth and J. Ponce; Computer Vision - A modern approach; Pearson India;2015

**Reference Books:**

1. Richard Szeliksy "Computer Vision: Algorithms and Applications" (http://szeliski.org/Book/)
2. Haralick& Shapiro, "Computer and Robot Vision", Vol II
3. G_erardMedioni and Sing Bing Kang "Emerging topics in computer vision"
4. Emanuele Trucco and AllessandroVerri "Introductory Techniques for 3-D Computer Vision", Prentice Hall, 1998.
5. Olivier Faugeras, "Three-Dimensional Computer Vision", The MIT Press, 1993

**Web References:**

1. https://www.youtube.com/watch?v=3LaVxEX3F0o&list=PLwdnzlV3ogoVsma5GmBSsgJM6gHv1QoAo

Mapping with Programme Outcomes:

| **Mapping with Programmers outcomes*** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | M | S | M | S | M | S | L | M | L | L |
| CO2 | S | M | M | S | M | M | S | L | M | L |
| CO3 | L | M | S | L | M | S | M | L | S | M |
| CO4 | S | L | L | M | M | L | L | S | M | S |
| CO5 | M | S | M | L | S | M | M | L | M | L |

S-Strong M-Medium L-Low

**List of Soft Skill Courses: Syllabus**

| Title of the Course/Paper | Communication Skills for Software Engineers - I | | |
|---|---|---|---|
| Soft Skill - | Year - Semester | | Credit: 2 |

**Objectives:**

- Understand the need of current soft skills
- Generalize self development and implementation procedures
- Demonstrate narration skills
- Design simple comprehension with given requirements
- Develop implementations in latest technologies
- Demonstrate the applications with varied soft skills like debate, oration, tell about yourself etc.

**Outcomes:**

- Enumerate varied soft skills needed for employment
- Identify the lack in oneself and improve it
- Learn the current technical implementations
- Summarize the different requirements for employability
- Calculate self performance ,Generalize narration , oration and debate skills
- Conceptualize the representation of current technologies

**1 Basics of Communication**

1.1 Definition and process of communication

1.2 Types of communication - formal and informal, oral and written, verbal and non-verbal

1.3 Communications barriers and how to overcome them

1.4 Barriers to Communication, Tools of Communication

**2 Application of Grammar**

2.1 Parts of Speech (Noun, verb, adjective, adverb) and modals

2.2 Sentences and its types

2.3 Tenses

2.4 Active and Passive Voice

2.5 Punctuation

2.6 Direct and Indirect Speech

**3 Reading Skill**

Unseen passage for comprehension (one word substitution, prefixes, suffixes, antonyms, synonyms etc. based upon the passage to be covered under this topic)

**4 Writing Skill**

4.1 Picture composition

4.2 Writing paragraph

4.3 Notice writing

**5 Listening and Speaking Exercises**

1. Self and peer introduction
2. Newspaper reading

3. Just a minute session-Extempore
4. Greeting and starting a conversation
5. Leave taking
6. Thanking
7. Wishing well
8. Talking about likes and dislikes
9. Group Discussion
10. Listening Exercises.

● Student should be encouraged to participate in role play and other student centred activities in class room and actively participate in listening exercises
● Assignments and quiz/class tests, mid-semester and end-semester written tests − Actual practical work, exercises and viva-voce − Presentation and viva-voce

**Recommended Texts:**

1. Communicating Effectively in English, Book-I by RevathiSrinivas; Abhishek Publications, Chandigarh.
2. Communication Techniques and Skills by R. K. Chadha; DhanpatRai Publications, New Delhi.

**Reference Books:**

1. High School English Grammar and Composition by Wren & Martin; S. Chand & Company Ltd., Delhi.
2. Excellent General English-R.B.Varshnay, R.K. Bansal, Mittal Book Depot, Malhotra
3. The Functional aspects of Communication Skills – Dr. P. Prsad, S.K. Katria & Sons, New Delhi
4. Q. Skills for success – Level & Margaret Books, Oxford University Press.
5. e-books/e-tools/relevant software to be used as recommended by AICTE/ NITTTR, Chandigarh.

**Web References:**

1. http://www.mindtools.com
2. http://www.letstalk.com.in
3. http://www.englishlearning.com
4. http://learnenglish.britishcouncil.org/en/
5. http://swayam.gov.in

Mapping with Programme Outcomes:

| **Mapping with Programmers outcomes*** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | L | L | M | S | M | S | L | S | S | M |
| CO2 | S | M | L | M | L | S | M | L | M | S |
| CO3 | M | S | S | L | M | S | L | M | S | M |
| CO4 | S | L | S | M | S | L | L | M | M | S |
| CO5 | S | M | L | S | L | M | S | L | M | S |

S-Strong M-Medium L-Low

| Title of the Course/Paper | Communication Skills for Software Engineers - II | | |
|---|---|---|---|
| Soft Skill - | Year - Semester | | Credit: 2 |

**Objectives:**

- Knowledge of English Language plays an important role in career development.
- This subject aims at introducing basic concepts of communication besides laying emphasis on developing listening, speaking, reading and writing skills as parts of Communication Skill.

**Outcomes:**

- Frame correct sentences with illustrations
- Comprehend the language correctly and Interpret the language correctly
- Use given material in new situations.
- Correspond effectively using various types of writings like letters, memos etc.
- Communicate effectively in English with appropriate body language making use of correct and appropriate vocabulary and grammar in an organised set up and social context.

**1. Functional Grammar**

1.1 Prepositions
1.2 Framing Questions
1.3 Conjunctions
1.4 Tenses

**2 Reading**

2.1 Unseen Passage for Comprehension ( Vocabulary enhancement - Prefixes, Suffixes, one word substitution, Synonym and Antonym) based upon the passage should be covered under this topic.

**3 Writing Skill**

3.1. Correspondence a) Business Letters- Floating Quotations, Placing Orders, Complaint Letters. b) Official Letters- Letters to Government and other Offices

3.2. Memos, Circular, Office Orders
3.3. Agenda & Minutes of Meeting
3.4. Report Writing

**LIST OF PRACTICALS**

Note: Teaching Learning Process should be focused on the use of the language in writing reports and making presentations. Topics such as Effective listening, effective note taking, group discussions and regular presentations by the students need to be taught in a project oriented manner where the learning happens as a byproduct.

**4 Speaking and Listening Skills**

1. Debate
2. Telephonic Conversation: general etiquette for making and receiving calls
3. Offering- Responding to offers.
4. Requesting – Responding to requests
5. Congratulating
6. Exploring sympathy and condolences

7. Asking Questions- Polite Responses
8. Apologizing, forgiving
9. Complaining
10. Warning
11. Asking and giving information
12. Getting and giving permission
13. Asking for and giving opinions

● Students should be encouraged to participate in role play and other student-centered activities in class rooms and actively participate in listening exercises

● Assignments and quiz/class tests, mid-semester and end-semester written tests - Actual practical work, exercises and viva-voce - Presentation and viva-voce

**Recommended Texts:**

1. Communicating Effectively in English, Book-I by RevathiSrinivas; Abhishek Publications, Chandigarh.
2. Communication Techniques and Skills by R. K. Chadha; Dhanpat Rai Publications, New Delhi.

**Reference Books:**

1. High School English Grammar and Composition by Wren & Martin; S. Chand & Company Ltd., Delhi.
2. e-books/e-tools/relevant software to be used as recommended by AICTE/NITTTR, Chandigarh.

**Web References:**

1. http://www.mindtools.com
2. http://www.letstalk.com.in
3. http://www.englishlearning.com
4. http://learnenglish.britishcouncil.org/en/
5. http://swayam.gov.in

Mapping with Programme Outcomes:

| **Mapping with Programmers outcomes*** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | L | L | M | S | M | S | L | S | S | M |
| CO2 | S | M | L | M | L | S | M | L | M | S |
| CO3 | M | S | S | L | M | S | L | M | S | M |
| CO4 | S | L | S | M | S | L | L | M | M | S |
| CO5 | S | M | L | S | L | M | S | L | M | S |

S-Strong M-Medium L-Low

| | | | |
|---|---|---|---|
| Title of the Course/Paper | Personality Development and other Soft skills for Software Engineers | | |
| Soft Skill - | Year - Semester | | Credit: 2 |

**Objectives:**

- The course intends to develop talent, facilitate employability enabling the incumbent to excel and sustain in a highly competitive world of business.
- The programme aims to bring about personality development with regard to the different behavioural dimensions that have far reaching significance in the direction of organisational effectiveness.
- To make students know about self-awareness, life skills, soft skills, need for personal development etc**.**

**Outcomes:**

- The student will be able to understand, analyse develop and exhibit accurate sense of self.
- Think critically.
- Demonstrate knowledge of personal beliefs and values and a commitment to continuing personal reflection and reassessment.
- Learn to balance confidence with humility and overcome problems associated with personality

**Unit 1: Personality Development : A Must for Leadership and Career Growth**

Case 1: One's Personality Sends Out a Signal that Others Read
Case 2: Same Person: Consciously Different Personalities can be Powerful
Case 3: There isn't One Right Personality
Learnings About Personality Development from the Three Cases
Personality Analysis - Freudian Analysis of Personality Development - Swami Vivekananda's Concept of Personality Development - Physical Self- Energy Self - Intellectual Self - Mental Self - Blissful Self - Personality Begets Leadership Qualities - Interpersonal Skills - Resolving Conflict - A Smiling Face - Appreciative Attitude - Assertive Nature - Communication - Skills-Listening Skills -Developing Empathy - The Personality Attribute of Taking Bold Decisions - Personality Types and Leadership Qualities - Mapping the Different Personality Types - Perfectionists-Helpers-Achievers-Romantics-

Observers -Questioners - Enthusiasts or Adventurers-Bosses or-Asserters-Mediators or Peacemakers - Personality Tests - Example of a Personality Test: Jung Typology Test - Personality Assessment

**Unit 2: Soft Skills: Demanded by Every Employer**

Case I: Dr Devi Shetty

Case II: Abraham Lincoln

Case III: Jeff Immelt

**Lessons from the Three Case Studies - Change in Today's Workplace: Soft Skills as a Competitive Weapon - Antiquity of Soft Skills - Classification of Soft Skills** - Time Management -Attitude -Responsibility - Ethics, Integrity, Values, and Trust -Self-confidence and Courage - Consistency and Predictability - Teamwork and Interpersonal Skills - Communication and Networking - Empathy and Listening Skills - Problem Solving, Troubleshooting and Speed-reading - Leadership

**Unit 3: Your Resume or Curriculum Vitae: The First Step Forward**

The Strategy of Resume Writing—From an Employer's Perspective

Strategy I: The Resume Should Reveal ose Personality Traits that Align with the Organization's Values

Strategy II: The Resume Should Convince the Potential Employer of Right Fitment to the Opening

Strategy III: The Resume Should Show to the Employer the Bene ts that the Candidate Will Bring in

A Favourable First Impression—The 'Career Objective' in the Resume - The Main Body of the Resume - Clarity and Crispness of the Resume - Format and Content of the Resume - A Fresher's Resume - Examples - Example of a Well-written Resumeby an Experienced Professional -Example of a Well-written Resumeof a Fresh Graduate - Example of a Poorly Written Resume - Writing a Modern Resume - How is the Modern CV Different from the Traditional One? - Various Modern ResumeFormats -

**Unit 4: Group Discussion: A Test of Your Soft Skills**

Case Studies - Learnings from the Three Case Studies - Ability to Work as a Team - Communication Skills, Including Active Listening - Non-verbal Communicatio - Leadership and Assertiveness - Reasoning - Ability to Influence - Innovation, Creativity and Lateral Thinking - Flexibility - Group Discussion Types - The Responsibility of the First Speaker - Concluding the Discussion — The Technique of Summing Up

**Recommended Texts:**

1. Personality Development and SOFT SKILLS, BARUN K. MITRA, Oxford University Press

**Reference Books:**

1. Communicating Effectively in English, Book-I by Revathi Srinivas; Abhishek Publications, Chandigarh.

2. Communication Techniques and Skills by R. K. Chadha; Dhanpat Rai Publications, New Delhi.

**Web References:**

1. http://www.mindtools.com
2. http://www.letstalk.com.in
3. http://www.englishlearning.com
4. http://learnenglish.britishcouncil.org/en/
5. http://swayam.gov.in

Mapping with Programme Outcomes:

| **Mapping with Programmers outcomes*** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | L | L | M | S | M | S | L | S | S | M |
| CO2 | S | M | L | M | L | S | M | L | M | S |
| CO3 | M | S | S | L | M | S | L | M | S | M |
| CO4 | S | L | S | M | S | L | L | M | M | S |
| CO5 | S | M | L | S | L | M | S | L | M | S |

S-Strong M-Medium L-Low

| Title of the Course/Paper | Documentation and Interview skills for Software Engineers | | |
|---|---|---|---|
| Soft Skill - | Year - Semester | | Credit: 2 |

**Objectives:**

- Ensure that you understand what the job involves, and that you have the necessary skills
- Make sure you do want to work for the company
- Check that the philosophy/values of the company match your personal requirements
- Find out more about the job, training, career structure etc.

**Outcomes:**

- Understand the purpose of interviews
- Be aware of the processes involved in different types of interviews
- Know how to prepare for interview
- Be clear about the importance of self presentation

**Unit 1: Job Interviews: The Gateway to the Job Market**

Types of Interviews - Groundwork Before the Interview - Abide by the Dress Code - Importance of Body Language in Interviews - Need for Proper Articulation - **Probable Interview Questions**: Tell Us about Yourself - Would You Call Yourself a Team Player? - **Few Tricky Questions and Possible Answers:**Why Should We Employ You? - Do You Have Off ers from Other Companies? - What Salary are You Expecting? - How Much do You ink You are Worth? - What Kind of a Culture are You Comfortable with? - What is More Important to You—Salary or Growth Opportunities? - What do You Know about Our Company? - Tell Us about Your Strengths and Weaknesses - Where do You See Yourself in 5 or 10 Years? - What are Your Plans for Higher Studies? - When Leading a Team, How

Will You Motivate Your Team Members and Resolve Any Differences between them? - What Has Been the Biggest Challenge You Have Faced, and How Did You Handle It? - What Do You ink are the Essential Qualities of a Good Employee? - You Claim to be Computer-savvy. Can You Mention Any Innovative Way to Enhance the Sales of the Company Using Your Computer Knowledge and Skills? — Concluding an Interview - Telephonic or Video Interview—A Growing Trend - Disadvantages of Telephonic or Video Interview - **A Mock Interview:**Why did the Interview Team Select Vikram? - Why did the Interview Team not Select Chandra and Amit?

**Unit 2:Body Language: Reveals Your Inner Self and Personality**

Emotions Displayed by Body Language:Aggressive - Submissive - Attentive - Nervous - Upset - Bored - Relaxed - Power - Defensive—Handshake—The Most Common Body Language— Eyes— A Powerful Reflection of One's Inner Self —Entry to My Space— Personal Zones May Vary: Intimate Zone - Personal Zone - Social Zone - Public Zone - Typical Body Language when Zones are Intruded — Body Language Exhibited During Different Professional Interactions -Interview - Manager's Discussions with a Subordinate Employee - Discussions with Supervisor - Presentation to a Large Audience - Group Discussions - Video-conference

**Unit 3: Enhance Your Writing Skill to Create an Impression**

Fifteen Principles to Increase Clarity of Communication - Use Short, Simple and Clear Words - Use Short Sentences - Do not Cram Di erent Points into One Sentence - Using Compact Substitutes for Wordy Phrases - Remove Redundant Words and Expressions - Avoid Use of Mixed Metaphors - Avoid Hackneyed and Stilted Phrases - Avoid Verbosity in the Use of Common Prepositions - Do not Twist the Word Order - Present Similar Ideas in a Sentence with Same Structural and Grammatical Form - Make Positive Statements Without Being Hesitant or Non-committal - e Statements Without Being Hesitant or Non-committal - Avoid Pompous Words and Phrases - Use Active Instead of Passive Voice - Ensure Correct Spelling and Grammar in the Text - Substitute Easily-understood Words for Words Imported from Other Fields - Edit-Edit-Edit - The Reader's Perspective - Clarity of Thought - Clarity of Text - Example of Poorly and Well-written Texts

**Unit 4: Fog Index: Provides Guidance for Proper Writing**

Fog Index or Clarity Index -Examples of Passages with High and LowFog Index - Infogineering Clarity Rating - Flesch Kincaid Reading Ease Index - Other Readability Indices - Checking Grammar, Spelling and Voice - Clarity of Verbal Communication - Case 1 - Case 2

**Recommended Texts:**

1. Personality Development and SOFT SKILLS, BARUN K. MITRA, Oxford University Press

**Reference Books:**

1. **C**ommunicating Effectively in English, Book-I by Revathi Srinivas; Abhishek Publications, Chandigarh.
2. Communication Techniques and Skills by R. K. Chadha; Dhanpat Rai Publications, New Delhi.

**Web References:**

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2. http://www.letstalk.com.in
3. http://www.englishlearning.com
4. http://learnenglish.britishcouncil.org/en/
5. http://swayam.gov.in

Mapping with Programme Outcomes:

| **Mapping with Programmers outcomes*** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | L | L | M | S | M | S | L | S | S | M |
| CO2 | S | M | L | M | L | L | M | S | M | S |
| CO3 | M | S | S | L | M | S | L | M | S | M |
| CO4 | S | L | S | M | S | L | L | M | M | S |
| CO5 | S | M | L | S | L | M | S | L | M | S |

S-Strong M-Medium L-Low

| Title of the Course/Paper | **Team Project** | | |
|---|---|---|---|
| Soft Skill - | Year - Semester | | Credit: 2 |

**Objectives:**

- Understand programming language concepts, particularly object-oriented concepts or go through research activities.
- Plan, analyze, design and implement a software project or gather knowledge over the field of research and design or plan about the proposed work.
- Learn to work as a team and to focus on getting a working project done on time with each student being held accountable for their part of the project.
- Learn about and go through the software development cycle with emphasis on different processes - requirements, design, and implementation phases.

**Outcomes:**

- Demonstrate the ability to locate and use technical information from multiple sources.
- Demonstrate the ability to communicate effectively in speech and writing.
- To demonstrate a depth of knowledge of modern technology.
- To do the Project Scheduling, tracking, Risk analysis, Quality management and Project Cost estimation using different techniques.
- To complete an independent research project, resulting in at least a thesis publication, and research outputs in terms of publications in high impact factor journals, conference proceedings.

**Project:**

- Any Computer related project has to be developed using latest software as a team.
- The project must be presented for viva-voce at the end of the semester.
- Students will write up a project report, which is an essay to provide a complete record of all the work carried out in their projects.
- The student project reports will be assessed solely according to academic marking guidelines by the supervisor(s) of the student project.
- If the work of the candidate is found to be insufficient and plagiarism, the supervisor(s) will decide the further process.

Mapping with Programme Outcomes:

| **Mapping with Programmers outcomes*** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | L | L | M | S | M | S | L | S | S | M |
| CO2 | S | M | L | M | L | S | M | L | M | S |
| CO3 | L | S | S | L | M | L | M | S | S | M |
| CO4 | S | L | S | M | S | L | L | M | M | S |
| CO5 | S | M | L | S | L | M | S | L | M | S |

S-Strong M-Medium L-Low

**S.A.C. SEPT'2022**

# APPENDIX – (i)24(R)
# UNIVERSITY OF MADRAS

## M.Sc. DEGREE COURSE IN BIOTECHNOLOGY
## Choice-Based Credit System
REVISED REGULATIONS
(w.e.f. 2022-2023)

**Preamble:**

The learning outcome is designed to help learners understand the objectives of studying biotechnology that is, to analyze, appreciate understand the use of the living system and organisms to develop or make products. Biotechnology is a fast-growing field of science where biological systems are used in diverse applications in the areas of environment, food industry, fermentation, etc. Interdisciplinary life science provides high-quality education and performs cutting-edge technological research. The fundamental research as well as in modern industrial enterprise patents, copyrights and various regulatory processes to make their efforts a success. In the increasingly globalized society, it is important that the younger generation especially the students are equipped with knowledge, skills, mindsets and behaviors so that they become important contributors to the development of society. Biotechnology is an interdisciplinary field that brings together knowledge from diverse fields such as cell biology to molecular biology, biochemistry to biophysics, genetic engineering to stem cell research, bioinformatics to genomics-proteomics, environmental biology to biodiversity, microbiology to bioprocess engineering, from bioremediation to Insilco drug discovery and so on. The proposed credit-based curriculum and grading system will even add much more to the existing interdisciplinary nature of biotechnology and will also offer many courses to the other branches of life science. The Choice Based Credit System (CBCS) curriculum for Biotechnology at the postgraduate level has now been developed into a new system called Learning Outcome Curriculum Framework (LOCF) under the recommendations and guidance of the University Grants Commission (UGC). The LOCF approach first envisioned the programme learning outcomes of the M.Sc. program in Biotechnology as well as the learning outcomes of the courses being taught under this programme, keeping in view the graduate attributes of the subject. A variety of learning assessment tasks has been included in the curriculum. The new Curriculum of M.Sc Biotechnology offers essential knowledge and technical skills. Students would be trained in all areas of biotechnology with significant interdisciplinary components. The theory and experimental knowledge suit the need of academics and industry. The curriculum will motivate the students to pursue research and entrepreneurial skill development.

**Introduction:**

The higher education institutions all over the globe are in grip of this urgent task and India needs to keep pace with future developments. The recent development in the field of biotechnology as rapid growth and the establishment of biotechnological industries. This has resulted in great demand for trained manpower in this field and has opened new career opportunities for the young generation of students to acquire skills, training and knowledge to enhance their thinking, comprehension and application abilities and prepare them to compete,

succeed and excel globally. Sustained initiatives are required to reform the present higher education system for improving and upgrading the academic resources and learning environments by raising the quality of teaching and standards of achievements in learning outcomes. The academic research into innovations for practical use in society and economy, promoting efficient and transparent governance and management of the higher education system, enhancing the capacity of the higher education system to govern itself through coordinated regulatory reform and increasing both public and private sector investment in higher education, with special emphasis on targeted and effective equity-related initiatives.

**Learning Outcomes based approach to Curriculum Planning:**

The Learning Outcomes based approach to Curriculum planning aims to factor in on the aptitude, interests and strengths of the students during their progress through the coursework and at the same time focus on overall student attainment. The main objective of the learning outcomes based framework is to better equip the students in their pursuit of knowledge, with the required employability skills, innovation in research and entrepreneurship skills. The course is so designed with practical work that will help students to apply their theoretical knowledge in experimenting and exploring. The curriculum envisions that the student, once graduates as specialists in a discipline, have an important role to play in the newer developments and innovations in the future in the subject for the advancement of the discipline.

**Graduate Attributes in Biotechnology:**

Graduate attributes are the high-level qualities, skills and understandings that a student should gain as a result of the learning and experiences. They equip students and graduates for lifelong personal development, learning and to be successful in society. Students will be equipped to be active citizens both nationally and globally. The students graduating in biotechnology should also develop excellent communication skills both in the written as well as spoken language which are a must for them to pursue higher studies from some of the best and internationally acclaimed universities and research institutions spread across the globe. The graduate attributes reflect both disciplinary knowledge and understanding, generic skills, including global competitiveness all students in different academic fields of study should acquire/attain and demonstrate. Some of the characteristic attributes that a graduate should demonstrate are as follows

- Leadership Readiness
- Moral and ethical awareness/reasoning.
- Multicultural Competence.
- Life–long Learning.
- Communication Skills.
- Critical thinking.
- Problem-solvingng.
- Research-related skills.
- Scientific reasoning.
- Self-directed learning.
- Disciplinary knowledge.

**Qualification Descriptors:**

Upon successful completion of the course, the students receive an M.Sc. degree in Biotechnology. Biotechnology postgraduates of this department are expected to branch out into different paths of seeking advanced research-based knowledge, professional employment, or entrepreneurship that they find fulfilling. They will be able to demonstrate knowledge as well as skills in diverse fields of Biotechnology. This will provide a foundation, which shall help them to embark on research careers by attaining doctoral positions in coveted institutions, as well as securing employment in research projects in industry or institutes. Besides research, they can get suitable teaching positions in Colleges and Universities as Assistant professors after qualifying National Eligibility Test (NET). It is expected that besides the skills specific to the discipline, the wider life skills of analysis, logical reasoning, scientific aptitude, communication skills, research and life ethics, and moral values will be inculcated in the students. The list below provides a synoptic overview of possible career paths provided by postgraduate training in Biotechnology:

- Biotechnology entrepreneurship
- Patents and Law
- Scientific Writing and Editing
- Document preparation and publication
- Research
- Industry
- Teaching
- Administration and Policy Making
- Scientific Communication

**Teaching-learning process**

The Learning Outcomes-Based Approach to curriculum planning and transaction requires that the teaching-learning processes are oriented towards enabling students to attain the defined learning outcomes relating to the courses within a programme. The outcome-based approach, particularly in the context of undergraduate studies, requires a significant shift from teacher-centric to learner-centric pedagogies, and from passive to active/participatory pedagogies. Planning for teaching therein becomes critical. Every programme of study lends itself to a well-structured and sequenced acquisition of knowledge and skills. Practical skills, including an appreciation of the link between theory and experiment, will constitute an important aspect of the teaching-learning process. Teaching methods, guided by such a framework, may include:

✓ **Classroom Teaching** for intensely information-based topics. This is a very regular feature of all the courses in Biotechnology.

✓ **PowerPoint slides** for topics that involve information and use of PowerPoint presentations are also made whenever the lectures are to be summarized in a crisp and point-wise manner to highlight salient/important conclusions from the topics.

✓ **Classroom Discussions** are a regular feature while teaching. The students are drawn into impromptu discussions by the teacher during the process of teaching.

✓ **Video Displaying**, both real-time and animations, are used for topics that require 3D dimensional viewing of the biological mechanisms to drive the point home. These have proved to be very helpful while teaching concepts of molecular biology like DNA replication, transcription and translation.

✓ **Model Making** is also used especially for understanding and building a perception of the students.

✓ **Laboratory Practical** are an integral part of every course included in the PG programme in Biotechnology. The is also a daily affair for PG students of Biotechnology.

✓ **Problem Solving** is encouraged during the laboratory work.

✓ **Group Activity** as well as discussions with the laboratory supervisor/ among the students themselves/ Mentor is also encouraged during laboratory work.

✓ **Project Work** is included in the programme where students work individually or in groups to design experiments to solve/answer a problem suggested by the Mentor or identified by the students in consultation with the Mentor. The students are mentored regularly during the duration of the project.

✓ **Presentations by the Students** are regularly done. The students are mentored in the presentation of data, interpretation of data and articulation with the students/teachers/Research Scholars during their presentation.

✓ **Presentations by Experts** in different specialties of Biotechnology are arranged to broaden the horizons of the students.

✓ **Interaction with Experts** is also encouraged during/after presentations to satisfy/ignite the curiosities of the students related to developments in the different areas of Biotechnology.

✓ **Visit to Industries/Laboratories** related to Biotechnology like fermentation, food, pharmaceuticals; diagnostics etc. are organized to acquaint the students with real-life working environments of the professional biotechnologist with a view to broadening their perspective on the subject of Biotechnology.

**Assessment methods**

The students of PG Biotechnology program must achieve the desired results in terms of the learning outcomes to be professionally sound and competitive in a global society. Achieving the desired learning outcomes is also imperative in terms of job employment leading to a happy and prosperous individual further leading to a happy and prosperous family and thereby a happy and prosperous society or nation. The assessment tasks are pivotal to getting authentic feedback for the teaching-learning process and mid-course corrections and further improvements in the future. The assessment tasks are carried out at various stages of the duration of the PG Biotechnology programme like Mid-term assessments, End-term assessments, Semester examinations, Regular assessments, viva-voce, etc. The assessment tasks are listed below:-

✓ **Short-Answer Questions** during term and semester examinations are used to assess the ability of the student to convey his thoughts in a coherent way where prioritization of the information in terms of their significance is tested.

✓ **Problem Solving questions** are generally given during the laboratory work.

✓

**Surprise Quizzes** are regularly used during continuous assessment while the teaching-learning process is continuing which prepares the student to quickly recall information or quickly analyze a problem and come up with proper solutions.

✓

**Impromptu Opinions** on biotechnological problems are sought from student during regular teaching-learning which help them to think quickly in a given context. This help build their ability to come up with solutions to problems that the students might not have confronted previously.

✓

**Data Interpretation** is also another assessment task that is used to develop the analytical skills of the students. This assessment is used during laboratory work as well as during project work.

✓

**Analytical Skills** are assessed during work related to several experiments like enzyme kinetics, growth of bacteria and Bacteriophages, and mutation frequencies.

✓

**Paper/ Project presentations** are used to assess the articulation skills of the student. These are carried out both during the duration of the teaching-learning processes as well as during end-Semester examinations.

✓

**Report Writing** is used to assess the keenness of the students for details related to Biotechnology while visiting laboratories/industries as students invariably are required to submit a report after such visits.

✓

**Assignment Writing** is used to assess the writing abilities of the students during midterm vacations.

✓

**Viva-voce** during the laboratory working hours and during laboratory, examinations are used to assess the overall knowledge and intelligence of the students.

**Key Words**:

Biotechnology, Teaching, Learning outcomes, Curriculum, Curriculum Framework, Programme outcomes, Course outcomes, PG Programme, Postgraduate programme, Teaching-learning processes, Assessment Tasks, Evaluation Tasks, Online Courses, MOOCS, SWAYAM, UGC, India, Higher Education Institutions.

**REVISED SCHEME OF EXAMINATIONS:**

**FIRST SEMESTER**

| S .No. | Course Components | Name of Course | | | S | Exam HRS | Max. Marks | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | CIA | External |
| 1 | Core Paper-1 | Biochemistry | I | 3 | 4 | 3 | 25 | 75 |
| 2 | Core Paper-2 | Molecular Genetics | I | 3 | 4 | 3 | 25 | 75 |
| 3 | Core Paper-3 | Molecular Cell Biology | I | 3 | 4 | 3 | 25 | 75 |
| 4 | Core Paper-4 Practical-I | Practical – I (A) Biochemistry (B) Molecular Genetics (C) Molecular Cell biology | I | 15 | 4 | 6 | 40 | 60 |
| 5 | Elective Paper-1* | Bioinstrumentation | I | 2 | 3 | 3 | 25 | 75 |
| 6 | Elective Paper-2 * | Biostatistics | I | 2 | 3 | 3 | 25 | 75 |
| 7 | Paper-3 * Elective | Enzymology | I | 2 | 3 | 3 | 25 | 75 |
| 8 | Soft Skill - I | | I | 2 | 2 | 3 | 40 | 60 |
| Total Credits : 24 | | | | | | | | |

*Candidates can opt for any two Electives

(Practical examination shall be conducted independently at the end of even semesters.)

## SECOND SEMESTER

| S. No. | Course Components | Name of Course | | Inst. Hours | Credits | Exam HRS | Max. Marks CIA | Max. Marks External |
|---|---|---|---|---|---|---|---|---|
| 9 | Core Paper-5 | Microbiology | II | 3 | 4 | 3 | 25 | 75 |
| 10 | Core Paper-6 | Plant and Animal Biotechnology | II | 3 | 4 | 3 | 25 | 75 |
| 11 | Core Paper-7 | Genetic Engineering | II | 3 | 4 | 3 | 25 | 75 |
| 12 | Core Paper-8 Practical-II | Practical – II (A) Microbiology (B) Plant and Animal Biotechnology (C) Genetic Engineering | II | 15 | 4 | 6 | 40 | 60 |
| 13 | Elective Paper-4* | Regulatory affairs and Industrial standards | II | 2 | 3 | 3 | 25 | 75 |
| 14 | Elective Paper-5* | Pharmaceutical Biotechnology | II | 2 | 3 | 3 | 25 | 75 |
| 15 | Elective Paper-6* | Environmental Biotechnology | II | 2 | 3 | 3 | 25 | 75 |
| 16 | Extra* disciplinary elective | Any Elective offered by other Depts. | II | 2 | 3 | 3 | 25 | 75 |
| 17 | Soft skill - II | | II | 2 | 2 | 3 | 40 | 60 |
| 18 | Elective offered to other Dept. | Extra disciplinary Tissue engineering | II | 2 | 3 | 3 | 25 | 75 |
| Total credits: 24 | | | | | | | | |

* Candidates can opt for any one Elective and one extra disciplinary elective

**THIRD SEMESTER**

| S. No. | Course | | Semester | Inst. Hours | Credits | Exam | Max. Marks | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | CIA | External |
| 19 | Core Paper-9 | Bioinformatics | III | 3 | 4 | 3 | 25 | 75 |
| 20 | Core Paper-10 | Immunology | III | 3 | 4 | 3 | 25 | 75 |
| 21 | Core Paper-11 | Bioprocess Technology | III | 3 | 4 | 3 | 25 | 75 |
| 22 | Core Paper-12 Practical-III | Practical – III<br>(A) Bioinformatics<br>(B) Immunology<br>(C) Bioprocess Technology | III | 15 | 4 | 6 | 40 | 60 |
| 23 | Elective Paper-7* | Nano Biotechnology | III | 2 | 3 | 3 | 25 | 75 |
| 24 | Elective Paper-8* | Molecular Developmental Biology | III | 2 | 3 | 3 | 25 | 75 |
| 25 | Extra* disciplinary elective | Any Elective offered by other Depts. | III | 2 | 3 | 3 | 25 | 75 |
| 26 | Soft skill - III | | III | 2 | 2 | 3 | 40 | 60 |
| 27 | **Internship | Internship in Industries to Biotechnology Field (food / clinical trial/ dairy/ aqusciences, pharmaceutical) CSIR/DBT/DST research laboratories | III | - | 2 | - | - | 100 |
| 28 | Elective offered to other Dept. | Principles of Gene Manipulation Technology | III | 2 | 3 | 3 | 25 | 75 |
| Total credits: 26 | | | | | | | | |

(Practical examination shall be conducted independently at the end of even semesters.)

*Candidates can opt for any one Elective and one extra disciplinary elective

** Internship will be carried out during the summer vacation of II Semester and the report will be evaluated by two examiners within the Department of the college/ institution. The marks should be sent to the University by the College and the same will be included in the Third Semester Marks Statement.

## FOURTH SEMESTER

| S. No. | Course Components | Name of Course | Semester | Inst. Hours | Credits | Exam HRS | Max. Marks | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | CIA | External |
| 29 | Core Paper-13 | Research Methodology | IV | 4 | 4 | 3 | 25 | 75 |
| 30 | Elective Paper-9* | Stem Cell Biology | IV | 2 | 3 | 3 | 25 | 75 |
| 31 | Elective Paper-10* | Bioethics, Human Rights and Social Issues | IV | 2 | 3 | 3 | 25 | 75 |
| 32 | Core Paper-14 | Dissertation | IV | 20 | 8 | | 60 | 240 (40-work book, 150 Dissertation + 50- Viva) |
| 33 | Soft skill - IV | | IV | 2 | 2 | 3 | 40 | 60 |
| Total credits: 17 / 19 * | | | | | | | | |

*Candidates can opt for any one of the two Electives and the additional 2 hours shall be used for Dissertation work. However, additional elective paper can be opted for earning extra credits.

**DISSERTATION EVALUATION:**

Dissertation Work should be carried out as an individual Dissertation and actual bench work. The Dissertation work will begin from III$^{rd}$ Semester, and will continue through the IV$^{th}$ Semester. The Dissertation report (also work book shall be presented at the time of presentation and viva voce) will be submitted at the end of the IV$^{th}$ Semester and evaluated. For the conduct of the End Semester Examination and evaluation of Dissertation Work, the University will appoint External Examiners.

Since the dissertation is by research, dissertation work carries a total of 300 marks and evaluation will be carried out by both internal and external evaluators. The average marks awarded by them will be considered. Project work book consisting of daily research activities, methods adopted, results recorded and maintained by the candidate shall also be submitted along with dissertation for evaluation. The viva-voce examination is part of dissertation which carries marks as specified below.

The assignment of marks for Project is as follows: Continuous Internal Assessment Marks Best 2 out of 3 presentations (Literature survey, Methodology and Results of the project work) - 60 marks Project work book - 40 marks

Dissertation/ - 150 marks

Viva-voce - 50 marks

**APPENDIX – 24(S)**
**UNIVERSITY OF MADRAS**
M.Sc. DEGREE COURSE IN BIOTECHNOLOGY
Choice-Based Credit System
**REVISED SYLLABUS**
(w.e.f. 2022-2023)
**Core Paper-1 BIOCHEMISTRY**

| **Paper – 1** | | | |
|---|---|---|---|
| Title of the paper | BIOCHEMISTRY | Subject code: | |
| Category of the course | Year | Semester | Credits |
| Core Paper | 1st | 1st | 4 |

**Learning Outcome:**
The paper imparts a thorough knowledge on the basics of all the Biochemical concepts, Metabolic reactions and its regulation. The student will get to understand the core concepts of metabolism and physiological processes of the body in both healthy and disease state.

**Course outcomes**:
At the end of the Course, the Student will be able to:

| | |
|---|---|
| CO-1 | To understand the basics of pH and related principles and carbohydrate metabolism. |
| CO-2 | To provide basic knowledge about lipid metabolism and related significance. |
| CO-3 | To enlighten the students on Bio-energetics and Biological oxidation pathways. |
| CO-4 | To update the knowledge on Amino acids and Protein. |
| CO-5 | To assess and appraise the role of Nucleic acids. |

| **SYLLABUS \| Core Paper-1 \| BIOCHEMISTRY** | | | | |
|---|---|---|---|---|
| **Unit** | **Content** | **Hours** | **COs** | **Cognitive level** |
| **I** | pH, pK . acid, base .Buffers- Henderson- Haselbach equation, biological buffer system –Phosphate buffer system, protein buffer system, bicarbonate buffer system, amino acid buffer system and Hb buffer system. Water, Carbohydrates: Nomenclature, classification, structure,chemical and physical properties of carbohydrates. Metabolisms: glycogenesis, glycogenolysis, gluconeogenesis, pentose phosphate pathway | 10 | CO1 | K1&k2 |
| **II** | Lipids: Nomenclature, classification, structure, chemical and physical properties of fatty acids. Metabolisms: biosynthesis of fatty acids, triglycerols, phospholipids, glycol lipids. Cholesterol biosynthesis, bile acids and salt formation. Eicosanoids, sphingolipids and steroid hormones. | 10 | CO2 | K1,K2 & K3 |

| | | | | |
|---|---|---|---|---|
| **III** | Bioenergetics – Concept of energy, Principle of thermodynamics, Relationship between standard free energy and Equilibrium constant, ATP ads universal unit of free energy in Biological systems. Biological oxidation: Electron transport chain, oxidative phosphorylation, glycolysis, citric acid cycle, cori.s cycle, glyoxalate pathway. Oxidation of fatty acids-mitochondrial and peroxisomal ß-oxidation, alpha and beta oxidation, oxidation of unsaturated and odd chain fatty acids, ketone bodies. Photosynthesis, urea cycle, hormonal regulation of fatty acids and carbohydrates metabolisms, Mineral metabolism | 10 | CO3 | K1,K2 & K3 |
| **IV** | Amino acids and Protein: Nomenclature, Classification, structure, chemical and physical properties of amino acids and proteins. Metabolisms: Biosynthesis of amino acids. Degradation of proteins, nitrogen metabolisms and carbon skeleton of amino acids. Over all in born error metabolisms | 10 | CO4 | K1,K2 & K3 |
| **V** | Nucleic acids: Nomenclature, Classification, structure, chemical and physical properties of purine and pyrimidines. In de novo and salvage synthesis of purines, pyrimidine bases, nucleosides and nucleotides. Catabolisms of purines and pyrimidines bases. Synthetic analogues of nitrogenous bases | 10 | CO5 | K1,K2 & K3 |

**Reference books:**


- Philip Kuchel, Simon Easterbrook-Smith, Vanessa Gysbers, Jacqui M. Matthews, 2011. Schaum.s Outline of Biochemistry, Third Edition (Schaum.s Outline Series), McGraw-Hill.
- Sathyanarayana.U and U.Chakrapani., 2011. Biochemistry. Books and Allied private limited, Kolkata.
- Jeremy M. Berg, John L. Tymoczko, Lubert Stryer, 2010. Biochemistry, Seventh Edition, W. H. Freeman.
- Albert Lehninger, David L. NelsonVoet Donald, Judith G.Voet and Charlotte W.Pratt., 2008. Principles of Biochemistry. John Wiley and sons, Inc., New Jersey.
- Michael M. Cox, 2008. Lehninger Principles of Biochemistry, Fifth Edition, W. H. Freeman publishers.


**Useful web sites:**

- mcdb-webarchive.mcdb.ucsb.edu/.../biochemistry/.../website-tourf.htm
- www.biochemweb.org/
- http://golgi.harvard.edu/biopages.html
- webarchive.mcdb.ucsb.edu/sears/biochemistry/info/website-

**Core Paper-2**

**MOLECULAR GENETICS**

| **Paper – 1** | | | |
|---|---|---|---|
| Title of the paper | MOLECULAR GENETICS | Subject code: | |
| Category of the course | Year | Semester | Credits |
| Core Paper | 1st | 1st | 4 |

**Learning outcome:**

The paper imparts a thorough knowledge on the basics of all the Genetics concepts, molecules and its regulation. The student will get to understand the core concepts of molecules and genetics.

**Course outcomes**:

At the end of the Course, the Student will be able to:

| | |
|---|---|
| CO-1 | To acquire good knowledge about the molecular mechanisms of gene expression and understand the theories behind the organization and functions of genetic material in the living world. |
| CO-2 | Identify and distinguish genetic regulatory mechanisms at different levels and explain the processes behind mutations and other genetic changes and study various chromosomal abnormalities. |
| CO-3- | Make the students understand different range of DNA damage and range of their tools for their detection an. |
| CO-4 | Learn the concepts of the transposons and their applications. |
| CO-5 | Detects the Allele frequencies and genotype frequencies in populations and describe the concepts behind the theory of evolution |

| **SYLLABUS \| Core Paper-2 \| MOLECULAR GENETICS** | | | | |
|---|---|---|---|---|
| **Unit** | **Content** | **Hours** | **COs** | **Cognitive level** |
| **I** | Genes and chromosomes, Colinearity of Genes and Proteins, Genetic code, Identification of DNA as the genetic material. The complexity of eukaryotic genome (introns, exons, repetitive DNA sequence, gene duplication and pseudogenes). DNA markers - VNTR, STR, microsatellite, SNP and their detection techniques | 10 | CO1 | K1,K2 & K3 |
| **II** | Replication of DNA, Gene expression and regulation in prokaryotes and eukaryotes. Mutation: Spontaneous and virus induced mutation, Radiation induced mutation. Ionizing radiation, UV radiation. Chromosomal Abnormalities and associated genetic diseases, Techniques in the study of chromosomes and their applications, Recombination – models | 10 | CO2 | K1,K2 &K3 |

| | | | | |
|---|---|---|---|---|
| **III** | DNA Damage and Repair-Internal and external agents causing DNA damages 3.2. DNA damages (Oxidative damages, Depurinations, Depyrimidinations, O6-methylguanines, Cytosine deamination, single and double strand breaks) 3.3. Mechanisms of DNA damage (transition, transversion, frameshift, nonsense mutations) 3.4. Repair mechanisms (Photo reactivation, excision repair, mismatch repair, post replication repair, SOS repair) 3.5. Discovery: Early experiments of McClintock in maize. Insertion sequences in prokaryotes. Complex transposons (ex. Tn3, Tn5, Tn9 and Tn10). Mechanisms, control consequences and application of transposition by simple and complex elements | 10 | CO3 | K1,K2 &K3 |
| **IV** | Allele frequencies and genotype frequencies, Random mating population, Hardy-Weinberg principle, complications of dominance, special cases of random mating – multiple alleles, different frequencies between sexes (autosomal and X-linked) inbreeding, genetics and evolution, random genetic drift, Karyotyping and usefulness of chromosomes in understanding Genetic variation, Genetics of eukaryotes gene linkage and chromosome mapping. | 10 | CO4 | K1 &K2 |
| **V** | Extrachromosomal heredity: Biology of Plasmids, their discovery, types and structure of F.RTH. *col* factors and Ti – Replication and partitioning, Incompatibility and copy number control-natural and artificial plasmid transfer and their applications-Human Genome Project, Genomics and Modern methodologies in understanding genome. | 10 | CO5 | K1,K2 & K3 |

**References:**


- Principles of Genetics- 8th Edition, Gardner, Simmons and Snustad, 2002.
- The Cell- A Molecular Approach. 3rd Edition. Geoffrey M. Cooper, Robert E. Hausman, 2003.
- Genetics- Kavitha B. Ahluwalia, New Age International Pvt Ltd and Publishers, New Delhi, 2010
- Genetics – P.S Verma and A.K Agarwal (Rack 3, Central Library)
- Robert Brooker.2011. Genetics- Analysis and Principles. 4th edition. McGraw Hill.
- Leland Hartwell,Leroy Hood, Michael Goldberg, Ann Reynolds, Lee Silver,2010.Genetics: From Genes to Genomes, 4th Edition, McGraw Hill.
- Rastogi Smita and Neelam Pathak.,2010. Genetic Engineering, Oxford University Press, New Delhi. (Rack 3, Central Library)
- Watson, Hopkins, Roberts, Steitz, Weiner, 2004. Molecular Biology of Genes, 4th Edition.

- DNA markers Protocols, applications and overviews Anolles G. C. & Gresshoff P. M. Wiley-Liss
- Molecular markers in Plant Genetics and Biotechnology Vienne De. D. Science Publishers
- Genetics of Population Hedrick P.W. Jones & Bartlett 4 Principle of Population Genetics Hartl D. L. and Clark A. G. Sinauer Associates

**Core Paper-3**
**MOLECULAR CELL BIOLOGY**

| **Paper – 3** | | | |
|---|---|---|---|
| Title of the paper | MOLECULAR CELL BIOLOGY | Subject code: | |
| Category of the course | Year | Semester | Credits |
| Core Paper | 1st | 1st | 4 |

**Learning Outcome:**

The paper imparts a thorough knowledge on the basics of all the Cell biology concepts, molecules and its regulation. The student will get to understand the core concepts of molecules and cell biology.

**Course outcomes:**

| | |
|---|---|
| CO-1 | To understanding of the molecular machinery of living cells and the principles that govern the structures of macromolecules and their participation in molecular recognition. |
| CO-2 | Identify the structures and purposes of basic components in prokaryotic and eukaryotic cells and their molecular mechanism |
| CO-3- | Demonstrate knowledge and understanding of the principles and basic mechanisms of nuclear envelope and its functions. |
| CO-4 | Understand the metabolic pathways and the process of transmission of extracellular signals |
| CO-5 | Demonstrate the operation of various microscopes and microtomy in the laboratory |

| **SYLLABUS \| Core Paper-3 \| MOLECULAR CELL BIOLOGY** | | | | |
|---|---|---|---|---|
| **Unit** | **Content** | **Hours** | **COs** | **Cognitive level** |
| **I** | Introduction to cell Biology- Basic properties of cells- Cellular dimension-Size of cells and their composition-Cell origin and Evolution (Endosymbiotic theory)–Microscopy- Light Microscopy, Electron Microscopy, Application of Electron Microscopy in cell biology, Phase Contrast Microscopy, Fluorescence Microscopy, Flow Cytometry and FRET .Organelles of the eukaryotic | 10 | CO1 | K1,K2 &K3 |

| | | | | |
|---|---|---|---|---|
| | cell and its functions; Biomembranes - structural organization, transport across membrane (Passive, Active and Bulk transport); Cell-Cell adhesion- Cell junctions (Tight junctions, gap junctions, desmosomes, adherens); Extra cellular matrix (ECM)-components and role of ECM in growth | | | |
| **II** | Structure of Nucleic acids, Genome organization in Eukaryotes, DNA Replication, Transcription, Translation and post translational Modification. Synthesis, sorting and trafficking of proteins: site of synthesis of organelle and membrane proteins – transport of secretary and membrane proteins across ER – post-translational modification in RER – transport to mitochondria, nucleus, chloroplast and peroxisome - protein glycosylation – mechanism and regulation of vesicular transport – golgi and post-golgi sorting and processing – receptor mediated endocytosis; Synthesis of membrane lipids. | 10 | CO2 | K1,K2 &K3 |
| **III** | Nucleus: Nuclear envelope – Nuclear pore complexes-nuclear matrix – organization of chromatin – supercoiling, linking number, twist - nucleosome and high order of folding and organization of chromosome(Solenoid and Zigzag model)-Global structure of chromosome –(Lamp brush and polytene chromosomes). | 10 | CO3 | K1,K2 &K3 |
| **IV** | Molecular basis of eukaryotic cell cycle, Regulation and cell cycle check points; Programmed cell death (Apoptosis); Cell-Cell signaling-signaling molecules, types of signaling, signal transduction pathways (GPCR-cAMP, IP3 , RTK, MAP Kinase, JAK-STAT, Wnt Pathway). | 10 | CO4 | K1, K2 & K3 |
| **V** | Cancer Biology: Multistage cancer development Mitogens, carcinogens, oncogenes and proto-oncogenes, tumor suppressor genes-Rb, p 53, Apoptosis and significance of apoptosis. | 10 | CO5 | K1,K2 & K3 |

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- Karp, G., 2009, Cell and Molecular Biology, Sixth edition, John Wiley & Sons, New York.
- David E.Sadva., 2009. Cell biology organelles structure and function, CBS publishers and distributors, New Delhi.
- Prakash S. Lohar , 2009. Cell and Molecular Biology.
- Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, 2007.,Molecular Biology of the Cell, Fifth edition. Garland Science.
- Lodish,H., Berk, A., Zipursky, S.L., Matsudaira, P., Kaiser, A., Krieger, Scott and Darnell, J.

2007. Molecular Cell Biology. Media Connected, sixth edition. W.H.Freeman and Company

- Geoffrey.M.Cooper, Robert.E.Hausman.2007.The Cell-A Molecular Approach, Fourth edition. Sinauer Associates. •
- Luiz Carlos Uchoa, Janqueira, Jose, Carneiro. 2005. Basic HistologyText and Atlas. McGraw-Hill Professional.
- Paul A, 2001, Text Book Of Cell And Molecular Biology 2edition Niyogi Books •
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- Alberts B, Molecular Cell Biology. 8. Casimeris et al., Lewin's cells. Jones and Bartlett.
- Plopper, Principles of cell Biology. Jones and Bartlett.
- Gartner, Cell Biology and Histology. LWW.
- Pollard et al., Cell Biology. Sounders.
- Copper, The Cell a Molecular approach. Sinauer

**Core Paper-4**
**PRACTICAL-I**
**(Biochemistry, Molecular Genetics & Molecular Cell biology)**

| **Paper – 4** | | | |
|---|---|---|---|
| Title of the paper | PRACTICAL-I (Biochemistry, Molecular Genetics & Molecular Cell biology) | Subject code: | |
| Category of the course | Year | Semester | Credits |
| Core Paper | 1st | 1st | 4 |

**Learning Outcome:**
The practical will establish a basic study skills on the subject and will improve the student's ability to calculate and improve their practical skill and knowledge.

**Course outcomes:**
On successful completion of the course the students will be able to

| | |
|---|---|
| CO 1 | (K2) Illustrate basic biochemistry procedures |
| CO 2 | (K3) study the methods of estimation of biomolecules |
| CO 3 | (K4) isolate & Analyze DNA, RNA & protein |
| CO 4 | (K5) critically analyze the isolated biomolecules |
| CO 5 | (K5) evaluate the quality and purity of DNA, RNA & Protein |

| **SYLLABUS \| Core Paper-4 \| PRACTICAL-I** | | | | |
|---|---|---|---|---|
| **Unit** | **Content** | **Hours** | **COs** | **Cognitive level** |
| **A** | **(A) Biochemistry - Practical**<br>1. Basic calculations in Biochemistry - Normality, Molarity, Molality percent solutions (v/v, w/v).<br>2. Calibration of pH meter | 15 | CO1<br>CO2<br>CO3<br>CO4 | K3 & K4 |

| | | | | |
|---|---|---|---|---|
| | 3. Transition interval of commonly used pH indicators<br>4. Preparation of biological buffer - phosphate buffer<br>5a. Extraction of Proteins from biological materials<br>5b Protein separation methods:-Ammonium sulphate Precipitation,<br>5c. Membrane Dialysis,<br>5d. SDS PAGE<br>6. Urea-SDS PAGE for separation of low molecular weight proteins<br>7. Estimation of Proteins by Lowry's method<br>8. Estimation of Proteins by Biuret method<br>9. Estimation of Proteins by Bradford method<br>10. Estimation of RNA by orcinol method<br>11. Estimation of DNA by diphenylamine method<br>12. Estimation of Carbohydrate by Anthrone method<br>13 Purity check of DNA & RNA by UV Spectrophotometry - A260/280<br>14. Separation of amino acids by Paper Chromatography<br>15. Separation of sugars by Paper Chromatography<br>16. Separation of amino acids by Thin layer chromatography<br>17. Separation of sugars by Thin layer chromatography<br>18. Thermal Denaturation of DNA and UV absorption studies<br><br>**Demo Experiments**<br>1. Gel permeation chromatography,<br>2. Affinity chromatography,<br>3. Ion.exchange chromatography<br>4. Western blotting<br>5. PCR | | CO5 | |
| **B** | **(B) Molecular Genetics - Practical**<br>1. Isolation of DNA from bacteria<br>2. Isolation of DNA from plants<br>3. Isolation of DNA from animal tissue<br>4. Isolation of DNA from blood<br>5. Plasmid DNA isolation.<br>6. Agarose gel electrophoresis of DNA<br>7. Transer of DNA from gel – Southern Blotting<br>8. Isolation of RNA<br>9. Glyoxal denatured Agarose gel electrophoresis of RNA | 15 | CO1<br>CO2<br>CO3<br>CO4<br>CO5 | K3,K4 &K5 |

| | | | | |
|---|---|---|---|---|
| | 10. Formaldehyde denatured Agarose gel electrophoresis of RNA<br>11. Urea denatured Agarose gel electrophoresis of RNA<br>12. Transfer of RNA from gel – Northern Blotting<br>13. Restriction digestion of DNA<br>14. Radiation induced genetic damage assessment<br>15. Chemical induced genetic damage assessment.<br>16. Preparation of metaphase chromosomes form blood | | | |
| **C** | **(C) Molecular Cell Biology -Practical**<br>1. Introduction to Microtome and types<br>2. Microtomy-Fixationoftissue<br>3. Microtomy -Embedding<br>4. Microtomy-Sectioning of tissue<br>5. H&E Staining of tissues<br>6. Histochemical staining to localize proteins<br>7. Histochemical staining to localize carbohydrates<br>8. Histochemical staining to localize lipids.<br>9. Subcellular fractionation and marker enzyme detection (mitochondria).<br>10. Giant chromosome studies in Chironomous larvae<br>11. Meiotic study in flower bud sand cockroach or grasshopper<br>12. Preparation of tissue culture medium and membrane filtration<br>13. Preparation of single cell suspension from spleen and thymus;<br>14. Cell counting and cell viability;<br>15. Embryonic development and stem cells (serpulidpolychaete Hydroideselegans/chick/ frog) | 15 | CO1<br>CO2<br>CO3<br>CO4<br>CO5 | K3,K4 & K5 |

**Elective Paper-1**

**BIOINSTRUMENTATION**

| **Paper – 1** | | | |
|---|---|---|---|
| Title of the paper | BIOINSTRUMENTATION | Subject code: | |
| Category of the course | Year | Semester | Credits |
| Elective Paper | 1st | 1st | 3 |

**Learning Outcome:**

The paper imparts a thorough knowledge on the basics of all the instrumentation concepts, in biology. The student will get to understand the core concepts of biological instruments and their principles.

**Course outcomes**:

At the end of the Course, the Student will be able to:

| | |
|---|---|
| CO-1 | Introduction and various types of Microscopic techniques |
| CO-2 | Impart understanding on centrifugation instruments and techniques |
| CO-3- | Separation of Biomolecules |
| CO-4 | Analytical methods on Spectroscopic Analysis |
| CO-5 | Understand the application and Detection on Bioinstrumentation |

| **SYLLABUS \| Elective Paper-1 \| BIOINSTRUMENTATION** | | | | |
|---|---|---|---|---|
| **Unit** | **Content** | **Hours** | **COs** | **Cognitive level** |
| **I** | Microscopic Techniques: Principles and Applications: Compound, Light, Stereo, Phase Contrast, Fluorescent Microscopy, Scanning and Transmission Electron Microscopy, Scanning Electron Microscopy, Atomic Force Microscopy, Confocal Microscopy, FRET and Flow Cytometry. | 7 | CO1 | K1 & K2 |
| **II** | Centrifugation: pH meter, Principle and Applications of various types of centrifugation, Sedimentation Coefficient, Svedberg unit, RCF, Density Gradient Centrifugation. Chromatography Techniques: Principle and Application of Paper Chromatography, TLC, Gel Filtration Chromatography, Ion Exchange Chromatography, Affinity Chromatography, GC & HPLC. | 7 | CO2 | K1, K2,K3 |
| **III** | Electrophoretic Techniques: Principle and Application of Agarose Gel Electrophoresis, 2D-gel Electrophoresis, PAGE- NATIVE & SDS PAGE, Iso-electric Focusing, High resolution Electrophoresis, Immuno Electrophoresis (Immunofixation EP,), ELISA, RIA, Southern, Northern and Western Blotting. Electro blotting, PCR and RT-PCR, Microarray (DNA, Proteins) | 7 | CO3 | K1, K2 & K3 |

| | | | | |
|---|---|---|---|---|
| **IV** | Spectroscopic Techniques: Theory and Application of UV and Visible Spectroscopy, Fluorescence Spectroscopy, Mass Spectroscopy, IR Spectroscopy NMR, ESR, Atomic Absorption Spectroscopy, X- ray Spectroscopy, Laser Spectroscopy and Raman Spectroscopy | 7 | CO4 | K1,K2 & K3 |
| **V** | Radio-isotopic Techniques: Introduction to Radioisotopes, Uses and their Biological Applications, Radioactive Decay – Types and Measurement , Principles and Applications of GM Counter, Solid and | 7 | CO5 | K1,K2 & K3 |
| | Liquid Scintillation Counter, Autoradiography, RIA, Radiation Dosimetry, Health effects of Radiations. | | | |

**Reference books**


- M.H. Fulekar and Bhawana Pandey Bioinstrumentation, Wiley
- Keith Wilson, John Walker, 2010. Principles and Techniques of Biochemistry and Molecular Biology (7th Edition), Cambridge University Press •
- David L. Nelson, Michael M. Cox. Menninger (2008). Principles of Biochemistry, Fifth edition W. H. Freeman, New York. •
- Experiments in Biochemistry: A Hands-On Approach by Shawn O. Farrell, Ryan T. Ranallo, Paperback: 324 pages, Publisher: Brooks Cole. 20 •
- Metzler D.E. 2001, the chemical reactions of living cells –Academic Press. 2nd edition.
- Stryer L,1999, Biochemistry-W.H. Freeman & Company, New York. 1. • 4th edition
- L.Veerakumari (2006) Bioinstrumentation MJP Publisher Kindle edition
- Jefrey. M., Backer el al., 1996. Biotechnology- A Laboratory Course. Academic Press, New York.
- Holcapek, M., Byrdwell, Wm. C. 2017. Handbook of Advanced Chromatography /Mass Spectrometry Techniques, Elsevier

## Elective Paper-2 BIOSTATISTICS

| Paper – 2 | | | |
|---|---|---|---|
| Title of the paper | BIOSTATISTICS | Subject code: | |
| Category of the course | Year | Semester | Credits |
| Elective Paper | 1st | 1st | 3 |

**Learning Outcome:**

The paper imparts a thorough knowledge on the basics of all the statistical concepts, in biology. The student will get to understand the core concepts of computation principles for the data analysis.

**Course outcomes:**

At the end of the Course, the Student will be able to:

| | |
|---|---|
| CO-1 | To understand the major Methods of collection & presentation of data |
| CO-2 | To provide basic knowledge about methods of analysis of variance |
| CO-3 | To enlighten the students about the methods of setting hypothesis and calculation of errors. |
| CO-4 | To update the knowledge on Tests of significance for large and small samples. |
| CO-5 | To assess and appraise the role of novel microbes in environment and integrate them in specific innovative approaches. |

| SYLLABUS \| Elective Paper-2 \| BIOSTATISTICS | | | | |
|---|---|---|---|---|
| **Unit** | **Content** | **Hours** | **COs** | **Cognitive level** |
| **I** | Statistics – Scope –collection, classification, tabulation of Statistical Data – Diagrammatic representation – graphs – graph drawing – graph paper – plotted curve –Sampling method and standard errors –random sampling – use of random numbers – expectation of sample estimates – means – confidence limits – standard errors – variance. Measures of central tendency – measures of dispersion – skewness, kurtosis, moments | 7 | CO1<br>CO2<br>CO3 | K1,K2,K3 & K4 |
| **II** | Correlation and regression – correlation table – coefficient of correlation – Z transformation – regression – relation between regression and correlation. Probability – Markov chains applications – Probability distributions – Binomial (Gaussian distribution) and negative binomial, compound and multinomial distributions – Poisson distribution | 7 | CO1<br>CO2<br>CO5 | K1,K2,K3 & K4 |

| | | | | |
|---|---|---|---|---|
| **III** | Normal distribution – graphic representation.– frequency curve and its characteristics –measures of central value, dispersion, coefficient of variation and methods of computation – Basis of Statistical Inference – Sampling Distribution – Standard error – Testing of hypothesis – Null Hypothesis –Type I and Type II errors | 7 | CO1<br>CO4<br>CO5 | K1,K2,K3 & K4 |
| **IV** | Tests of significance for large and small samples based on Normal, t, z distributions with regard to mean, variance, proportions and correlation coefficient – chi-square test of goodness of fit – contingency tables – c2 test for independence of two attributes – Fisher and Behrens 'd' test – 2×2 table – testing heterogeneity – r X c table – chi-square test in genetic experiments – partition X 2 – Emerson's method | 7 | CO1<br>CO2<br>CO3 | K1,K2,K3 & K4 |
| **V** | Tests of significance –t tests – F tests – Analysis of variance – one way classification – Two way classification, CRD, RBD, LSD. Spreadsheets – Data entry –mathematical functions – statistical function – Graphics display – printing spreadsheets – use as a database word processes – databases – statistical analysis packages graphics/presentation packages | 7 | CO1<br>CO2<br>CO4<br>CO5 | K1,K2,K3 & K4 |

**References Books:**


- Veer bala Rastogi. 2011. Fundamentals of Biostatistics. Ane books Pvt Ltd, Chennai.
- Rosner,B (2005), "Fundamentals of Biostatistics", Duxbury Press.
- Warren,J; Gregory,E; Grant,R (2004), "Statistical Methods in Bioinformatics",1st edition, Springer
- Milton,J.S.(1992),. "Statistical methods in the Biological and Health Sciences", 2nd edition ,Mc Graw Hill,
- Sundar Rao P. S.S., Jesudian G. & Richard J. (1987), "An Introduction to
- Biostatistics", 2nd edition,. Prestographik, Vellore, India,.
- Zar, J.H. (1984) "Bio Statistical Methods", Prentice Hall, International Edition


**Useful Websites:**

- www.statsoft.com/textbook/ biosun1.harvard.edu/
- www.bettycjung.net/Statsites.htm
- www.ucl.ac.uk/statistics/biostatistics

## Elective Paper-3 ENZYMOLOGY

| Paper – 3 | | | |
|---|---|---|---|
| Title of the paper | ENZYMOLOGY | Subject code: | |
| Category of the course | Year | Semester | Credits |
| Elective Paper | 1st | 1st | 3 |

**Learning Outcome:**

The subject imparts knowledge on the fundamentals of enzyme structure and its kinetics. The student will be provided with a basic knowledge and understanding about the functions of enzyme as well as the industrial application of enzymes.

**Course outcomes:**

| | |
|---|---|
| CO-1 | (K2) Explain the basics of enzyme nomenclature and properties |
| CO-2 | (K3) Classify and Cognize the native and immobilized enzyme |
| CO-3 | (K4) Examine the equations of steady state kinetics |
| CO-4 | (K5) Assess extraction and downstream processing of enzymes |
| CO-5 | (K6) Compile the uses of enzymes and design enzymes for Industrial and Clinical application |

| SYLLABUS \| Elective Paper-3 \| ENZYMOLOGY | | | | |
|---|---|---|---|---|
| **Unit** | **Content** | **Hours** | **COs** | **Cognitive level** |
| **I** | Introduction to enzymes, Classification, nomenclature and general properties like effects of pH, substrate and temperature on enzyme catalysed reactions. Extraction Isolation and purification of enzymes by precipitation, centrifugation, chromatography and electrophoresis and liquid-liquid extraction methods | 7 | CO1 CO5 | K3 & K5 |
| **II** | Kinetics of catalysed reaction : Single substrate reactions, bisubstrate reactions, concept of Michaelis - Menten, Briggs Haldane relationship, Determination and significance of kinetic constants, Limitations of Michaelis-Menten Kinetics, line weaver burk plot, Hanes wolf equation, Eadie hoofstee equation ,Inhibition of enzyme activity | 7 | CO1 CO2 CO5 | K3 & K5 |
| **III** | Enzyme catalysis: enzyme specificity and the concept of active site, determination of active site. Stereospecificity of enzymes. Mechanism of catalysis: Proximity and orientation effects, general acid-base catalysis, concerted acid - base catalysis, nucleophilic and electrophilic attacks, catalysis by distortion, metal ion catalysis | 7 | CO1 CO3 | K3 & K4 |

| | | | | |
|---|---|---|---|---|
| **IV** | Theories on mechanism of catalysis.-Mechanism of enzymes action: mechanism of action of lysozyme, chymotrypsin, carboxypeptidase and DNA polymerase. Multienzymes system, Mechanism of action and regulation of pyruvate dehydrogenase and fatty acid synthetase complex | 7 | CO1 CO4 | K3, K4 & K6 |
| **V** | Coenzyme action. Enzyme regulation: General mechanisms of enzyme regulation, Allosteric enzymes, sigmoidal kinetics and their physiological significance, Symmetric and sequential modes for action of allosteric enzymes. Reversible and irreversible covalent modification of enzymes, Immobilized enzymes and their industrial applications.Clinical and industrial applications of enzymes, Enzyme Engineering | 7 | CO1 CO5 | K3,K4, K5 & K6 |

**Reference Books**


- Nicholas C.Price and Lewis Stevens., 2010. Fundamentals of Enzymology. Oxford University Press, New Delhi
- Lehninger, Nelson and Cox, 2005, Principles of Biochemistry - 4th edition, WH Freeman and Company, New York, USA
- Principles of Biochemistry with human focus - Garrett and Grisham, 2002, Harcourt College Publishers, Orlando, Florida, USA.
- Geoffrey L, Zubay, Biochemistry -, 1998, 4th edition. 23
- Donald Voet, Judith Voet and Pratt, 1995, Fundamentals of Biochemistry, 2nd edition.
- Harper.s Biochemistry - Murray et al, 2000, 25th edition, Appleton and Lange Publishers.
- Enzymes – Trevor Palmer 2002.


**Useful Websites**

- www.lsbu.ac.uk/biology/enztech/
- www. lsbu.ac.uk/biology/enzyme/
- http://www.aetlted.com/tech/applications.html

## Core Paper-5 MICROBIOLOGY

| Paper – 5 | | | |
|---|---|---|---|
| Title of the paper | MICROBIOLOGY | Subject code: | |
| Category of the course | Year | Semester | Credits |
| Core Paper | 1st | 2nd | 4 |

**Learning Outcome:**

To provide a comprehensive knowledge on taxonomy and microbial diversity, growth, their harmful effects and beneficial role of microorganisms in agriculture and environment

**Course outcomes:**

| | |
|---|---|
| CO-1 | To understand the major discoveries of microbiology and describe microbial diversity, Microbial growth and metabolism. |
| CO-2 | To provide basic knowledge about microbial culture, identification of microbes, principle and working of microscopes and sterilization techniques |
| CO-3 | To enlighten the students on host microbe interaction and Epidemiology of microbial disease |
| CO-4 | To update the knowledge on epidemic and pandemic diseases. |
| CO-5 | To assess and appraise the role of novel microbes in environment and integrate them in specific innovative approaches. |

| SYLLABUS \| Core Paper-5 \| MICROBIOLOGY | | | | |
|---|---|---|---|---|
| **Unit** | **Content** | **Hours** | **Cos** | **Cognitive level** |
| **I** | History and microbial taxonomy: Major discoveries related to the field of microbiology: Antony Von Leeuwenhoek, Louis Pasteur, Robert Koch and Edward Jenner. Microbial taxonomy: Bacteria, viruses, fungi, algae and protozoa, Microbial diversity: Biovars, Serovars and Prions, Microbial growth and metabolism: Microbial growth: Growth curve, factors affecting growth, Microbial | 10 | CO1 CO2 | K1,K2 &K3 |

| | | | | |
|---|---|---|---|---|
| | metabolism- Methanogenesis, acetogenesis and auxotrophs | | | |
| **II** | Microbial culture, identification, and control: Nutritional requirements for growth - Growth media and types, Pure culture techniques: Serial dilution and plating methods, Staining methods - Principles and types of staining (simple and differential), Identification of bacteria – Biochemical – IMViC, 16s rRNA sequencing. Microscopy: principles and applications of Bright field, florescent and Scanning electron microscopes, Microbial growth control: Physical Methods – Heat, Filtration, Low Temperatures, High Pressure, Desiccation, Osmotic Pressure, Radiation; Chemical Methods | 10 | CO2<br>CO3<br>CO5 | K2,K3,K5 |
| **III** | Host microbe interaction and Epidemiology: Human microbiome; Skin, Gastrointestinal tract, Oral cavity, Lung. Symbiotic relationship of microbes: Symbiosis, Mutualism, Parasitism, Commensalism and endophyte. Epidemiology of microbes: causes, types and transmission of epidemic, endemic and pandemic diseases | 10 | CO1<br>CO3<br>CO4 | K1,K2,K3 |
| **IV** | Microbial Diseases: Microbial diseases - General characteristics, pathogenesis, laboratory diagnosis and control measures of Pandemic and Epidemic diseases: Tuberculosis, Leprosy, Cholera, Typhoid, COVID-19, Yellow Fever, Flu, AIDS, Ebola, Zika Virus, Small Pox, Dengue, Chickungunya, Malaria, filariasis, Candidiasis, superficial mycosis | 10 | CO4<br>CO5 | K4 &K5 |
| **V** | Agricultural and Environmental Microbiology: Biological nitrogen fixation, free living, symbiotic nitrogen fixation, mechanism of Nitrogen, Biofertilizers- types and applications; Rhizosphere effect. Biogeochemical cycles-Carbon, Nitrogen, Sulphur and Phosphorous; Methanogenic bacteria Extremphiles- Thermophiles Acidophiles, Halophiles and alkalophiles; Biotechnological application of extremophiles | 10 | CO1<br>CO2<br>CO3 | K4 & K5 |

**References**


- Joanne Willey, Linda Sherwood, Christopher J. Woolverton, (2017). Prescott's Microbiology, (10th edition), McGraw-Hill Education, ISBN: 978-1259281594.
- Maheshwari D K, Dubey R C 2013. A Textbook of Microbiology.4th Edn S Chand Publishing India.

- Ananthanarayan and Paniker's (2017) Textbook of Microbiology, (10th edition), The Orient Blackswan, ISBN: 978-9386235251.
- Benson HJ. (1999). Microbiological Applications: A Laboratory manual in General Microbiology, 7th Edition, McGraw Hill. 5
- Managing epidemics- Key facts about major deadly diseases, World Health Organization (WHO) 2018. 9. O'Flaherty, Vincent & Collins, Gavin & Mahony, Thérèse. (2010). Environmental Microbiology, Second Edition. 10.1002/9780470495117.ch11.
- Agriculture Microbiology, 2016. E-Course Developed By TNAU (ICAR)


**Web Sources**


- https://www.who.int/emergencies/diseases/managing-epidemics-interactive.pdf ISBN 978-92-4-156553-0. https://doi.org/10.3389/fmicb.2020.631736
- https://www.agrimoon.com/wp-content/uploads/AGRICULTURAL-Microbiology.pdf.

**Core Paper-6**

**PLANT AND ANIMAL BIOTECHNOLOGY**

| **Paper – 6** | | | |
|---|---|---|---|
| Title of the paper | PLANT AND ANIMAL BIOTECHNOLOGY | Subject code: | |
| Category of the course | Year | Semester | Credits |
| Core Paper | 1st | 2nd | 4 |

**Learning Outcome:**

The paper imparts a thorough knowledge on the basics of all the biotechnological application on plant and animals. The student will get to understand the core concepts of biotechnology.

**Course outcomes:**

| | |
|---|---|
| CO-1 | To impart theoretical knowledge on various techniques of plant biotechnology like tissue culture, plant genetic transformation and their application in industries. |
| CO-2 | Importance of secondary metabolites and production in plants. |
| CO-3 | To develop concepts, principles and processes in animal biotechnology. |
| CO-4 | Concept and different types in Animal Cell Culture and animal cell lines. |
| CO-5 | Use of molecular biology techniques genetically engineer the animals to improve sustainability, productivity and suitability for pharmaceutical and industrial applications. |

| **SYLLABUS \| Core Paper-6 \| PLANT AND ANIMAL BIOTECHNOLOGY** | | | | |
|---|---|---|---|---|
| **Unit** | **Content** | **Hours** | **COs** | **Cognitive level** |
| **I** | Introduction of plant tissue culture, composition of media, Micropropagation, organogenesis, somatic embryogenesis, haploid and triploid production, protoplast isolation and fusion, hybrid and cybrid, | 10 | CO1 CO5 | K1,K2 &K3 |
| | synthetic seed production. Secondary metabolites in plants - Phytochemicals- Glycosides and Flavonoids; Anthocyanins and Coumarins - Lignans, Terpenes, Volatile oils and Saponins; Carotenoids and Alkaloids: biogenesis, therapeutic applications | | | |
| **II** | Plant Transformation Direct transformation by electroporation and particle gun bombardment. Agrobacterium, Ti plasmid vector. Theory and techniques for the development of new genetic traits, conferring resistance to biotic and abiotic. Plant engineering towards the development of enriched food products, plant growth regulators; Molecular Marker aided breeding: RFLP maps, Linkage analysis, RAPD markers, STS Mirco satellite, SCAR, SSCP, QTL, Map based cloning and Molecular marker assisted selection. | 10 | CO1 CO2 CO5 | K1,K2 & K5 |

| | | | | |
|---|---|---|---|---|
| **III** | Animal health disease diagnosis, hybridoma technique, monoclonal antibodies, application of probes for disease diagnosis of existing and emerging animal diseases. Prophylaxis - Vaccines, Oral vaccines DNA Vaccines in animal disease. Cell culture: primary and established culture; organ culture; tissue culture | 10 | CO1<br>CO3<br>CO5 | K4 & K5 |
| **IV** | Disaggregation of tissue and primary culture; cell separation, Slide and coverslip cultures, flask culture, test tube culture techniques, cell synchronization, cryo preservation. Scaling up of animal cell culture, cell line and cloning micromanipulation and cloning, somatic cell cloning. Karyotyping; measuring parameters for growth, measurement of cell death, apoptosis and its determination, cytotoxicity assays | 10 | CO4<br>CO5 | K2,K3,K4 & K5 |
| **V** | Nuclear magnetic resonance methods of monitoring cell metabolism culturing animal cells in fluidised bed reactors. Application of animal cell culture for in vitro testing of drugs, in production of human and animal viral vaccines and pharmaceutical proteins. Culture Scale up and mass production of biologically important compounds. Harvesting of products, purification and assays. Transgenic animals: Production and application; transgenic animals in livestock improvement, transgenic animals as model for human diseases; Stem Cells- Properties, Types, Therapy, Prospects and Ethics in stem cell research. | 10 | CO5 | K3,K4 & K6 |

**Reference Books**


- Razdan. M. K., 2011. Plant tissue culture. Oxford and IBH publishing Company Pvt. Ltd, New Delhi.
- Chawla. H. S., 2010. Introduction to plant biotechnology. Oxford and IBH publishing company pvt. Ltd, New delhi.
- Ian Freshney, 2010. Culture of animal cells. 6th edition, Wiley-Blackwell publishers.
- Slater, 2008. Plant Biotechnology: The Genetic manipulation of plants, Second Edition, Oxford University Press, USA.
- J.D.Watson, Gillman, J.Witknowski and M.Zoller, 2006. Recombinant DNA. 3rd ed.
- W.H.Freeman. 26 K. Dass. 2005, Text book of Biotechnology, Second Edition, Wiley Dreamtech, India (P) Ltd.
- H.Kreuzer & A.Massey. 2001. Recombinant DNA and Biotechnology: A guide for teachers Second Edition. ASM press, Washington.
- M.Sudhir. 2000. Applied Biotechnology & Plant Genetics. Dominant publishers & Distributors.
- Genetic Engineering of Animals by (Ed) A.Puhler, VCH Publishers, Weinheim, FRG, 1993.
- Animal Cell culture Practical approach. Ed. John R.W.Masters, Oxford.2004.
- Concepts in Biotechnology D. Balasubramaniam, Bryce, Dharmalingam, Green, JayaramanUniv. Press, 1996

**Core Paper-7**
**GENETIC ENGINEERING**

| Paper – 7 | | | |
|---|---|---|---|
| Title of the paper | GENETIC ENGINEERING | Subject code: | |
| Category of the course | Year | Semester | Credits |
| Core Paper | 1st | 2nd | 4 |

**Learning Outcome:**
The paper imparts a thorough knowledge on the basics of all the biotechnological application on plant and animals. The student will get to understand the core concepts of biotechnology.

**Course outcomes:**

| | |
|---|---|
| CO-1 | Understanding the basic steps of gene cloning and the role of enzymes and vectors responsible for gene manipulation, transformation and genetic engineering. |
| CO-2 | Getting detailed knowledge of gene transfer methods and identifying suitable hosts for cloning. |
| CO-3 | Acquiring theoretical knowledge in the techniques, tools, and application and safety measures of genetic engineering. |
| CO-4 | Describes the genome mapping and sequencing and methods for gene therapy. |
| CO-5 | Elucidate different techniques involved in genetic engineering |

| SYLLABUS \| Core Paper-7 \| GENETIC ENGINEERING | | | | |
|---|---|---|---|---|
| **Unit** | **Content** | **Hours** | **COs** | **Cognitive level** |
| **I** | Gene cloning. Genetic engineering tools. Nucleic acid manipulating enzymes. Promoters, Selectable markers and reporters used in rDNA technology. Restriction digestion, Ligation, Transformation, Selection of Recombinants. Construction of gene libraries | 10 | CO1 | K1,K2, K5 |
| **II** | E.Coli vectors - pBR322 and its derivatives; Cloning vectors for gram negative bacteria - ColE1, p15A, R1, IncPa, pSC101; Lambda bacteriophage vectors, filamentous phages, Cosmids, Phasmids, Phagemids. Cloning in gram-positive bacteria (Bacillus subtilis) | 10 | CO2 | K2,K3, K4 |
| **III** | Cloning in yeast *Saccharomyces cerevisae*. Life cycle and types of vectors; Eukaryotic vectors. SV40 (molecular genetics and expression); Specialized cloning vector for cDNA; Synthesis of specific RNA in vitro; Vectors for cloning promoters and terminators; vectors with adjustable copy number | 10 | CO4 | K3,K4 &K6 |

| | | | | |
|---|---|---|---|---|
| **IV** | Nucleic acid hybridization techniques; Molecular probes (Types of probes and its construction); probe labeling. Nick translation, End labeling and Random primer labeling. Polymerase chain reaction and its variants; DNA fingerprinting; DNA sequencing first generation sequencing methods (Maxam and Gilbert sequencing, Sangers Dideoxy sequencing, Pyrosequencing, PCR based sequencing and hybridization sequencing).Second generation sequencing methods | 10 | CO4 | K3,K4,K5 & K6 |
| **V** | Site directed mutagenesis; DNA microarray; chromosome walking and jumping.Molecular techniques in prenatal diagnosis gene therapy, Transgenic animals (knockout mice) and plants (Flavr savr tomato), Pharmaceutical products (Vaccine, Humulin, etc), Crop improvement. Pesticide resistance, herbicide resistance, transgenic animals and GM foods; Modern Concepts in Genetic Analysis. | 10 | CO5 | K3,K4,K5 & K6 |

**Reference Books:**


- T.A. Brown, 2010. Gene cloning and DNA analysis: An introduction, 6th edition, Wiley-Blackwell.
- Sandy B.Primrose and Richard Twyman, 2006. Principles of Gene Manipulation and genomics, 7th edition, Wiley-Blackwell.
- Lewin, 2009. Genes X, 10th edition, Jones & Barlett Publishers
- Raymond Rodriguez and David T.Denhart 2003.Vectors, A survey of molecular cloning vectors and their uses
- Errst-L. Winnacker 1987.From genes to clones. Introduction to Gene Technology,
- Ed. David V. Geoddel 2002.Gene Expression technologies. Methods in enzymology (Vol.185)
- William Wu, Michael J.Welsh, Peter B.Kaufrmar, Helen H.Zhang 2001. Methods in Gene Biotechnology

**Core Paper-8**

## PRACTICAL-II
## (Microbiology, Plant and Animal Biotechnology & Genetic Engineering)

| **Paper – 8** | | | |
|---|---|---|---|
| Title of the paper | PRACTICAL-II (Microbiology, Plant and Animal Biotechnology & Genetic Engineering) | Subject code: | |
| Category of the course | Year | Semester | Credits |
| Core Paper | 1st | 2nd | 4 |

**Learning Outcome:**

The practical will establish a basic study skill on the subject and will improve the student's ability to have a hands on experience on the above core subjects.

**Course outcomes:**

| | |
|---|---|
| CO-1 | (K2) Isolate and identify microbes from various sources. |
| CO-2 | (K3) Characterize microbes. |
| CO-3 | (K4) Examine Plant and Animal cells and their functions |
| CO-4 | (K5) Assess extracted DNA, RNA and protein for rDNA technology |
| CO-5 | (K6) to study cloning tools |

| **SYLLABUS \| Core Paper-8 \| PRACTICAL-II** | | | | |
|---|---|---|---|---|
| **Unit** | **Content** | **Hours** | **COs** | **Cognitive level** |
| **A** | **(A) Microbiology-Practical**<br>1. Sterilization of glassware using dry heat- hot air oven<br>2. Sterilization of media using moist heat – autoclave<br>3. Filter sterilization<br>4. Liquid media preparation – nutrient broth<br>5. Solid media preparation – SDA plates<br>6. Preparation of Agar slants<br>7. Streak plate method<br>8. Pour plate method<br>9. Spread plate method | 15 | CO1<br>CO2<br>CO3<br>CO4<br>CO5 | K,.K2,K3,K4,K5 &K6 |

| | | | | |
|---|---|---|---|---|
| | 10. Enumeration of total count of the bacteria<br>10. 11. Isolation of microbes from soil<br>12. Isolation of microbes from water<br>13. Isolation of microbes from air<br>14. Isolation of microbes from plant surface.<br>15. Isolation of pure culture of E.coli,<br>16. Isolation of pure culture of Aspergillus niger,<br>17. Isolation of pure culture of Streptomyces.<br>18. Gram staining and morphological characterization of microbes.<br>19. Negative staining of bacteria<br>20. Determination of growth curve of bacteria – E.coli<br>21. IMViC test of enteric bacteria<br><br>**Demonstration**<br>16srRNA sequencing | | | |
| **B** | **(B) Plant and Animal Biotechnology - Practical:**<br>1. Plant tissue culture media preparation<br>2. Plant tissue culture sterilization techniques.<br>3. Generation of Callus from leaf<br>4. Generation of Callus from root<br>5. Generation of Callus from bud<br>6. Generation of Callus from shoot apex<br>7. Maintenance of callus culture.<br>8. Cell suspension culture<br>9. Anther culture<br>10. Pollen culture<br>11. Embryo culture.<br>12. Isolation of plant protoplast<br>13. Culture of plant protoplast.<br>14. Protoplast viability test.<br>15. Localization of nucleus using nuclear stain.<br>16. Agrobacterium culture maintenance and isolation of plasmid DNA.<br>17. Mass culture of Chlorella /Spirulina<br>18. Introduction to Animal Cell culture: Procedure for handling cells and medium.<br>19. Cleaning and sterilization of glassware and plastic tissue culture flasks<br>20. Preparation of tissue culture media<br>21. Preparation of sera for animal cell culture<br>22. Preparation of single cell suspension from chicken liver (Primary cell culture). | 15 | CO1<br>CO2<br>CO3<br>CO4<br>CO5 | K3,K4 & K5 |

| | | | | |
|---|---|---|---|---|
| | 23. Trypsinization of established cell culture.<br>24. Cell counting and viability - staining of cells (a) Vital Staining (Trypan blue, Erythrosin (b) Giemsa staining.<br>25. MTT Assay | | | |
| **C** | **(C) Genetic Engineering - Practical**<br>1. Preparation of plasmid DNA by alkaline lysis method.<br>2. Agarose gel electrophoresis<br>3. Silver staining of gels<br>4. Methylene blue DNA staining<br>5. Elution of DNA from agarose gel.<br>6. Restriction enzyme digestion.<br>7. Restriction mapping of plasmid DNA.<br>8. Ligation.<br>9. Competent cell preparation<br>10. Transformation and selection of recombinants.<br>11. Cloning of fragments in PBR322<br>12. Insertional inactivation/Blue white screening<br>13. RAPD<br>14. RFLP<br>15. Amplification of DNA - PCR<br>16. Determination of molecular weight of DNA<br>**Demonstration:**<br>RT-PCR for COVID-19 | 15 | CO1<br>CO2<br>CO3<br>CO4<br>CO5 | K3,K4 &K5 |

**Elective Paper-4**
**REGULATORY AFFAIRS AND INDUSTRIAL STANDARDS**

| **Paper – 4** | | | |
|---|---|---|---|
| Title of the paper | REGULATORY AFFAIRS AND INDUSTRIAL STANDARDS | Subject code: | |
| Category of the course | Year | Semester | Credits |
| Elective Paper | 1st | 2nd | 3 |

**Learning Outcome:**

The subject imparts knowledge on the fundamentals of regulatory requirement in industries. The student will be provided with a basic knowledge and understanding about the regulatory affairs based on biotechnological industry requirements.

**Course outcomes:**

| | |
|---|---|
| CO-1 | Elucidate the basic requirements of establish laboratory for testing samples as per the regulatory body's requirements |
| CO-2 | Describe the Scientific, technical knowledge about various food preservation techniques |
| CO-3 | Describe the basic concepts of packing of food materials, various parameters observed during packaging |
| CO-4 | Describe the testing of food materials and identifying of microbial food contaminant |
| CO-5 | Explain the basic of food safety management system, good manufacturing practice and good hygienic practices |

| **SYLLABUS \| Elective Paper-4 \| REGULATORY AFFAIRS AND INDUSTRIAL STANDARDS** | | | | |
|---|---|---|---|---|
| **Unit** | **Content** | **Hours** | **COs** | **Cognitive level** |
| **I** | **Planning, Organisation and setting of Food testing laboratory and laboratory safety**<br>Understand the requirements for setting up a laboratory for the legal defensibility of analytical data. The ideal structure design, environment, layout for microbiological testing and Air handling etc., Introduction about accreditation, Different accreditation bodies (NABL, APLAC, ILAC), Requirements for ISO/IEC 17025:2017, documentation, pre-requisites for accreditation, management requirements, technical requirements, measurement of traceability, Laboratory safety: Personnel and laboratory hygiene, emergency planning, general hazards in a food laboratory, safety equipment, storage of chemicals, acids, flammables etc, handling and biological spills and waste disposal. | 7 | CO1 | K2,K3,K4 |

| | | | | |
|---|---|---|---|---|
| **II** | **Principles of Food Preservation technology**<br>Heat: Principles of Heat transfer, Blanching, Pasteurization, Heat sterilization, thermal extrusion, cooking. Water Removal: Forms of Water in Foods, Sorption of water in foods, Water activity, drying and evaporation technology. Temperature reduction: Chilling, Freezing, Radiation: Ionizing Radiation, Microwave, Use of chemicals: Class-I & Class-II preservatives, smoke other chemical additives, New non-thermal methods: High hydrostatic pressure, modified atmosphere, high intensity pulsed electric fields, intense pulsed light, oscillating magnetic fields, hurdle technology, ultrasonic and ohmic heating etc. | 10 | CO2 | K2 & K3 |
| **III** | **Principles of Food Packaging technology**<br>Effect of environment on food stability: light, oxygen, water, temperature, sensitivity to mechanical damage | 10 | CO3 | K2,K3 & K4 |
| | and attack by biological agents, Different packaging materials used for food packaging and their properties including barrier properties, strength properties, optical properties: Glass, metals, paper, plastics, biodegradable and edible films and coatings aseptic packaging and combinations, Selection of packaging material and design for various food commodities including fresh produce (Fruits and vegetables), milk and milk products (dairy), cereal, pulses, oil, meat, fish, poultry, water and processed foods, Evaluation of quality and safety of packaging materials- different testing procedures, Function of packaging: Protective packaging and active packaging smart and intelligent packaging, Newer packaging technologies-CAP/MAP packaging aseptic processing and packaging, irradiated packaging, retort pouch and microwaveable packaging. | | | |

| | | | | |
|---|---|---|---|---|
| **IV** | **Food Microbiology and testing**<br>Introduction of Food microbiology: Classification and nomenclature of microorganisms. Morphology and structure of microorganisms in foods (yeast and Molds, Bacterial cells viruses), Important genera of mold, yeast, bacteria (Gram positive and Gram negative, facultative aerobic and anaerobic, endospore forming bacteria and non-sporulating bacteria), Bacterial groups (lactic acid, acetic acid, butyric acid etc.,), thermophilic, proteolytic, saccharomyticetc, coliforms, faecal coliforms, enteric pathogens and emerging microbes, Sources of microorganisms in food chain (raw materials, water, air, equipment etc) and microbiological quality of foods, Microbial growth characteristics: Reproduction and growth (fission, generation time optimum growth, growth curve etc). Microbial growth in foods: intrinsic (pH, Moisture content, oxidation-reduction potential, nutrient content, antimicrobial constituents and extrinsic parameters (temperature of storage, relative humidity of environment, presence and concentration of gases in the environment, Thermal destruction of microorganisms: Thermal death time, D Value, Z-Value, F-Value, thermal death time curve, 12 D Concept, Microbial food spoilage and food borne diseases, food pathogens, bacillus *cereus and other* | 10 | CO4 | K2,K3,K4 |
| | *bacillus species, campylobacter, clostridium species, Enterobacteriaceae, E. coli, listeria monocytogens, salmonella, shigella, staphylococcus aureus, vibrio species, yersinia enterocolitica, fungi, virus etc.*, Methods for the Microbiological examination of foods: Sampling activity and sampling plan, pure culture isolation: streaking, serial dilution and plating, cultivation, maintenance and preservation/stocking of pure culture, Observation of Indicator organisms: Direct examination, enumeration methods, plate count, MPN, biochemical test, Rapid methods detection of specific organisms. | | | |

| | | | | |
|---|---|---|---|---|
| **V** | **HACCP and Food safety management systems:**<br>ISO 22000: Importance of implementing a HACCP system and how it can be applied to various products. Prerequisite programs, HACCP principles, some limitation of HACCP food safety objective (FSO).<br>Food safety audits: Management review, audit certification and importance. Good manufacturing practices (GMP), Good hygienic practices (GHP), Food safety plan, food safety management risk analysis. Traceability food products recall and sanitation. | 7 | CO5 | K2,K3 & K6 |

**References:**


- ISO 9001, Quality management systems – Requirements
- ISO 17034 General requirements for the competence of reference material producers
- ISO/IEC 17043 Conformity assessment – General requirements for proficiency testing.
- Food safety standards authority regulation 2011.

**Elective Paper-5**

**PHARMACEUTICAL BIOTECHNOLOGY**

| **Paper – 5** | | | |
|---|---|---|---|
| Title of the paper | PHARMACEUTICAL BIOTECHNOLOGY | Subject code: | |
| Category of the course | Year | Semester | Credits |
| Elective Paper | 1st | 2nd | 3 |

**Learning Outcome:**

The subject imparts knowledge on the fundamentals of pharmaceutical biotechnology. The student will be provided with a basic knowledge and understanding about the pharmaceutical products produced based on biotechnological methods and its biomedical applications.

**Course outcomes:**

| | |
|---|---|
| CO-1 | Explain the basic components of pharmaceutical and biotechnology industry and methods and applications of biosensor |
| CO-2 | Describe the Scientific, technical and economic aspects of vaccine & rDNA technology |
| CO-3 | Describe the basic concepts of protein Engineering, therapeutic proteins and enzyme immobilization techniques |
| CO-4 | Describe the concepts of hybridoma technology, microbial biotransformation and microbial bio-transformed products |
| CO-5 | Explain the basic components of somatic gene therapy, Xeno-transplantation and fermenter and bio safety methods |

| **SYLLABUS \| Elective Paper-5 \| PHARMACEUTICAL BIOTECHNOLOGY** | | | | |
|---|---|---|---|---|
| **Unit** | **Content** | **Hours** | **COs** | **Cognitive level** |
| **I** | Introduction to concepts and technologies in pharmaceutical biotechnology and industrial applications, Biosensors- Working and applications of biosensors in pharmaceutical Industries; Pharmacology and Ethnopharmacology: Scope, applications and Importance. | 7 | CO1 | K1 |

| | | | | |
|---|---|---|---|---|
| **II** | Scientific, technical and economic aspects of vaccine research and development, Preparation of bacterial vaccines, toxoids, viral vaccine and antitoxins, Storage conditions and stability of vaccines, Recombinant DNA technology, Application of rDNA technology and genetic engineering in the production of: (i) Interferon (ii) Vaccines - hepatitis- B (iii) Hormones – Insulin, Brief introduction to Protein Engineering, Therapeutic proteins, Production of Enzymes- General consideration – Amylase, Catalase, Peroxidase, Lipase, Protease, Penicillinase, Methods of enzyme immobilization and applications | 7 | CO2 | K3 & K4 |
| **III** | Hybridoma technology - Production, Purification and Applications, Formulation of biotech products - Rituximab, Introduction to Microbial biotransformation and applications, Study of the production of – penicillins, citric acid, Vitamin B12, Glutamic acid and Griseofulvin Somatic gene therapy, Xenotransplantation in pharmaceutical biotechnology, Large scale production fermenter design and its various controls, Bio safety in pharmaceutical industry | 7 | CO3 | K2 |
| **IV** | Pharmacological activity of Plant drugs, Plant | 7 | CO4 | K2 & K4 |
| | Chemicals in modern pharmacology; biochemistry and pharmacology of atropine, caffeine, ephedrine, opioids, taxol, vinca alkaloids, synthetic substitutes for therapeutically active plant constituents; drug improvement by structure modification and bio-transformation. Criteria for pharmacological evaluation of drugs. | | | |
| **V** | Clinical Pharmacology, Drug therapy, therapeutic situation, benefits and risk of use of drugs, Mechanism of drug action, Therapeutic efficacy, Therapeutic index, tolerance, dosage forms and routes of drug action , factors affecting drug action; Adverse Drug reactions and drug poisoning-classification and causes of ADR; principle clinical manifestations and treatment of ADR, General principles of management of drug poiosoning; antidotes, classisfication of drugs. | 7 | CO5 | K1,K2 &K5 |

**Reference Books:**


- Harbans lal, 2011. Pharmaceuticals biochemistry. CBS Publishers and distributors Pvt. Ltd, Chennai.
- Carlos A. Guzmán and Giora Z. Feuerstein, 2009. Pharmaceutical Biotechnology, 1st edition, Springer.
- Daniel Figeys (Ed.). 2005. Industrial Proteomics: Applications for Biotechnology and Pharmaceuticals. Wiley, John & Sons, Incorporated.
- Kayser, O and Muller R.H.. 2004. Pharmaceutical Biotechnology Drug Discovery and Clinical Applications. WILEY-VCH
- Leon Shargel, Andrew B. C. Yu, Susanna Wu-Pong, and Yu Andrew B. C. 2004. Applied Biopharmaceutics & Pharmacokinetics. McGraw-Hill Companies
- Stefania Spada, Garywalsh. 2004. Directory of approved biopharmaceutical
- Gary Walsh. 2003. Biopharmaceutical, Biochemistry & Biotechnology.
- Heinrich Klefenz. 2002. Industrial pharmaceutical biotechnology.
- Thomas Lengauer (Ed.). 2002. Bioinformatics – from Genomes to Drugs. Volume I& II. Wiley-VCH.
- John F. Corpenter (editor), Mark C. Manning. 2002. Rational Design of stable formulation Theory and Practice (Pharmaceutical Biotechnology). Plenum, US. Ist edition.
- D.I.A. Crommelin, et al., 2002. Pharmaceutical Biology. Amazon prime publications.
- Werner Kalow, Urs A Meyer and Rachel F. Tyndale. 2001.
- Pharmacogenomics. CPL press.


**Useful Websites:**

- https://tugasakhirsttifbogor.files.wordpress.com/2018/08/pharmaceutical-biotechnology.pdf
- http://library.nuft.edu.ua/ebook/file/Gad2007.pdf
- https://oasis.iik.ac.id:9443/library/repository/a932eb462c49885a2c72755977036b81.pdf

**Elective Paper-6**
**ENVIRONMENTAL BIOTECHNOLOGY**

| Paper – 6 | | | |
|---|---|---|---|
| Title of the paper | ENVIRONMENTAL BIOTECHNOLOGY | Subject code: | |
| Category of the course | Year | Semester | Credits |
| Elective Paper | 1st | 2nd | 3 |

**Learning Outcome:**
The subject imparts knowledge on the fundamentals of ecology and pollution. The student will be provided with a basic knowledge and understanding about the functions of ecosystem and reduction of pollution by biotechnological tools.

**Course outcomes:**
On successful completion of the course the students will be able to

| | |
|---|---|
| CO-1 | (K2) explain various waste management methods |
| CO-2 | (K3) classify potential methods of biodegrading organic pollutants. |
| CO-3 | (K4) examine the techniques involved in remediation of polluted environments |
| CO-4 | (K5) assess types of pollution & its control |
| CO-5 | (K6) compile biotechnological approaches to degrade xenobiotic compounds |

| SYLLABUS \| Elective Paper-6 \| ENVIRONMENTAL BIOTECHNOLOGY | | | | |
|---|---|---|---|---|
| **Unit** | **Content** | **Hours** | **COs** | **Cognitive level** |
| **I** | Environment: Basic concepts and issues; Environmental management and Conservation, Environmental Laws & Agencies involved in conservation. Environmental Pollution: Types of pollution & its control strategies -Air pollution, Soil pollution, Water pollution, Oil pollution & Radioactive pollution | 7 | CO1 CO5 | K2 |
| **II** | Biofilm Kinetics: Completely mixed biofilm reactor-Soluble microbial products and inert biomass-Special-case biofilm solution. Reactor types:- batch reactor - continuous-flow stirred-tank reactor- Plug-flow reactor. Engineering design of reactors- Reactors in series | 7 | CO1 CO2 CO5 | K3 |
| **III** | Waste water management, source of waste water, Waste water treatment- physical, chemical and biological treatment. Microbiology of Waste water; Aerobic and anaerobic process, BOD and COD. | 7 | CO3 | K4 |
| **IV** | Toxicity: Types and Test for evaluating Toxicity. Biosensors, Biomonitoring of toxic materials .Biomagnification, Biomining and Biofuels | 7 | CO4 | K5 |

| | | | | |
|---|---|---|---|---|
| **V** | Bioremediation; *In-situ and Ex-situ* Bioremediation of contaminated soils and waste land; Microbiology of degradation of Xenobiotics in environment; Pesticides, Surfactants, Degradative plasmids. Solid waste: Composting, Vermiculture and methane production. | 7 | CO5 | K6 |

**Reference Books:**


- Gareth M. Evans, Gareth G. Evans, Judy Furlong 2011
- Environmental biotechnology: theory and application John Wiley & Sons, Ltd. West Sussex, UK
- M. Moo-Young, W.A. Anderson, A.M. Chakrabarty, 2010. Environmental Biotechnology: Principles and Applications. Springer.
- M. H. Fulekar, 2010 Environmental Biotechnology, by Science Publishers Department of Life Sciences, University of Mumbai, India,
- Stanley E. Manahan, 2009. Environmental Chemistry, Ninth Edition, CRC Press.
- Environmental chemistry 5th edition by A.K.De. 1997.
- Bruce E. Rittmann and Perry L. McCarty. 2001. Environmental Biotechnology :Principles and applications. McGraw Hill, Newyork.
- Ahmed N, Qureshi, F.M. and Khan, O.Y. 2001.Industrial and Environmental Biotechnology. Horizon Press.
- Ahmed N, Qureshi, F.M. and Khan, O.Y. 2001.Industrial and Environmental Biotechnology. Horizon Press.


**Useful Websites:**

- lbewww.epfl.ch/LBE/Default_E.htm
- http://lbe.epfl.ch

**Extra disciplinary subject for other department students**
**TISSUE ENGINEERING**

| **Paper –** | | | |
|---|---|---|---|
| Title of the paper | TISSUE ENGINEERING | Subject code: | |
| Category of the course | Year | Semester | Credits |
| Extra disciplinary subject | 2nd | 3rd | 3 |

**Learning Outcome:**

The subject imparts knowledge on the fundamentals of tissue and its function. The student will be provided with a basic knowledge and understanding about the functions of tissue and its biomedical applications.

**Course Outcome:**

| | |
|---|---|
| CO-1 | Understand the basics of Basics of Tissue Engineering |
| CO-2 | Apply the knowledge to create tissue culture methods |
| CO-3 | Acquire adequate knowledge in the use of tissue in medical application |
| CO-4 | Evaluate the benefits of Tissue Engineering & Pharmaceutical Products |
| CO-5 | Analyze the importance of applications of tissue engineering |

| **SYLLABUS \| Extra disciplinary subject \| TISSUE ENGINEERING** | | | | |
|---|---|---|---|---|
| **Unit** | **Content** | **Hours** | **Cos** | **Cognitive level** |
| **I** | Basic biology of tissue engineering: The basis of growth and differentiation-morphogenesis and tissue engineering | 7 | CO1 | K4 & K5 |
| **II** | In vitro control of tissue development-Growth factors-Tissue engineering bioreactors- In vitro synthesis of Tissue and organs- Organotypic and histotypic engineered tissues. 3D cell culture-Tissue assembly in microgravity | 7 | CO2 | K3 & K5 |
| **III** | Biomaterials in tissue engineering-Scaffolds, extracellular matrix, polymers and nanocomposites. Approaches to transplanting engineered cells | 7 | CO3 | K1,K2,K3 & K4 |
| **IV** | Bioartificial pancrease, Hepatassist liver support system, Artificial Womb, Heamatopoietic system: Red blood cell substitutes, Renal replacement devices | 7 | CO4 | K2,K3,K4,K5 |
| **V** | Structural tissue engineering-Bone regeneration through cellular engineering, Skin tissue engineering, Brain implants-Neural stem cells, Periodontal applications | 7 | CO5 | K2,K3,K4 & K6 |

**Reference Books:**


- Sylvia, S. Mader, 2011, Human Biology, Twelfth edition, Mc Graw Hill, USA.
- Robert P. Lanaza, Robert Langer and Joseph Vacanti, 2007. Principles of Tissue Engineering. Third edition Academic Press.
- Micklem.H.S., Loutit John.F., 2004, Tissue grafting and radiation, Academic Press, New York..
- Penso.G., Balducci.D., 2004.Tissue cultures in biological research,Elsevier, Amsterdam
- Cecie Starr, 1996, Biology, Third edition , Wordsworth, America.


**Useful Websites:**

- www.nuigalway.ie/anatomy/tissue_engineering.htm

**Core Paper-9**
**BIOINFORMATICS**

| **Paper – 9** | | | |
|---|---|---|---|
| Title of the paper | BIOINFORMATICS | Subject code: | |
| Category of the course | Year | Semester | Credits |
| Core Paper | 2nd | 3rd | 4 |

**Learning Outcome:**
The paper imparts a thorough knowledge of the basics of bioinformatics tools. The student will get to understand the core concepts of in Silico biological research.

**Course outcomes:**

| | |
|---|---|
| CO-1 | To get introduced to the basic concepts of Bioinformatics and its significance in Biological data analysis. |
| CO-2 | Describe the history, scope and importance of Bioinformatics and role of internet in Bioinformatics. |
| CO-3 | Explain about the methods to characterize and manage the different types of Biological data. |
| CO-4 | Classify different types of Biological Databases. |
| CO-5 | Introduction to the basics of sequence alignment and analysis |

| **SYLLABUS \| Core Paper-9 \| BIOINFORMATICS** | | | | |
|---|---|---|---|---|
| **Unit** | **Content** | **Hours** | **COs** | **Cognitive level** |
| **I** | Database concepts, Introduction to internet and its application, Introduction to bioinformatics, Protein and nucleotide databases, Information retrieval from biological databases, Sequence alignment and database searching-similarity searches using BLAST and FASTA. Artificial Intelligence: Introduction to biological neural network, motivation for artificial neural network (ANN), Big data analysis - DNA/RNA/protein sequence or structure data, gene expression data, protein-protein interaction (PPI) data, pathway data and gene ontology (GO) data | 10 | CO1 | K1 & K2 |
| **II** | Sequence alignment basics, match, mismatch, similarity, scoring an alignment, gap penalty, protein vs DNA alignments, Dot-matrix alignment, pairwise alignment. Global and local alignment algorithms, multiple sequence alignment-progressive alignment and Iterative alignment algorithms, consensus sequence, patterns and profiles, Database searching: | 10 | CO2 | K2,K3 & K5 |

| | | | | |
|---|---|---|---|---|
| | Pairwise alignment based rigorous algorithm (Smith and Waterman) and Heuristic algorithms (FASTA and Blast). Multiple sequence alignment based database searching. PSI- Blast, PAM and Blosum matrices | | | |
| **III** | Bioinformatics for genome sequencing, EST Clustering and analyses, Finding genes in prokaryotic and eukaryotic genomes, Regulatory sequence analysis, Bioinformatics for Genome maps and markers, Bioinformatics for understanding Genome variation, Protein structure-X-ray crystallography, The protein databank and the PDBSum-SCOP, CATH, DALI and HSSP ;Visualization of molecular structures-RasMol and Pymol; Protein secondary structure prediction, Fold Recognition; Transmembrane topology prediction | 10 | CO3 | K2 & K5 |
| **IV** | Molecular visualization tools. Rasmol, Chime and Spdb viewer. Structure analysis tools. VAST and DALI, Structural biology - Homology modeling, Bioinformatics for micro array designing and transcriptional profiling, Bioinformatics for metabolic reconstruction, Bioinformatics for phylogenetic analysis | 10 | CO4 | K4 & K5 |
| **V** | Medical application of Bioinformatics. Disease genes, Drug Discovery. History. Steps in drug discovery. Target Identification. Target Validation. QSAR. Lead Identification. Preclinical pharmacology and toxicology. ADME. Drug designing. Rational drug design. Computer aided drug design. Ligand based approach. Target based approach | 10 | CO5 | K3,K4 & K6 |

**Reference Books:**


- DassanayakeS.Ranil, Y.I.N. Silva Gunawardene, 2011. Genomic and Proteomic Techniques, Narosa Publishing House Pvt. Ltd, New Delhi.
- Thiagarajan B, Rajalakshmi.P.A., 2009. Computational Biology, MJP publishers, Chennai.
- BosuOrpita, SimminderKaurThukral, 2007. Bioinformatics Databases, Tools and Algorithms, Oxford University press, New Delhi.
- Rastogi.S.C, Mendiratta.N, Rastogi.P, 2004. Bioinformatics methods and applications, Prentice-Hall of India private limited, New Delhi.
- Lohar s. Prakash, 2009. Bioinformatics, MJP Publishers, Chennai.
- Stephen misener and Stephen A. Krawetz., 2000. Bioinformatics methods and protocols, Humana press Inc, New Jersey.
- Durbin.R, S.Eddy, A.Krogh and G.Mitchison, 1998. Biological sequence analysis, Cambridge university press, Cambridge.

**Core Paper-10**
**IMMUNOLOGY**

| Paper – 10 | | | |
|---|---|---|---|
| Title of the paper | IMMUNOLOGY | Subject code: | |
| Category of the course | Year | Semester | Credits |
| Core Paper | 2nd | 3rd | 4 |

**Learning Outcome:**
The paper imparts a thorough knowledge on the basics of immunology. The student will get to understand the core concepts of immune systems and their non-specific and specific mechanisms, vaccine, etc.

**Course outcomes:**
At the end of the course the students will be able to

| | |
|---|---|
| CO-1 | (K2) Illustrate various mechanisms that regulate immune responses and maintain tolerance |
| CO-2 | (K3) describe key events and cellular players in antigen presentation, and how the nature of the antigen will shape resulting effector responses |
| CO-3 | (K4) learn the concepts of cellular and molecular processes that represents the human immune system. |
| CO-4 | (K5) elucidate the role of immunological regulation and tolerance at a cellular and molecular level |
| CO-5 | (K6) compile concepts on immunological principles and diagnosis |

| SYLLABUS \| Core Paper-10 \| IMMUNOLOGY | | | | |
|---|---|---|---|---|
| **Unit** | **Content** | **Hours** | **COs** | **Cognitive level** |
| **I** | History and overview of the immune system. Types of immunity - innate, acquired, passive and active, self vs non-self-discrimination. Physiology of immune response: HI and CMI specificity and memory. Cells and organs of the immune system .Lymphoid tissue, origin and development. Hematopoiesis and differentiation of lymphocytes | 10 | CO1 | K1 & K2 |
| **II** | Lymphocyte-sub-populations of mouse and man. APC cells, lymphokines, Phagocytic cells, macrophage, dendritic cells, K and NK Cells. Nature and biology of antigens, epitopes, haptens, adjuvents. Immunoglobulins- structure, distribution and function. Immunoglobulin super family Isotypic, Allotypic and Idiotypic variants, generation of antibody diversity | 10 | CO2 | K2,K3 & K5 |

| | | | | |
|---|---|---|---|---|
| **III** | Monoclonal antibody production and its applications. Types of vaccine and vaccination schedule. Role of MHC antigens in immune responses, Structure and function of class I and class II MHC molecules. MHC antigens in transplantation and HLA tissue typing. Transplantation immunology- immunological basis of graft rejection, cinical transplantation and Immunosuppressive therapy. Tumour Immunology - Tumour antigen, Immune response to tumours | 10 | CO3 | K2 & K5 |
| **IV** | Effector mechanisms in immunity - macrophage activation, cell mediated cytotoxicity, cytotoxicity assay. Hypersensitivity reactions and types. The complement system, mode of activation, classical and alternate pathway, biological functions of C proteins | 10 | CO4 | K4 & K5 |
| **V** | Immunotechniques- Principle and Applications: Immuno diffusion,Immuno fluorescence, Insitu localization technique - FISH and GISH. RIA and ELISA, FACS, Western blot, ELISPOT assay. Agglutination tests. VDRL test.Purification ofantibodies, Quantitation of immunoglobulin by RID, EID and nephelometry, CMI techniques and Immunotherapy. | 10 | CO5 | K3,K4 & K6 |

**Reference Books:**


- Peter J. Delves, Seamus J. Martin, Dennis R. Burton, Ivan M. Roitt,2011.
- Roitt.s Essential Immunology, 12 edition, Wiley-Blackwell. USA.
- Kannan. I., 2010. Immunology. MJP Publishers, Chennai.
- Abbas, A.K., A.H.L. Lichtman and S.Pillai, 2010. Cellular and MolecularImmunology. 6th Edition. Saunders Elsevier Publications, Philadelphia.
- SeemiGarhat Bashir, 2009. Text Book of Immunology, PHI LearningPvt. Ltd. New Delhi.
- Thomas J. Kindt, Barbara A. Osborne and Richard A. Goldsby, 2006.Kuby Immunology, 6th edition, W. H. Freeman & Company.
- Nandini Shetty, 1996, Immunology: introductory textbook - I. NewAge International, New Delhi.


**Useful Websites:**

- www.library.csusm.edu/course guides/biology
- www.immunologylink.com
- http://www.wiley.com/college/bio/karp12791/weblinks.html

**Core Paper-11**
**BIOPROCESS TECHNOLOGY**

| **Paper – 11** | | | |
|---|---|---|---|
| Title of the paper | BIOPROCESS TECHNOLOGY | Subject code: | |
| Category of the course | Year | Semester | Credits |
| Core Paper | 2nd | 3rd | 4 |

**Learning Outcome:**
The paper imparts a thorough knowledge on the basics of bioprocess and industrial fermentation. The student will get to understand the core concepts of fermentation and its commercial application.

**Course outcomes:**
The student will learn about the:

| | |
|---|---|
| CO-1 | (K2) Outline the basis of Bioprocess Engineering |
| CO-2 | (K3) Relate reactors in fermentation |
| CO-3 | (K4) Differentiate fermentation processes |
| CO-4 | (K5) Assess Scale up and Scale down |
| CO-5 | (K6) Compile the output of fermentation processes |

| **SYLLABUS \| Core Paper-11 \| BIOPROCESS TECHNOLOGY** | | | | |
|---|---|---|---|---|
| **Unit** | **Content** | **Hours** | **COs** | **Cognitive level** |
| **I** | Introduction to fermentation. General requirements of fermentation. Microbial growth kinetics of batch and continuous culture. Solid substrate, slurry fermentation and its application. Microbial cell culture. Immobilization of cells and enzymes. Food Safety: Introduction to food safety aspects and food related hazards – HACCP and ISO. | 10 | CO1 | K1 & K2 |
| **II** | Types of bioreactors: Submerged reactors, surface reactors, mechanically agitated reactors, non-mechanically agitated reactors. Design of fermenters, body construction. Production of citric acid, penicillin and insulin. Isolation and improvement of Industrially important Micro-organisms, Media for Industrial fermentation and Sterilization. | 10 | CO2 | K2,K3 & K5 |
| **III** | Introduction to bioproducts and bioseparation. Primary recovery process: Cell disruption methods. Cell lysis and Flocculation: Osmotic and mechanical methods of lysis. Flocculation by electrolysis; polymorphic flocculation. Precipitation methods. | 10 | CO3 | K2 & K5 |

| | | | | |
|---|---|---|---|---|
| | Filtration: Principles, Conventional, Crossflow filtration. Sedimentation: Principles, Sedimentation coefficients. Extraction Principles, Liquid liquid extraction, aqueous two phase extraction, supercritical fluid extraction. | | | |
| **IV** | Down Stream Processing: Chromatography Techniques, Membrane separation, ultrafiltration. Drying .Principles and operation of vacuum dryer, shelf dryer, rotary dryer, freezer and spray dryer. Crystallization and Whole broth processing. | 10 | CO4 | K4 & K5 |
| **V** | Aerobic and anaerobic fermentation processes and their application in the field of biotechnology industry. Production of commercially important primary and secondary metabolites, Effluent Treatment and Fermentation Economics. | 10 | CO5 | K3,K4 & K6 |

**Reference Books:**


- Min-tzeLiong, 2011. Bioprocess Sciences and Technology. NovaScience Pub Inc.
- Michael L.Shuler, FikretKargi. 2003. Bioprocess Engineering. PHIpublishers.
- P.A.Belter, E.L.Cursler, and W.S.Hu. 1988.Bioseparation: Downstream processing for Biotechnology. John Wiley and sons.
- R.G. Harrison, P.Todd, SR.Rudge and D.P. Petrides. 2003.Bioseparation science and engineering. Oxford Press.


**Useful Websites:**

- www.wildfermentation.com/John Schollar and BenedikteWatmore, Practical Fermentation-a technicalguide
- web.mit.edu/professional/short.../fermentation_technology.html

**Core Paper-12**
**PRACTICAL-III**
**(Bioinformatics, Immunology & Bioprocess Technology)**

| **Paper – 12** | | | |
|---|---|---|---|
| Title of the paper | PRACTICAL-III (Bioinformatics, Immunology & Bioprocess Technology) | Subject code: | |
| Category of the course | Year | Semester | Credits |
| Core Paper | 2nd | 3rd | 4 |

**Learning Outcome:**

The practical will establish a basic study skill on the subject and will improve the student's ability to calculate and improve their practical skill and knowledge.

**Course outcomes:**

| | |
|---|---|
| CO-1 | (K2) to learn the Bioinformatics tools for sequence retrieval and alignment |
| CO-2 | (K3) to apply the learned tools for various applications |
| CO-3 | (K4) to isolate, identify & enumerate immune cells |
| CO-4 | (K5) to learn the technique of immunodiagnostics |
| CO-5 | (K6) to study upstream & downstream techniques |

| SYLLABUS \| Core Paper-12 \| PRACTICAL-III | | | | |
|---|---|---|---|---|
| **Unit** | **Content** | **Hours** | **COs** | **Cognitive level** |
| **A** | **(A) Bioinformatics-practical**<br>1. Sequence retrieval from Genbank<br>2. Sequence retrieval from Uniprot.<br>3. Sequence identity search- Sequence similarity search using BLAST<br>4. Sequence similarity search using FASTA<br>5. Sequence similarity search using PSI BLAST<br>6. Sequence similarity search using PHI- BLAST.<br>7. Prediction of signal sequence using SignalP online tool<br>8. Pattern Search (Domains & Motifs) using Pfam<br>9. ORF gene Search - Genscan<br>10. Sequence translation using ExPASy translate tool<br>11. Characterization of retrieved protein sequence by ProtParam tool.<br>12. Pair-wise global sequence alignment using EBI-EMBOSS Needleman Wunsch tool<br>13. Pair-wise local sequence alignment using EBI-EMBOSS Smith Waterman tool<br>14. Multiple sequence alignment using EBI-CLUSTALW2.<br>15. PHYLOGENY- Phylogenetic tree using PHYLIP.<br>16. Prediction of secondary protein structure using GOR (Garnier Osguthorpe-Robson) server.<br>17. Prediction of tertiary protein structure using SWISS-MODEL Server<br>18. Validation of the predicted structure using PROCHECK server<br>19. Molecular visualization of proteins using RASMOL.<br>20. Docking of small molecule with protein structure using Hex software. | 15 | CO1<br>CO2<br>CO3<br>CO4<br>CO5 | K1,K2,K3,K4 &K5 |

| | | | | |
|---|---|---|---|---|
| | 21. Docking of two proteins using PatchDock (Protein-Protein docking) tool.<br>22. Retrieval of E.Coli glycolytic pathway from KEGG | | | |
| **B** | **(B) Immunology - practical**<br>1. Identification of various immune cells from human peripheral blood.<br>2. Lymphocyte separation and identification<br>3. Determination of lymphocyte viability by trypan blue method<br>4. WBC counting<br>5. Preparation of serum and plasma<br>6. Electrophoretic profile of human serum in native PAGE<br>7. Preparation of cellular antigen – human RBC<br>8. Preparation of antigen-adjuvent mixture for production of polyclonal antibody<br>9. Isolation of IgG molecule from serum<br>10. Immunodiagnostics: CRP<br>11. Immunodiagnostics: ASO<br>12. Immunodiagnostics: Widal<br>13. Immunodiagnostics: RA<br>14. Immunodiagnostics: Blood grouping and typing<br>15. Immunodiagnostics: hCG<br>16. ELISA<br>17. Radial Immunodiffusion<br>18. Ouchterlony Immunodiffusion<br>19. Immunoelectrophoresis<br>20. Rocket electrophoresis<br>21. Counter current immunoelectrophoresis.<br>22. Bioassays for cytokines<br>23. Radioimmunoassays (Demonstration) | 15 | CO1<br>CO2<br>CO3<br>CO4<br>CO5 | K2,K3,K4 |
| **C** | **(C) Bioprocess Technology - Practical**<br>1. Parts and design of fermenter<br>2. Solid state fermentation<br>3. Submerged fermentation<br>4. Foaming and antifoaming agents<br>5. Media preparation and sterilization<br>6. Isolation of industrially important microorganisms for microbial processes.<br>7. Conservation of Bacteria by Lyophilization.<br>8. Production and estimation of protease<br>9. Production and estimation of amylase.<br>10. Production of wine using grapes<br>11. Production of penicillin | 15 | CO1<br>CO2<br>CO3<br>CO4<br>CO5 | K2,K3,K4 & K5 |

| | | | | |
|---|---|---|---|---|
| | 12. Determination of penicillin activity<br>13. Citric acid production<br>14. Use of alginate for cell immobilization.<br>15. Media standardization (C:N ratio) for maximum biomass production of an industrially important microorganism.<br>16. Cell disruption (Sonication)<br>17. Aqueous Two Phase Extraction of enzymes | | | |

**Elective Paper-7**
**NANO BIOTECHNOLOGY**

| Paper – 7 | | | |
|---|---|---|---|
| Title of the paper | NANO BIOTECHNOLOGY | Subject code: | |
| Category of the course | Year | Semester | Credits |
| Elective Paper | 2nd | 3rd | 3 |

**Learning Outcome:**
The subject imparts knowledge on the fundamentals of nanoparticles. The student will be provided with a basic knowledge and understanding about the role of nanoparticles in biotechnology.

**Course outcomes**:

| | |
|---|---|
| CO-1 | Understand the bases for Introduction to Nanotechnology |
| CO-2 | To impart understanding on Nanoparticle based Drug Delivery. |
| CO-3 | Fabrication of nanomaterials for bone tissue grafting |
| CO-4 | Methods of Nanofabrication |
| CO-5 | Understand the application of Nanotechnology |

| SYLLABUS \| Elective Paper-7 \| NANO BIOTECHNOLOGY | | | | |
|---|---|---|---|---|
| **Unit** | **Content** | **Hours** | **COs** | **Cognitive level** |
| **I** | Introduction to Nanotechnology- Scientific revolution, Feynman's vision, Classification of nanobiomaterials -Types of nanomaterials – nanoparticles, nanotubes, nanowires, Nanofibers, Size deoendent variation in the properties of Nanomaterials, Nature's Nanophenomena. | 7 | CO1 | K1 |
| **II** | Preparation of Nanomaterials, Top down and bottom up approaches, Biosynthesis, Nanobiomaterials- Polymer, Ceramic, Metal based Nanobiomaterials, Carbon based Nanomaterials, DNA based Nanostructures, Protein based Nanostructures, | 7 | CO2 | K4 |

| | | | | |
|---|---|---|---|---|
| | Quantum dots, Magnetic Nanoparticles, Nanofibres, Hydrogels, Films and Scaffolds. | | | |
| **III** | Application of Nanomaterials in Bone substitutes and Dentistry, Food and Cosmetic applications, Bio-sensors and Lab-on-a-chip, Bio-devices and implantable devices, Bioremediation, Nanomaterials for anti-microbial coating – medical implants and paints, Application of Nanotechnology in textile industry. | 7 | CO3 | K1 & K5 |
| **IV** | Nanomaterials for diagnosis and therapy, Implications of drug delivery, Nano-carriers for application in medicine, polymeric nanoparticles as drug carriers, Drug release mechanism, Targeted Drug Delivery using nanocarriers, Nanoparticle technologies for cancer therapy and diagnosis, Point of Care and Personalized medicine, Magnetic nanoparticles for imaging and Hyperthermia. | 7 | CO4 | K2 |
| **V** | Nanotoxicology, Portals of Entry of the nanoparticles into the Human Body, Bio-toxicity of Nanoparticles, Nanoparticles in Mammalian systems and Health threats, Biological response and cellular interaction of implant materials and scaffolds, Risk assessment and Safety Regulation of nanoparticles. | 7 | CO5 | K5 |

**Reference Books:**


- Nanotechnology, S.Shanmugam, Mjp publication. 2011.
- Advanced nanomaterials, kurt E. geckeler, Hiroyuki Nishide , Wiley VHC.2010.
- Nanotechnology and tissue engineering. T.Laurencin, Lakshmi S. Nair, CRC press. 2012.
- Handbook of carbon nanomaterials. Francis D souza, Karl M. Kadish.
- World scientific publishing co. pte. ltd. 2011.
- Oded Shoseyov (Editor), Ilan Levy, 2010. NanoBioTechnology: BioInspired Devices and Materials of the Future, Humana Press.
- Chad A. Mirkin and Christof M. Niemeyer, 2007. Nanobiotechnology II: More Concepts and Applications, Wiley-VCH.
- Challa S.S.R.Kumar (Ed). 2006. Biologicals and pharmaceutical nanomaterials, Wiley-VCH Verlag Gmbh & Co, KgaA.
- K.K.K.Jain 2006. Nanobiotechnology in Molecualr Diagnostics: Current Techniques and Applications Horizon Bioscience
- Niemeyer, C.M., Mirkin, C.A. (Eds). 2004. Nanobiotechnology Concepts, Applications and Perspectives, Wiley-VCH, Weinheim.
- Andrze w. Miziolek, Shashi P.Karna, J malthew Mauro and Richard A.Vaia. 2005 Defense Applications of Nanomaterials :
- Springer Handbook of Nanotechnology- Ed. by B. Bhushan, Springer-Verlag (2004)

- The Chemistry of Nanomaterials: Synthesis, Properties and Applications, C.N.R. Rao, A. Muller, A. K. Cheetham (Eds), Wiley-VCH Verlag (2004)
- Nanomaterials for medical diagnosis and therapy, Challa Kumar, Wiley-VCH, 2007.
- Nanotechnology for cancer therapy, Mansoor M. Amiji, CRC Press, 2007.
- K.K.Jain, Nano Biotechnology, Horizions Biosciences, 2006
- Nanomaterials: An introduction to synthesis, properties and application, Dieter Vollath, Wiley VCH, 2008
- Cato T. Laurencin and Lakshmi S. Nair, Nanotechnology and Tissue Engineering The
- Scaffold, CRC Press taylor& Francis Group.
- Introduction to Nanoscience and Nanotechnology, Gabor .L et al, Fundamentals of Nanotechnology, Hornyak, G. Louis, Tibbals, H. F., Dutta, Joydeep, CRC Press, 2009.
- Assessing Nanoparticle Risks to Human Health, Gurumurthy Ramachandran, Elesvier, 2011.
- Nanotechnology: Environmental Health and safety, Risks, Regulation and Management, Matthew Hull and Diana Bowman, Elsevier, 2010.
- Nanotechnology: Health and Environmental Risks, Jo Anne Shatkin, CRC Press, 2013


**Useful Websites:**

http://www.zyvex.com/nano www.fda.gov/nanotechnology/ www.nature.com/nnano/

**Elective Paper-8**
**MOLECULAR DEVELOPMENTAL BIOLOGY**

| **Paper – 8** | | | |
|---|---|---|---|
| Title of the paper | MOLECULAR DEVELOPMENTAL BIOLOGY | Subject code: | |
| Category of the course | Year | Semester | Credits |
| Elective Paper | 2nd | 3rd | 3 |

**Learning Outcome:**
The subject imparts knowledge on the fundamentals of developmental biology. The student will be provided with a basic knowledge and understanding about the molecular aspects of developmental biology.

**Course outcomes:**

| | |
|---|---|
| CO-1 | Illustrate the structure and function of developmental biology, Gametogenesis |
| CO-2 | Discuss basic fertilization process of animals |
| CO-3 | Demonstrate the functions of embryonic development process |
| CO-4 | Illustrate the organ development of vertebrate animals |
| CO-5 | Demonstrate the impact of gene in developmental biology and developmental disorders |

| **SYLLABUS \| Elective Paper-8 \| MOLECULAR DEVELOPMENTAL BIOLOGY** | | | | |
|---|---|---|---|---|
| **Unit** | **Content** | **Hours** | **COs** | **Cognitive level** |
| **I** | Definition and scope of developmental biology. Gametogenesis - Spermatogenesis and Oogenesis. Structure of Sperm and oocyte. Instructive and permissive interactions, competence, epithelial - mesenchymal interactions. Important signaling pathways in vertebrate development | 7 | CO1 | K1,K2 & K5 |
| **II** | Fertilization - Definition, mechanism of fertilizatiom in mammal & sea urchin. Types of fertilization. Nieuwkoop center, Molecular role of organizer | 7 | CO2 | K4 |
| **III** | Cleavage in Xenopus, Chick and mammals, Regulation of cleavage cycle. Morphogenetic movements, Gastrulation in Xenopus, Chick and mammals. Fate Maps | 7 | CO3 | K3 |
| **IV** | Vertebrate Development: Formation of the neural tube, myogenesis, and hematopoiesis. Mechanism of vertebrate eye development | 7 | CO4 | K2 |
| **V** | Drosophila Maternal effect genes, induction at single cell level - differentiation of photoreceptors in ommatidia. Developmental disorders Spina bifida, Anenecephaly, and craniorachischis, Cyclopia, Thanotrophic dysplasia | 7 | CO5 | K1 & K4 |

**Reference Books:**


- Scott F.Gilbert, 2010. Developmental Biology, 9th edition, Sinauer Associates Inc.
- Subramoniam, T. 2002. Developmental Biology. 1st edition. Narosa publications.
- Richard M.Twynman, 2001 Developmental Biology. (2 nd edition), Viva Publications, New Delhi.


**Useful Websites:**

sackler.tufts.edu/.../Cell-Molecular-and-Developmental-Biology www.devbio.com/

## INTERNSHIP

| Paper – | | | |
|---|---|---|---|
| Title of the paper | INTERNSHIP | Subject code: | |
| Category of the course | Year | Semester | Credits |
| Paper | 1st | 2nd | 2 |

**Learning Outcome:**

To gain hands on training and expertise in handling sophisticated instruments and acquire in depth knowledge in their applications.

**Course outcomes**:

The student will learn to

| | |
|---|---|
| CO-1 | (K2) understand working principles and the techniques of various processes |
| CO-2 | (K3) apply standard operating procedures followed in industries |
| CO-3 | (K3) prepare to face challenges & gain confidence in the field of study. |
| CO-4 | (K5) critically assess the utilization of sophisticated instruments and expensive consumables |
| CO-5 | (K6) develop work ethics to be followed in a scientific laboratory |

**Extra disciplinary subject for other department students**

## GENE MANIPULATION TECHNOLOGY

| **Paper –** | | | |
|---|---|---|---|
| Title of the paper | GENE MANIPULATION TECHNOLOGY | Subject code: | |
| Category of the course | Year | Semester | Credits |
| Extra disciplinary subject | 1st | 2nd | 3 |

**Learning Outcome:**

After studying this course, students will be able to:

- To understand more about the science that underlies the development of genetically modified organisms and in particular how gene transfer is brought about
- To know something of the potential benefits and uncertainties associated with gene transfer and the high levels of technical ingenuity involved
- To understand more the science that underpins the development of Golden Rice and understand why the usefulness of this product has proved so contentious.

**Course Outcome:**

| | |
|---|---|
| CO-1 | Understand the basics of Basics of Gene Manipulation Technology |
| CO-2 | Apply the knowledge to create Constructions of DNA Libraries Constructions of DNA Libraries. |
| CO-3 | Acquire adequate knowledge in the use of Genome Sequencing and Transcriptomics |
| CO-4 | Evaluate the benefits of Protein Engineering & Pharmaceutical Products |
| CO-5 | Analyse the importance of Gene Cloning & Applications of Gene Cloning |

| SYLLABUS \| Extra disciplinary subject \| GENE MANIPULATION TECHNOLOGY | | | | |
|---|---|---|---|---|
| **Unit** | **Content** | **Hours** | **COs** | **Cognitive level** |
| **I** | Basics of Gene Manipulation Technology-Restriction Enzymes-Cutting and Joining Reactions-Vectors-Selection of Recombinants- Agarose Gel Electrophoresis-Southern Blotting- Hybridization-Autoradiography-PCR- Native Page- SDS-Page-2D Gel Electrophoresis- Western Blotting. | 7 | CO1 | K2,K4 &K5 |
| **II** | Constructions of DNA Libraries- Vectors Used In the Construction of CDNA and Genomic DNA Libraries-Chromosome Walking- Positive Selection and Subtractive Hybridization- Preparation Of (BAC/YAC Library). | 7 | CO2 | K1,K3,K5 |
| **III** | Genome Sequencing and Transcriptomics- Sanger's Sequencing, Whole Genome Shot gun Sequencing-Comparative Genome Sequencing- Transcriptome Analysis- DNA Microarray- Expression of Recombinant Proteins. | 7 | CO3 | K1,K2,K3 &K4 |
| **IV** | Protein Engineering & Pharmaceutical Products- Site Directed Mutagenesis- Protein Analysis- Therapeutic Protein- Vaccines. | 7 | CO4 | K2,K3 &K4 |
| **V** | Applications of Gene Cloning- creating Transgenic Animals and Plants- Reporter Genes- Animal Cloning, Gene expression in plants- Biosafety and Bioethics. | 7 | CO5 | K2,K3 &K4 |

**References**:


- An Introduction Gene Cloning And Manipulation- Howe.C
- Molecular Cloning: A Laboratory Manua l (3- Volume Set)- Sambrook J. et al.
- T.A. Brown 1995. Gene Cloning and Introduction.
- Thiel 2002. Biotechnology Nucleic Acids to Protein: A Laboratory Project. Tatamcgraw.Hill
- Desmond S. T. Nicholl, an Introduction To Genetic Engineering 3rd Edition.
- R. W. Old & S.B. Primrose, Principles Of Gene Manipulation, Fifth Edition, Blackwell Science
- Genetic Engineering Principles And Methods By Setlow, Jane K. (VOLUME 24)
- Bernard R Glick and Jack .J. Pasternack, 1994, Molecular Biotechnology, ASM Press.

**Core Paper-13**
**RESEARCH METHODOLOGY**

| **Paper – 13** | | | |
|---|---|---|---|
| Title of the paper | RESEARCH METHODOLOGY | Subject code: | |
| Category of the course | Year | Semester | Credits |
| Core Paper | 2nd | 4th | 4 |

**Learning Outcome:**
The paper imparts a thorough knowledge on the basics of academic research. The student will get to understand the core concepts of methodologies & ethics to pursue research.

**Course outcomes:**

| | |
|---|---|
| CO-1 | Understand the bases for research |
| CO-2 | To know about research proposal and dissertation writing. |
| CO-3 | To know about Statistical application in research |
| CO-4 | To know about office tools used in research |
| CO-5 | To know about search engines. |

| **SYLLABUS \| Core Paper-13 \| RESEARCH METHODOLOGY** | | | | |
|---|---|---|---|---|
| **Unit** | **Content** | **Hours** | **COs** | **Cognitive level** |
| **I** | Research Methodology - An Introduction: Meaning of Research, Objectives of Research, Types of Research, Research Approaches, Importance of knowing how research is done, Research Process, Criteria of good research. Defining the Research Problem; Research Design; Sampling Design; Methods of Data Collection; Processing and Analysis of Data; Sampling Fundamentals | 10 | CO1 | K1 |
| **II** | Review of literature, Writing the Research Report (Thesis and publications): Components of research report - Title, Authors, Addresses, Abstract, Keywords, Introduction, Materials and Methods, Results, Discussion, Summary, Acknowledgements and Bibliography | 10 | CO2 | K2 &K6 |
| **III** | Standard Deviation- T test. Analysis of Variance components (ANOVA) for fixed effect model; Total, treatment and error of squares, Degrees of freedom, Confidence interval; ANOVA for random effects model, Estimation of variance components, Model adequacy checking. Two factor Factorial Design, Basic definitions and principles, main effect and | 10 | CO3 | K3 |

| | | | | |
|---|---|---|---|---|
| | interaction, response surface and contour plots, General arrangement for a two factor factorial design | | | |
| **IV** | Spreadsheet Tool: Introduction to spreadsheet application, features and functions, Using formulas and functions, Data storing, Features for Statistical data analysis, Generating charts/ graph and other features. Presentation Tool: Introduction to presentation tool, features and functions, Creating presentation, Customizing presentation, Showing presentation. Tools used may be Microsoft Power Point, Open Office or similar tool | 10 | CO4 | K1 & K4 |
| **V** | Web Search: Introduction to Internet, Use of Internet and WWW, Using search engine like Google, Yahoo, Pubmed, Science direct, Scopus etc, and Using advanced search techniques | 10 | CO5 | K1 & K2 |

**Reference Books:**


- Montgomery, Douglas C. (2007), 5/e, Design and Analysis of Experiments, (Wiley India).
- Montgomery, Douglas C. & Runger, George C. (2007), 3/e, Applied Statistics & Probability for Engineers (Wiley India).
- Kothari C.K. (2004), 2/e, Research Methodology- Methods and Techniques (New Age International, New Delhi).
- Krishnaswamy, K.N., Sivakumar, Appa Iyer and Mathiranjan M. (2006), Management Research Methodology; Integration of Principles, Methods and Techniques (Pearson Education, New Delhi).
- The complete reference Office Xp – Stephan L. Nelson, Gujulia Kelly (TMH).
- Basic Computer Science and Communication Engineering – R. Rajaram (SCITECH).


**Useful Websites**

- www.ask.com/Methodology+Research
- www.qmethod.org/

**Elective Paper-9**

**STEM CELL BIOLOGY**

| Paper – 9 | | | |
|---|---|---|---|
| Title of the paper | STEM CELL BIOLOGY | Subject code: | |
| Category of the course | Year | Semester | Credits |
| Elective Paper | 2nd | 4th | 3 |

**Learning Outcome:**

The subject imparts knowledge on the fundamentals of stem cells. The student will be provided with a basic knowledge and understanding about the application of stem cell biology.

**Course Outcomes**: At the end of the Course, the Student will be able to:

| | |
|---|---|
| CO1 | To understand the major discoveries of stem cell biology |
| CO2 | To provide basic knowledge about stem cell niche and functions |
| CO3 | To enlighten the students on Stem cell isolation and culture techniques |
| CO4 | To update the knowledge on Stem cell cycle |
| CO5 | To assess and appraise Applications of Embryonic stem cells. |

| SYLLABUS \| Elective Paper-9 \| STEM CELL BIOLOGY | | | | |
|---|---|---|---|---|
| **Unit** | **Content** | **Hours** | **COs** | **Cognitive level** |
| **I** | Stem cells - Definition, Characterization, Pluripotency, Self-renewal and differentiation. Types of stem cells- Embryonic stem cells, Adult stem cells and mesenchymal stem Cells, Adipose stem cells | 7 | CO1 | K1 |
| **II** | Stem cell niche, Niche specification - Drosophila germ line stem cells. Receptors, genes and markers of stem cells | 7 | CO2 | K1 & K2 |
| **III** | Stem cell isolation and culture techniques. Characterization of stem cells | 7 | CO3 | K3, K4 |
| **IV** | Stem cell cycle. Chromatin modification and transcriptional regulation, chromatin modifying factors, Chromosomal inactivation. JAK -STAT pathway, Ras\Raf pathway, PI3K cell signaling, p53 check points, Role of LIF pathway in cell cycle control | 7 | CO4 | K3,K3 & K5 |
| **V** | Applications of Embryonic stem cells, Bone marrow stem cells, Adipose derived stem cells and Hematopoietic stem cells. Ethics in human stem cell research | 7 | CO5 | K3,K4 & K5 |

**Reference Books:**


- Stem Cell Biology, Daniel Marshak, Richard L. Gardener and David Gottlieb, Cold Spring Harbour Laboratory Press
- Stem cell biology and gene therapy, Booth C., Cell Biology International, Academic Press
- Stem Cell and Gene-Based Therapy: Frontiers in Regenerative Medicine, Alexander Battler, Jonathan Leo, Springer, STEM CELL TECHNOLOGY Syllabus - Semester First References:
- Stem Cell Biology and Gene Therapy. Quesenberry PJ, Stein GS, eds. (£65.00.) Wiley, 1998.
- Progress in gene therapy, Volume 2,Pioneering stem cell/gene therapy trials, Roger Bertolotti, Keiya Ozawa and H. Kirk Hammond, VSP international science publishers
- Stem Cells Handbook: Stewart Sell, Humana Press; Totowa NJ, USA; Oct. 2003,
- Human Embryonic Stem Cells: The Practical Handbook by Stephen Sullivan and Chad A Cowan

**Elective Paper-10**

**BIOETHICS, BIOSAFETY, CLINICAL TRIALS, IPR & ENTREPRENEURSHIP**

| **Paper – 10** | | | |
|---|---|---|---|
| Title of the paper | BIOETHICS, BIOSAFETY, CLINICAL TRIALS, IPR & ENTREPRENEURSHIP | Subject code: | |
| Category of the course | Year | Semester | Credits |
| Elective Paper | 2nd | 4th | 3 |

**Learning Outcome:**

This course provides the guidelines and regulations governing research; evaluate ethical conduct and social responsibilities; to adhere to safe working practices; to appreciate the need for protection of human subjects; to recognize the potential harms in research and show sensitivity to cultural and ethical issues; to create a general awareness about IPR.

**Course Outcome:**

| | |
|---|---|
| CO-1 | Understand the basics of biosafety and bioethics and its impact on biological sciences and the importance of human life. |
| CO-2 | Apply the knowledge to recognize the importance of biosafety guidelines and good clinical practices. |
| CO-3 | Acquire adequate knowledge in the use of genetically modified organisms and its effect on human health. |
| CO-4 | Evaluate the benefits of GM technology and importance of IPR |
| CO-5 | Analyse the importance of protection of new knowledge and innovations and its role in business and entrepreneurship |

| **SYLLABUS \| Elective Paper-10 \| BIOETHICS, BIOSAFETY, CLINICAL TRIALS, IPR & ENTREPRENEURSHIP** | | | | |
|---|---|---|---|---|
| **Unit** | **Content** | **Hours** | **COs** | **Cognitive level** |
| **I** | Introduction to Bioethics Need for bioethics in social and cultural issues. Bioethics & GMO's Issues and concerns pertaining to Genetically modified foods & food crops, Organisms and their possible health implications and mixing up with the gene-pool. Bioethics in Medicine Protocols of ethical concerns related to prenatal diagnosis, gene therapy, Organ transplantation, Xenotransplantation, Containment facilities for genetic engineering experiments, regulations on field experiments and release of GMO`s labeling of GM foods. | 10 | CO1 | K2,K3 & K4 |
| **II** | Clinical trials –Regulations. Bioethics & Cloning Permissions and Procedures in Animal Cloning, | 10 | CO2 | K3, K4 & K5 |

| | | | | |
|---|---|---|---|---|
| | Human cloning, Risks and hopes. Bioethics in Research Stem cell research, Human Genome Project, Use of animals in research, human volunteers for Clinical research, Studies on Ethnic races. Ethics in patient care, Informed consent. | | | |
| **III** | Biosafety – Biological risk assessment. Biological agents and Hazard groups. Criteria in biological risk assessment. Guidelines for categorization of genetically modified plants for field test. Regulation, national and international guidelines of Biosafety, rDNA guidelines, Regulatory requirements for drugs and Biologics GLP. Biosafety levels. Safety equipments and Biological Safety cabinets. | 10 | CO3 | K3,K4 & K5 |
| **IV** | IPR: Introduction to Intellectual Property rights, Patenting – Factors for patentability – Novelty, Non-obviousness, Marketability. Procedures for registration of Patents. Copyright works, ownership, transfer and duration of Copyright. Renewal and Termination of Copyright. Industrial Designs - Need for Protection of Industrial Designs. Procedure for obtaining Design Protection. Infringement, Right of Goodwill, Passing Off. Trademarks - Introduction to Trademarks. Need for Protection of Trademarks. Classification of Trademarks. Indian Trademarks Law. Procedural Requirements of Protection of Trademarks | 10 | CO4 | K4, K5 & K6 |
| **V** | Geographical Indications - Indication of Source and Geographical Indication. Procedure for Registration, Duration of Protection and Renewal. Infringement, Penalties and Remedies. Layout- Designs of Integrated Circuits: Conditions and Procedure for Registration. Duration and Effect of Registration Protection of Plant variety and Plant breeders' rights in India. Protection of traditional knowledge, Bioprospecting and biopiracy. India's new IP Policy (2016), Govt of India's steps to promote IPR. Career opportunities in IP. Entrepreneurship: Definition and importance, Characteristics and functions of an entrepreneur. | 10 | CO5 | K4,K5 & K6 |

**Reference Books:**


- "Bioethics & Biosafety" by Sateesh MK, IK International publications, 2008
- USPTO Web Patent Databases at: www.uspto.gov/patft
- Government of India's Patents Website: patinfo.nic.in

- Intellectual property India: www.ipindia.nic.in
- "Indian Patent Law : Legal and Business Implications" by Ajit Parulekar, Sarita D'Souza Macmillan India publication, 2006
- "Agriculture and Intellectual Property Rights", edited by: Santaniello,V., Evenson, R.E., Zilberman, D. and Carlson, G.A. University Press publication, 2003
- Research papers and Reports provided from time to time
- Ganguli P, (2001), Intellectual Property Rights, Tata Mcgraw Hill.
- Ramesh Chandra, (2004), Issues Of Intellectual Property Rights, Isha Books.
- Erbisch F.h., Maredia K.M, (2000), Intellectual Property Rights In Agricultural Biotechnology, Universities Press.
- Shiv Sahai Singh, (2004), Law Of Intellectual Property Rights, Deep & Deep Publications (p) Ltd.
- Subbian A, Bhaskaran S, (2007), Intellectual Property Rights: Heritage, Science And Society Int. Treaties, Deep & Deep Publications.
- Elad Harison (2008). Intellectual Property Rights, Innovation and Software Technologies. Edward Elgar Publishing Limited, UK.

**Core Paper-14**
**DISSERTATION**

| **Paper – 14** | | | |
|---|---|---|---|
| Title of the paper | DISSERTATION | Subject code: | |
| Category of the course | Year | Semester | Credits |
| Core Paper | 2nd | 4th | 8 |

**Learning Outcome:**

The paper imparts a thorough knowledge on the basics of academic research. The student will get to understand the core concepts of pursuing research.

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**S.A.C. SEPT'2022**

| | |
|---|---|
| **APPENDIX – (i)37(R)**<br>**UNIVERSITY OF MADRAS**<br>**CHOICE BASED CREDIT SYSTEM** | |
| Programme: | **MASTER OF SOCIAL WORK**<br>**REVISED REGULATIONS**<br>**(w.e.f. 2022-2023)** |
| Programme Code: | SSSC |
| Duration: | 2 years |
| Programme Outcomes: | 1. The programme will make the students to become highly capable and an efficient social work professional in all the fields of social work such as Medical, Psychiatric, Child Welfare Guidance, Geriatric, Health, Correctional, Family, Youth, Labour Welfare and Rural development, etc.<br>2. The programme will train and enrich the students with high scientific skills and techniques to deal with social issues and its problems.<br>3. The concepts, methods and techniques of social work will train the students in following its principles and practice it in various fields, thus creating a better society.<br>4. The programme is designed to make the students become well aware about the social work professional code of ethics which is followed in the social work settings.<br>5. It makes the students follow a systematic and scientific knowledge of social work philosophy and methods for becoming more professional in the various fields of social work.<br>6. Social work programme is designed to aid individuals, groups and communities for addressing individuals coping problems, group development and betterment of communities in the society.<br>7. The programme makes them more responsible in fulfilling humanitarian needs, solve psycho-social problems and adjust mental problems, thereby making the society more harmonious and unified.<br>8. It aids the students to become a social change agent for creating a better and cordial social environment.<br>9. The Social Work programme motivates the students to become a responsible professional social worker and work for the betterment of the individual psychological well-being, group development and community welfare. |

| | |
|---|---|
| | 10. The Social Work programme stimulates the students to engage and involve in deep research investigation on any particular social problem and make the society a better place to live in by addressing it. |
| Programme Specific Outcomes: | 1. The Master of Social Work programme makes the students to become more knowledgeable and skilful in dealing with human behaviour.<br><br>2. The outcome of the programme is to develop the skill of self-examination, critical thinking, analytical thinking, self-awareness, problem solving ability, constructive use of relationships and productive utilization of self.<br><br>3. The programme makes the students to become an expert professional, responsible, efficient, effective, practical, logical, and pragmatically experiential in dealing with individuals, groups and community for effective implementation of social work philosophies and its values in the society.<br><br>4. The Social worker concentrates more on solving the individuals psycho-social maladjustment problems, effectively motivating the groups to engage in group activity for accomplishing groups desire and needs, and using the resources skilfully for the communities welfare and development.<br><br>5. The interest for research is instilled in the mind of social work students to create new theories, ideologies, values, principles and techniques for the upcoming social work professionals to efficiently deal and address the social problems skilfully. |

**CORE / MAJOR PAPERS**

| S/N | Semester | Course Code | | TITLE OF THE COURSE | Duration (Hours) | No. of Credits | Internal | External | Total |
|---|---|---|---|---|---|---|---|---|---|
| 1 | I | SSSC051 | Paper 1 | Social Work Profession-History and Philosophy | 4 | 4 | 25 | 75 | 100 |
| 2 | | SSSC052 | Paper 2 | Social Casework | 4 | 4 | 25 | 75 | 100 |
| 3 | | SSSC053 | Paper 3 | Social Group Work | 4 | 4 | 25 | 75 | 100 |
| 4 | | SSSC054 | Paper 4 | Field Work Practicum – I | 10 | 5 | 40 | 60 | 100 |
| 5 | II | SSSC055 | Paper 5 | Community Organization & Social Action | 4 | 4 | 25 | 75 | 100 |
| 6 | | SSSC056 | Paper 6 | Social Work Research and Statistics | 4 | 4 | 25 | 75 | 100 |
| 7 | | SSSC057 | Paper 7 | Field Work Practicum – II | 10 | 5 | 40 | 60 | 100 |
| 8 | III | SSSC058 | Paper 8 | Rural Community Development - CD | 4 | 4 | 25 | 75 | 100 |
| | | SSSC059 | Paper 8 | Human Resource Management - HRM | | | | | |
| | | SSSC060 | Paper 8 | Community Health - MPSW | | | | | |
| 9 | | SSSC061 | Paper 9 | Urban Community Development - CD | 4 | 4 | 25 | 75 | 100 |
| | | SSSC062 | Paper 9 | Labour Legislations - HRM | | | | | |
| | | SSSC063 | Paper 9 | Mental Health – MPSW | | | | | |
| 10 | | SSSC064 | Paper 10 | Social Welfare Administration | 4 | 4 | 25 | 75 | 100 |
| 11 | | SSSC065 | Paper 11 | Field Work Practicum – III | 10 | 5 | 40 | 60 | 100 |
| 12 | | | | Summer Internship | | 2 | 40 | 60 | 100 |
| 13 | IV | SSSC066 | Paper 12 | Development Planning | 4 | 4 | 25 | 75 | 100 |
| | | SSSC067 | Paper 12 | Employee Relations and Welfare | | | | | |
| | | SSSC068 | Paper 12 | Medical Social Work | | | | | |
| 14 | | SSSC069 | Paper 13 | Entrepreneurship Development | 4 | 4 | 25 | 75 | 100 |

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|---|---|---|---|---|---|---|---|---|---|
| | | SSSC070 | Paper 13 | Organizational Behaviour and Development | | | | | |
| | | SSSC071 | Paper 13 | Psychiatric Social Work | | | | | |
| 15 | | SSSC072 | Paper 14 | Field Work Practicum – IV | 10 | 5 | 40 | 60 | 100 |
| 16 | | SSSC073 | Paper 15 | Dissertation | 4 | 6 | 40 | 60 | 100 |
| 17 | | | | Internship / Block Placement | | 2 | | | |

**ELECTIVE PAPERS**

| S/N | Semester | Course Code | | TITLE OF THE COURSE | Duration (Hours) | No. of Credits | Internal | External | Total |
|---|---|---|---|---|---|---|---|---|---|
| 17 | I | SSSE051 | Paper 1 Elective | Sociology and Psychology for Social Work Practice | 4 | 3 | 25 | 75 | 100 |
| 18 | II | SSSE052 | Paper 2 Elective | Disaster Risk Reduction / | 4 | 3 | 25 | 75 | 100 |
| | | SSSE053 | Paper 2 Elective | Counselling-Theory and Practice / | | | | | |
| 19 | | SSSE054 | Paper 3 Elective | Gender and Development | 4 | 3 | 25 | 75 | 100 |
| | | SSSE055 | Paper 3 Elective | Human Rights and Social Work | | | | | |
| 20 | III | SSSE056 | Paper 4 Elective | Corporate Social Responsibility | 4 | 3 | 25 | 75 | 100 |
| | | SSSE057 | Paper 4 Elective | Hospital Administration | | | | | |
| 21 | | SSSE058 | Paper 5 Elective | Social Policy and Social Legislation / | 4 | 3 | 25 | 75 | 100 |
| | | SSSE059 | Paper 5 Elective | Environmental Social Work | | | | | |
| 22 | IV | SSSE060 | Paper 6 Elective | International Social Work | 4 | 3 | 25 | 75 | 100 |
| | | SSSE061 | Paper 6 Elective | International Human Resource Management | | | | | |
| 23 | | SSSE062 | Paper 7 Elective | Migration Issues and Human Security / | 4 | 3 | 25 | 75 | 100 |
| | | SSSE063 | Paper 7 Elective | NGOs and Development Practice | | | | | |

**SOFT SKILLS**

| S/N | Semester | TITLE OF THE COURSE | Duration (Hours) | No. of Credits | Internal | External | Total |
|---|---|---|---|---|---|---|---|
| 23 | I | PAPER – I SOFT SKILL | 2 | 2 | 40 | 60 | 100 |
| 24 | II | PAPER – II SOFT SKILL | 2 | 2 | 40 | 60 | 100 |
| 25 | III | PAPER – III SOFT SKILL | 2 | 2 | 40 | 60 | 100 |
| 26 | IV | PAPER – IV SOFT SKILL | 2 | 2 | 40 | 60 | 100 |

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**S.SENATE. SEPT'2022**

**APPENDIX – 37(S)**

**UNIVERSITY OF MADRAS**

**CHOICE BASED CREDIT SYSTEM**

# MASTER OF SOCIAL WORK

**REVISED SYLLABUS**

**(w.e.f. 2022-2023)**

| **Semester I** | **Core** |
|---|---|
| **Title of the Course:** | **SSSC 051 Social Work Profession-History and Philosophy** |
| Credits: | 4 |
| Course Objectives | 1. To gain an understanding of the history and philosophy of Social Work and its emergence as a profession.<br>2. To develop insights into the origin and development of Voluntary organization.<br>3. To appreciate Social Work as a profession and to recognize the need and importance of Social Work education and training.<br>4. To understand the evolution of social work according to the International and Indian perspective.<br>5. To learn about the contributions of great social reformers in India. |
| Course Outcomes | 1. The students are able to synchronise the theoretical knowledge of social work profession in their actual practical social settings.<br>2. The students enhance their social work professional perspective to practically implement in their work settings, such as, NGO, |

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|---|---|
| | Hospitals and Factories.<br>3. The students are enriched with different school of thoughts and ideologies.<br>4. The students imbibe great ideas from social reformers and their inspirable social movements.<br>5. The students enhance their philosophical knowledge of social work which motivates them to enlarge their vision and ideology. |
| Pre-requisites, if any: | |
| Units | |
| I | **Historical Evolution of Social Work**<br>• International Perspectives: UK & USA<br>• Social Work in India:<br>• Socio-cultural and religious thought<br>• Contributions of Social Reformers and Social Movements - E.V.R. Periyar, Raja Ram Mohan Roy, Ambedkar, Dalit and Backward Class Movements, Gandhian ideology and Sarvodhaya Movement, Christian Missionaries, Gandhian Social Work<br>• India as a Welfare State<br>• Contributions of Voluntary organisations |
| II | **Social Work Profession**<br>• Meaning & definition, basic concepts, goals and functions, methods and fields<br>• Origin and Growth in India: scope and status, International/ national bodies and forums<br>• Social Work Education: Importance of fieldwork and supervision; problems and status; bodies/ forums in education, curriculum recommendations of UGC |
| III | **Social Work Ideologies, Theories and Approaches**<br>• Ideologies: Philanthropy, humanitarianism, welfares', socialism, democracy, Marxism, equality, human rights, reservations and social justice<br>• Models: welfare, developmental, empowerment and advocacy models, approaches: remedial, rehabilitative, preventive and promotive approaches, rights based, participatory, indigenous approaches, anti-discriminatory practice |
| IV | **Philosophy of Social Work Profession**<br>• Values, Beliefs and Principles of the Profession<br>• Code of Ethics: Evolution of Code of Ethics, IFSW & IASSW Ethics in Social Work, Statement of Principles, Declaration of Ethics for Social Workers (SWEF -1997) |
| V | **International Social Work:**<br>• Concept, definition, meaning and need, global issues, basic concepts, principles and assumptions; values, beliefs and goals; practice levels and sectors<br>• Approaches: personal, social, developmental, global; multicultural, international and transnational practice models; Global Agenda; Global Standards; Skills for practice; Dilemmas in practice |

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|---|---|
| Books For Reference | • Cox David, ManoharPawar, International Social Work; Issues, Strategies and Programmes. New Delhi; Vistaar. 2006.<br>• Dominelli, L.D., Social Work: Theory and Practice for a Changing Profession. Cambridge: Policy. 2004.<br>• Watson David (ed), Code of Ethics of Social Work- The Second Step. London: Routledge and Kegan Paul.1971.<br>• Antony A. Vass, New Directions in Social Work- Social Work Core Knowledge Values and Skills. New Delhi: Sage, 1996.<br>• Cox David, PawarManohar, International Social Work; Issues, Strategies and Programmes. New Delhi: Vistaar, 2006.<br>• University Grants Commission, I and II Review Commission on Social Work Education. New Delhi: University Grants Commission, 1992.<br>• Dominelli, L.D., Social Work: Theory and Practice for a Changing Profession. Cambridge: Policy Press, 2004.<br>• Midgley, J., Social Work in International Context: Challenges and Opportunities for the 21st Century. In M. Reisch& E. Gambrill (Eds.), Social Work in the 21st Century (pp. 59-67). CA: Thousand Oaks, Pine Forge, 1997.<br>• Payne, M., Modern Social Work Theory: A Critical Introduction, Hong Kong; Maxmillan Education, 1991.<br>• Reisch Michael, Eileen Gambrill, Social Work in the 21st Century. New Delhi: Pine Forge Press, 1997. |

Methods of assessment:
Recall (K1) – Simple definitions, MCQ, Recall steps, Concept definitions
Understand/ Comprehend (K2) – MCQ, True/False, Short essays, Concept explanations, Short summary or overview

Application (K3) – Suggest idea/concept with examples, Suggest formulae, Solve problems, Observe, Explain

Analyse (K4) – Problem-solving questions, Finish a procedure in many steps, Differentiate between various ideas, Map knowledge

Evaluate (K5) – Longer essay/ Evaluation essay, Critique or justify with pros and cons

Create (K6) – Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations

Mapping with Programme Outcomes:
Map course outcomes for each course with programme outcomes (PO) in the 3-point scale of Strong, Medium and Low

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | S | M | S | S | S | S | S | M | M | S |
| CO 2 | S | S | S | S | M | M | S | S | M | S |
| CO 3 | S | S | S | S | M | M | S | S | S | S |
| CO 4 | S | S | S | M | S | M | M | S | S | S |
| CO 5 | S | M | S | M | S | S | M | S | S | S |

S-Strong M – Medium L- Low

| **Semester I** | **Core** |
|---|---|
| **Title of the Course:** | **SSSC052 SOCIAL CASEWORK** |
| Credits: | 4 |
| Course Objectives | 1. To understand Social Case Work as a method of Social Work and develop skills in Social Work practice.<br>2. To comprehend theory and models and apply them in direct practice with individuals.<br>3. To become aware of the scope of using the methods in various settings.<br>4. To better understand the Case work relationship for making the client to adjust with the social environment.<br>5. Different approaches increase the horizon of perspective towards dealing with client and their psycho-social problems. |
| Course Outcomes | 1. The students can use the principles and skills in their daily practice of case work relationship when dealing with the client to solve their psycho-social problems.<br>2. The students can use the techniques of counselling to fully understand the client's problem in a non-judgemental way to help them for better coping and adjusting with the social environment and human relations.<br>3. The outcome of the course is to develop the skills of Case worker for better studying about the history of client and their individualistic problems personally in a psycho-social manner.<br>4. The students come to understand about certain process framed in studying the client's psycho-social personality development for solving their problems.<br>5. Tools and techniques are used by the Case worker in the social institutional settings like schools, hospitals and communities for building Case worker relationship. |
| Pre-requisites, if any: | |
| Units | |
| I | **Introduction to Working with Individuals**<br>• Historical development of Social Case Work as a Method of Social Work, Concept and Definition, Philosophy, Values, Principles, Skills and Components.<br>• Case Work Relationship: Empathy, Skills in Building Relationship, Transference and Counter Transference, Difference between Casework, Counselling and Psychotherapy. |
| II | **The Helping Process**<br>• Phase I- Psychosocial Study, Psychosocial Assessment<br>• Phase II- Intervention Plan and Goal Setting, Intervention<br>• Phase III- Termination, Evaluation and Follow up. |
| | |

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| III | **Models and Approaches**<br>• Psychoanalytic Approach, Psychosocial, Functional, Client Centered, Cognitive Behavioural Approach, Life Model, Task Centered, Strength Based, Evidence Based Approach, Ecological approach, Integrated Approach. |
| IV | **Tools and Techniques in working with Individuals**<br>• Observation, Interviews, Home Visits, Collateral Contacts, Resource Mobilization, Referrals, Environment modification and Communication. |
| V | **Case Work in different Settings and Recording**<br>• Case work in Hospitals, Schools, Communities, Institutional settings and Industry; Types of recording-verbatim, narrative, condensed, analytical, topical, summary recording. |
| Books For Reference | • Fischer, Joel. Effective Case Work Practice An Eclectic Approach. New York: Mc Graw Hill, 1978.<br>• Upadhyay, R. K., Social Case Work. Jaipur: Rawat, 2003.<br>• Vyas, A.A. New Directions in Social Work - Social Work Competencies - Core Knowledge,<br>• Values and Skills. Delhi: Sage, 1996.<br>• Bhattacharya, Sanjay. Social Work, An Integrated Approach. NewDelhi: Deep & Deep, 2004.<br>• DatarSudha, Ruma, Bawikar et al. Skill Training for Social Workers - A Manual. New Delhi: Sage, 2010.<br>• Hamilton, Gordon, Theory & Practice of Social Case Work 2nd Edition. Jaipur: Rawat, Indian Reprint, 2013.<br>• Hepworth, D.H. & J.A. Larsen. Direct Social Work Practice: Theory and Skills. Dorsey Press, 1993.<br>• Mathew, Grace. An Introduction to Social Casework. Mumbai TISS, 1992.<br>• Misra, P.D. &BeenaMisra. Social Work Profession in India. Lucknow: New Royal Book, 2004.<br>• Trevithick, Pamela. Social Work Skills – A Practice Handbook. 2nd Edition. Jaipur: Rawat, 2009. |

Methods of Assessment:

Recall (K1) – Simple definitions, MCQ, Recall steps, Concept definitions.

Understand/ Comprehend (K2) – MCQ, True/False, Short essays, Concept explanations, Short summary or overview.

Application (K3) – Suggest idea/concept with examples, Suggest formulae, Solve problems, Observe, Explain.

Analyse (K4) – Problem-solving questions, Finish a procedure in many steps, Differentiate between various ideas, Map knowledge.

Evaluate (K5) – Longer essay/ Evaluation essay, Critique or justify with pros and cons.

Create (K6) – Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations.

Mapping with Programme Outcomes:

Map course outcomes for each course with programme outcomes (PO) in the 3-point scale of Strong, Medium and Low

| | PO1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | S | S | M | S | M | S | S | M | S | S |
| CO 2 | S | M | M | M | M | S | S | S | S | S |
| CO 3 | S | S | S | S | S | S | S | S | S | S |
| CO 4 | S | S | S | S | S | M | M | S | M | M |
| CO 5 | M | S | S | S | S | M | M | S | S | M |

S-Strong M – Medium L- Low

| | |
|---|---|
| **Semester I** | **Core** |
| **Title of the Course:** | **SSSC053 SOCIAL GROUP WORK** |
| Credits: | 4 |
| Course Objectives | 1. To understand Group Work as a method of Social Work and develop skills in practice.<br>2. To understand models and apply them in practice with groups.<br>3. To become aware of the scope of using the method in various settings.<br>4. To study about different types of groups by applying the concept of group spirit in achieving the target planned by the groups.<br>5. To learn about the purpose of group work is to engage the community for fulfilling their goals with group involvement. |
| Course Outcomes | 1. The students are able to learn the art of engaging the groupfor accomplishing their goal and motive.<br>2. The course will make the students to observe each phase of group work process that gives an idea about how the group formation and development occurs in it.<br>3. The course makes the students efficient in dealing with the group engagement and their motivation for helping them to achieve their group needs and desires.<br>4. The course enables the students to be an initiator, motivator and enabler for initiating group formation and achieving group objectives and goals.<br>5. The outcome of the course is to make the students into a capable and efficient social group work professional in conducting group activities. |
| Pre-requisites, if any: | |
| Units | |
| I | **Introduction to Working with Groups**<br>• Historical development of Social Group Work as a Method, definition and meaning, purpose, objectives, values, skills, principles, use of groups in practice. |
| II | **Types of Groups**<br>• Definition and characteristics of groups, importance of groups in human life, primary and secondary groups, formal and informal groups, open and closed groups, reference groups, treatment groups, task groups, developmental groups. |

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| III | **Phases of Group Work Process**<br>• Planning Phase: establishing purpose, assessing recruiting, orienting, contracting, preparing group environment.<br>• Beginning Phase: Introduction, motivation, member feedback, defining purpose, objectives, goal setting, assessment<br>• Middle Phase: preparing for meetings, structuring the group work, intervention strategies in groups-programme planning and implementation – meaning and principles of programme planning. Monitoring and evaluating group process<br>• Ending Phase: preparing for termination; evaluation and feedback |
| IV | **Group Processes and Dynamics**<br>• Stages in a group development; new comers, isolation, rejection, group-bond, sub groups, clique, gang, dyad, triad, group norms, membership, cohesiveness, group pressure, group morale, leadership, team building, decision making, problem solving, conflict management, communication in a group, role clarity, use of sociometry |
| V | **Group Work Models and Practice in different settings**<br>• Social goals model, remedial model, reciprocal model, practice in different settings: hospital, school, community, industry and institutional setting, recording: importance of recording, skills required for recording in group work, types of recording in group work |
| Books For Reference | • Bhattacharya, Sanjay. Social Work an Integrated Approach. New Delhi: Deep & Deep, 2008.<br>• Choudhary, Paul. Introduction to Social Work. Delhi :Atma Ram & Sons,1983.<br>• Douglass, Tom. Group Processes in Social Work – A Theoretical Synthesis. New Delhi: Thomson, 1979.<br>• Jha, Jainendra Kumar. Encyclopaedia of Social Work. New Delhi: Anmol,2001.<br>• Balagopal, P.R .Vassil, T.V. Group in Social Work an Ecological Perspective. New York: Macmillan, 1983.<br>• Doel, Mark &Sawda, Catherine. The Essentials of Group |

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| | Worker. London: Jessica Kingsley, 2003.<br>• Garvin, Charlesd.D.Gutierrez, Lorraine .M. Galinsky, Maeda. J. Handbook of Social Work with Groups. New York: The Guildford, 2006.<br>• Johnson and Johnson. Joining Together: Group Theory and Group Skills. New Delhi: Premier, 1982.<br>• Mark Doel.Using Group Work. London: Routledge, 2010.<br>• Misra P.D. and BeenaMisra. Social Work Profession in India. Lucknow: New Royal,1979<br>• Trecker. Harleigh, B. Social Group Work- Principles and Practice. New York: Association Press, 1970.<br>• Brandler, S.and Roman, C. P. (1999). Group Work Skills and Strategies for Effective Interventions. New York: The Haworth Press.<br>• Toseland, R. W. and Rivas, R. (1984). An Introduction to Group Work Practice. New York: McMillian. |

Methods of assessment:

Recall (K1) – Simple definitions, MCQ, Recall steps, Concept definitions

Understand/ Comprehend (K2) – MCQ, True/False, Short essays, Concept explanations, Short summary or overview

Application (K3) – Suggest idea/concept with examples, Suggest formulae, Solve problems, Observe, Explain

Analyse (K4) – Problem-solving questions, Finish a procedure in many steps, Differentiate between various ideas, Map knowledge

Evaluate (K5) – Longer essay/ Evaluation essay, Critique or justify with pros and cons

Create (K6) – Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations

Mapping with Programme Outcomes:

Map course outcomes for each course with programme outcomes (PO) in the 3-point scale of Strong, Medium and Low

| | PO1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | S | S | M | S | S | M | S | S | M | S |
| CO 2 | S | M | M | M | S | S | S | S | M | M |
| CO 3 | S | S | S | S | S | S | S | S | S | S |
| CO 4 | M | S | S | S | M | M | M | M | S | S |
| CO 5 | M | S | S | S | S | M | S | M | S | S |

S-Strong M – Medium L- Low

| **Semester I** | **Core** |
|---|---|
| Title of the Course | SSSC054 Field Work Practicum - I |
| Credits | 6 |
| General Objectives | 1. To get exposed to wider area of social realities at the micro level<br>2. To develop analytical and assessment skills of social problems at the level of individual, group and community and local, regional, national and international dimensions<br>3. To acquire documentation skills to ensure professional competence<br>4. To develop the right values and attitudes required for a professional social worker |
| Components | 1. Orientation<br>2. Practice Skill Laboratory<br>3. Observation Visits<br>4. Rural Camp |

Methods of assessment:

Recall (K1) – Simple definitions, MCQ, Recall steps, Concept definitions

Understand/ Comprehend (K2) – MCQ, True/False, Short essays, Concept explanations, Short summary or overview

Application (K3) – Suggest idea/concept with examples, Suggest formulae, Solve problems, Observe, Explain

Analyse (K4) – Problem-solving questions, Finish a procedure in many steps, Differentiate between various ideas, Map knowledge

Evaluate (K5) – Longer essay/ Evaluation essay, Critique or justify with pros and cons

Create (K6) – Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations

Mapping with Programme Outcomes:

Map course outcomes for each course with programme outcomes (PO) in the 3-point scale of Strong, Medium and Low

| | PO1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | M | S | M | S | S | S | M | S | M | S |
| CO 2 | S | S | M | S | S | M | S | M | S | S |
| CO 3 | M | M | S | S | S | S | S | S | S | S |
| CO 4 | M | S | S | M | M | S | M | S | M | M |
| CO 5 | S | S | S | M | M | S | M | S | S | M |

S-Strong M – Medium L- Low

| **Semester II** | **Core** |
|---|---|
| **Title of the Course:** | **SSSC055 COMMUNITY ORGANIZATION & SOCIAL ACTION** |
| Credits: | 4 |
| Course Objectives | 1. To understand a community as a social system<br>2. To learn techniques and skills of CO as a method of Social Work<br>3. To understand methods and approaches in Community Organisation and Social Action<br>4. To learn about the various concepts of community organization to work efficiently for their development and growth<br>5. To learn the principles of community organization by handling community resources skillfully for the emancipation of communities welfare |
| Course Outcomes | 1. The course will provide knowledge about the community organization and its process that stimulates the student to actively participate in the community emancipation and development<br>2. The students will come to understand well about the communities characteristics and their livelihood that will enhance them to work for their betterment<br>3. The students can be able to learn how to approach the community and bring 'we' feeling among them to fulfil their basic unmet needs.<br>4. The course instil more values and principles of community organization among the students for making them a better social worker<br>5. The course teach different theories on community that make the students to have a holistic perspective towards community |
| Pre-requisites, if any: | |
| Units | |
| I | **Community**<br>Meaning and definition, community as a social system; subsystems in community; types of communities and characteristics, theories of communities, community power structure: concept of community power, types, people's power-its place in communities community dynamics: integrative and disintegrative process; participative groups and groupism; factions and subgroups; minority groups; decision making and problem-solving processes |
| II | **Community Organisation**<br>• Evolution of CO as a method in Social Work;<br>• Community Organisation: definition, rationale, philosophy, principles, goals, scope of co in India,<br>• Community organization models: J.Rothman, social planning, locality development and social action, Murray |

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| | Ross-general content, specific content and process objective. |
| III | **Process and Skills of Community of Organisation**<br>Analysis, study, assessment, discussions, organization, action, evaluation, modification, continuation<br>Skills of CO worker - communication, training, consultation, organizing, enabling, facilitating, public relations, mobilizing, participatory skills, liasoning. |
| IV | **Social Action as a Method of Social Work**<br>• Definition and meaning; aims and objectives, scope, social action as a method in Social Work,<br>• Paradigm of five elements: causes, change agent, change target, change channels, change strategy; strategies and tactics for social action: channels topology, influence channels, responsive channels; strategies, power, persuasive, re-educative, reform and political change strategies; social worker as an activist, role and personality requirements;<br>• Skills of a social activist - mediation, advocacy, negotiation, conflict-resolution |
| V | **Models and Approaches to Social Action**<br>• Introduction to Models of Social Action- Paulo Freire-Pedagogy of the oppressed, Gandhi- Rural Reconstruction, Martin Luther King-Civil Rights Movement, Saul Alinsky-Radical Movement, Gene Sharp- Nonviolence revolutionary Movement. Introduction to Social Action Movements in India - Environmental movement (Narmada BachaoAndolan, Chipko Movement), Tribal Movements), Dalit Movements; Participatory methods and assessment-tools and techniques |
| Books For Reference | • Christopher A.J. & Thomas, William. New Delhi. Community Organisation and Social Action. New Delhi: Himalaya, 2009.<br>• Gangrade K.D, Community Organisation in India. New Delhi: S Chand, 1972<br>• Harper Ernest B, Community Organisation in Action. New Delhi: Vikas,1973<br>• Walter A. Friedlander Hall, Concepts & Methods of Social Work. Delhi: Prentice Hall, 1977.<br>• Zaltman, G. Philip Kotler, Ira Kaufman, Creating Social Change. Sydney: Holt Renchart& Winston, 1972.<br>• Kramer Ralph M, Readings in Community Organisation Practice. Delhi: Prentice-Hall,1972.<br>• McMillen Wayne, Community Organisation for Social Welfare, Chicago: The University of Chicago Press, 1952.<br>• Dunham, A. E. (1958). Community Welfare Organization. |

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| | New York: Thomas Y. Crowell.<br>• Jodhka, S. (2001). Community and Identity: Contemporary Discourses on Culture and Politics in India. New Delhi: Sage.<br>• Ross, M. G. with B.W. Lappin. (1955). Community Organization: Theory, Principles and Practice. New York: Harper and Row |

Methods of assessment:

Recall (K1) – Simple definitions, MCQ, Recall steps, Concept definitions

Understand/ Comprehend (K2) – MCQ, True/False, Short essays, Concept explanations, Short summary or overview

Application (K3) – Suggest idea/concept with examples, Suggest formulae, Solve problems, Observe, Explain

Analyse (K4) – Problem-solving questions, Finish a procedure in many steps, Differentiate between various ideas, Map knowledge

Evaluate (K5) – Longer essay/ Evaluation essay, Critique or justify with pros and cons

Create (K6) – Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations

Mapping with Programme Outcomes:

Map course outcomes for each course with programme outcomes (PO) in the 3-point scale of Strong, Medium and Low

| | PO1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | S | M | S | M | S | M | S | S | M | M |
| CO 2 | S | M | S | M | S | M | S | S | S | S |
| CO 3 | S | S | S | S | S | S | S | S | S | S |
| CO 4 | M | S | M | S | M | S | M | M | S | S |
| CO 5 | M | S | M | S | M | S | S | M | M | S |

S-Strong M – Medium L- Low

| **Semester II** | **Core** |
|---|---|
| **Title of the Course:** | **SSC056 SOCIAL WORK RESEARCH AND STATISTICS** |
| Credits: | 4 |
| Course Objectives | 1. To understand the nature, principles and methods of Social Work Research<br>2. To develop the skills of independently conceptualising a problem and executing a research study<br>3. To understand and learn the application of appropriate statistical techniques in Social Work Research<br>4. To instil research inquest and investigation among the students on social work problems and its impact in various social institutions<br>5. To make the students a capable social work researcher in making new theories on social work problems and providing solution to it |
| Course Outcomes | 1. The research work has undertaken by students to investigate deep into the topic of the research for finding out a beneficial result for the development of the society<br>2. The course will make the students to stimulate curiosity and inquest among them to better understand about the process and steps of research<br>3. The research work will help the students to work for the development and betterment of the society and for the growth of the large institutions and esteemed organizations<br>4. The course enhance the research capacity and deep investigation among the students on various social problems and its effect in the society<br>5. The outcome of the course is to know well about the research methodologies and its implications in doing the research activity on various social issue topics |
| Pre-requisites, if any: | |
| Units | |
| I | **Social Research and Social Work Research**<br>Basic elements of scientific method; Social research and Social Work Research – definition, objectives, scope and limitations; scientific attitude, Ethics in Social Work research; quantitative and qualitative; Planning a research project: problem formulation, framing objectives, defining concepts, use of theorization in review of literature, variables: definition and function; assumptions – hypotheses, types of hypotheses |

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| II | **Research Designs**<br>Definition and Functions; Types of Designs: Survey, Case Study, Exploratory, Descriptive, Explanatory, Experimental, Evaluative, Single case evaluation, Census Study, Ex-Post Facto, Action and Participatory Designs; Applications and Limitations of various designs; Sampling Methods-Definition, Probability and Non-Probability Sampling: Sampling Error |
| III | **Methods and Tools of Collecting Data**<br>Observation, types; Interview schedule, Interview guide, Questionnaire, Scaling techniques and types; reliability and validity of tools; factors affecting reliability, methods of determining reliability, |
| | Validity, types, data processing, manual and computerized data presentation; editing, coding, preparation of master sheet, tabulation and interpretation, report writing; research abstracts |
| IV | **Overview of Qualitative Research**<br>Nature of qualitative research, assumptions, characteristics, tools of data collection – key informant, focus group discussion, participatory and rapid appraisal techniques; process of qualitative research, case analysis, social histories |
| V | **Application of Statistics in Social Work**<br>Normal Distribution, Characteristics, Levels of Measurement, Measures of Central Tendency and their uses, Measures of Dispersion; use of graphs, Tests of significance, Hypothesis Testing, Type I and II error; Level of Confidence, Degrees of Freedom, Chi Square and t-Test; Measures of Correlation. |
| Books For Reference | • Gupta, S.P. Statistical Methods. New Delhi: Sultan Chand and Sons, 2003.<br>• Kumar, Ranjit, Research Methodology. A Step-by-Step Guide for Beginners. London: Sage, 1996.<br>• Lal Das, D.K., Designs of Social Research. Jaipur: Rawat, 2005.<br>• Ramachandran P., Survey Research for Social Work, Bombay: Institute for Community Organisation Research, 1993.<br>• Rubin, Allen and Earl, Babbie. Research Methods for Social Work. New Delhi: Cengage Learning, 2011.<br>• Alston, Margaret and Wendy Bowles. Research for Social Workers – An Introduction to Methods. 2nded, Jaipur: 2003.<br>• Bohrnstedt, George W. and David Knoke, Statistics for Social Data Analysis. 2nd ed., Illinois: Peacock, 1988.<br>• Garrett, Henry E. Statistics – in Psychology and Education. New Delhi: Paragon, Indian Reprint, 2011.<br>• Mark, Raymond. Research Made Simple – A Handbook for Social Workers. New Delhi: Sage, 1996.<br>• Thakur, Devendra. Research Methodology in Social Sciences. New Delhi: Deep and Deep. 1993. |

Methods of assessment:

Recall (K1) – Simple definitions, MCQ, Recall steps, Concept definitions

Understand/ Comprehend (K2) – MCQ, True/False, Short essays, Concept explanations,

Short summary or overview

Application (K3) – Suggest idea/concept with examples, Suggest formulae, Solve problems, Observe, Explain

Analyse (K4) – Problem-solving questions, Finish a procedure in many steps, Differentiate between various ideas, Map knowledge

Evaluate (K5) – Longer essay/ Evaluation essay, Critique or justify with pros and cons

Create (K6) – Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations

Mapping with Programme Outcomes:

Map course outcomes for each course with programme outcomes (PO) in the 3-point scale of Strong, Medium and Low

| | PO1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | S | M | S | M | S | S | M | S | M | S |
| CO 2 | S | M | S | M | S | M | M | S | S | M |
| CO 3 | S | S | S | S | S | S | S | S | S | S |
| CO 4 | M | S | M | S | M | S | S | M | S | S |
| CO 5 | M | S | M | S | M | S | S | M | M | S |

S-Strong M – Medium L- Low

| **Semester II** | **Core** |
|---|---|
| **Title of the Course** | **SSSC057 Field Work Practicum – II** |
| Credits | 6 |
| Objectives | 1. Acquire knowledge and practice related to social work intervention at the individual, group and community level in different fields.<br>2. To train students to practice social work from an ecological, development and integrated perspective<br>3. Develop skills for problem solving in work at the micro level and change at the macro level.<br>4. Provide concurrent opportunity for the integration of class-room learning and Field Practicum<br>5. Develop professional values and commitment and the professional ideal<br>6. Develop skills to effectively use the integrated approach to problem solving and enhance skills of intervention, at the micro and the macro levels of system in relation to the needs and problems of the client system.<br>7. Develop skills to organize people to meet their needs and solve their problems.<br>8. Use roles appropriate to work e.g. advocacy for child's right, human rights.<br>9. Develop an understanding of the pattern of behaviour of people – their strengths and their pathological behaviour.<br>10. Develop the ability to carry out tasks in relations to service delivery and programme management. Routine administration, staff supervision and training, prepare project proposals, time management, management by objectives and enhancing skills in documenting.<br>11. Recording skills to show interest, engagement in practice and enhanced growth as a practitioner<br>12. Develop the ability to make innovative contribution to the organization's functioning<br>13. Gain confidence to represent the profession in interdisciplinary teams, and integrate theory or classroom training into practice<br>14. Develop the capacity to utilize instruction for enhancing and integrating field Practice<br>15. Utilize field instructions for enhancing and integrating professional growth<br>16. Make creative use of field instructions to evaluate mutual input<br>17. Utilize practice-based research to test effectiveness of specific aspects of Intervention<br>18. Weekly individual conference with Faculty and Agency Supervisor to enable integration of theory and practice |
| Components | Seminars and Viva –Voce to be conducted before the commencement of university Examinations |

Methods of assessment:

Recall (K1) – Simple definitions, MCQ, Recall steps, Concept definitions

Understand/ Comprehend (K2) – MCQ, True/False, Short essays, Concept explanations, Short summary or overview

Application (K3) – Suggest idea/concept with examples, Suggest formulae, Solve problems, Observe, Explain

Analyse (K4) – Problem-solving questions, Finish a procedure in many steps, Differentiate between various ideas, Map knowledge

Evaluate (K5) – Longer essay/ Evaluation essay, Critique or justify with pros and cons

Create (K6) – Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations

Mapping with Programme Outcomes:

Map course outcomes for each course with programme outcomes (PO) in the 3-point scale of Strong, Medium and Low

| | PO1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | S | S | M | S | M | S | M | M | S | M |
| CO 2 | S | M | S | M | M | M | M | S | S | S |
| CO 3 | S | S | S | S | S | S | S | S | S | S |
| CO 4 | M | S | S | S | S | S | S | S | M | S |
| CO 5 | S | S | M | S | S | S | S | S | M | S |

S-Strong M – Medium L- Low

| **Semester III** | **CORE PAPER VIII** |
|---|---|
| **Title of the Course:** | **SSSC058 HUMAN RESOURCE MANAGEMENT – HRM** |
| Credits: | 4 |
| Course Objectives | 1. Gain knowledge about the Concepts, Principles and Strategies of HRD.<br>2. Understand the strategic role and efficient use of human resources.<br>3. Acquire the skills of implementing Strategic HR aiming at higher practices.<br>4. Enhance the potentiality of students in knowing about the various concepts of human resource development.<br>5. To provide the perspective of HR and its outlook among students. |
| Course Outcomes | 1. The students improve their skills and abilities by gaining knowledge on human resource development and can practice it in their work settings<br>2. The students learn how to increase the talents and concentrate more on the talent development of the employees.<br>3. The students bring more growth to their organization by learning about the human resource development concepts and the expansion of business to other countries.<br>4. The outcome of the course is to make the students to become well verse in various management principles, techniques and skills for their overall development in their career.<br>5. The course provides practical knowledge of HR to students for implementing it during their internship period. |
| Pre-requisites, if any: | |
| Units | |
| I | **Human Resource Management and Development**<br>• Definition, Philosophy, policy, programmes, functions and practices in HRM. Objectives,<br>• Approaches & Principles; Strategic HRM, Human Capital Management; Human Resource Development (HRD):<br>• Performance Measurement Systems – Feedback, Coaching, Mentoring, Career planning, Career development, Reward system; HR Interventions: Organizational Goal setting process - Key Result Areas (KRA) and Key Performance Indicators (KPI) |
| II | • **Approaches to Measuring Human Resources** Management by Objectives (MBO), HR Auditing, HR Accounting, Competitive Benchmarking, HR Effectiveness Index, HR Key Indicators |
| III | **Talent Development**<br>• Concept and importance - Training Need Analysis at Individual and Organizational level: Designing and conducting Training programs - Types of Training: On |

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| | the Job and Off the Job Training- Coaching Apprentices, Job Rotation |
| IV | **Training & Development**<br>• Methods - programmed instruction, role play, structured and unstructured role plays, in-basket exercise, simulation, case study and sensitivity training. Evaluation of Training Program. The Cost/Benefit Analysis of training- using the results to improve training and development function. Improving training utility by following up Training Action Plans. Balance Score Card. |
| V | **Employee Empowerment**<br>• Concept, definition & objectives of employee empowerment – Prerequisites – Types & benefits – Strategies - Ways to employee empowerment –<br>• Employee Counselling; Counseling skills; Practice of Social Work Methods; Role of Employee Counsellor in Organizations. Developing Positive Employee Relationship |
| Books For Reference | • DepTopomoy. 2010. Human Resource Development. Anne Books. New Delhi.<br>• Dessler Garry, Biju Varkkey.2011. Human Resource Management. Dorling Kindersley Publishing Company. New Delhi<br>• Fred Luthans. 2001. Organizational Behaviour. Mc.Graw-Hill Publication Companies.<br>• ParathSarathi. 2002. Planning, Auditing and Developing Human Resources. Manak Publication PVT.LTD. New Delhi.<br>• Pippa Riley. 2012. Human Resource Management. Viva Books PVT, LTD. New Delhi.<br>• Premavathy N. 2011. Human Resource Management and Development. Sri Vishnu Publications. Chennai.<br>• Rao T.V. 2008. HRD Score Card 2500 Based on HRD Audit. Response Business Books Sage. New Delhi.<br>• Werner M. Jon. 2009. Human Resource Development. Cengage learning. Delhi.<br>• Sanjeev Kumar Singh, "Human Resource Development: HRD – IR Interface Approach," Atlantic Publishers & Distributors, Delhi, 2008.<br>• Silvera D.M., "Human Resource Development,' The Indian Experience, New<br>• India Publications, New Delhi, 1990.<br>• Rao. T.V, "The HRD Missionary- Role and Functions of HRD managers & HRD Departments," Oxford IBH Publishing Co., New Delhi, 1990<br>• Rao. T.V & Pereira D. F., "Recent Experiments in HRD", Oxford & IBH Publishing Co., Delhi.<br>• Rao. T.V., "Future of HRD", Macmillan, Delhi. |

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|---|---|
| | • Rao. T.V., "HRD Audit, Response Books, Delhi, 1999<br>• Suresh Vyas, "HRD Priorities", Pointed publishers, Jaipur, 1988 |

Methods of assessment:

Recall (K1) – Simple definitions, MCQ, Recall steps, Concept definitions.

Understand/ Comprehend (K2) – MCQ, True/False, Short essays, Concept explanations, Short summary or overview.

Application (K3) – Suggest idea/concept with examples, Suggest formulae, Solve problems, Observe, Explain.

Analyse (K4) – Problem-solving questions, Finish a procedure in many steps, Differentiate between various ideas, Map knowledge.

Evaluate (K5) – Longer essay/ Evaluation essay, Critique or justify with pros and cons.

Create (K6) – Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations.

Mapping with Programme Outcomes:

Map course outcomes for each course with programme outcomes (PO) in the 3-point scale of Strong, Medium and Low

| | PO1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | S | M | S | S | M | S | S | S | M | S |
| CO 2 | S | S | S | S | S | M | S | M | S | M |
| CO 3 | S | S | S | S | S | S | S | S | S | S |
| CO 4 | M | S | M | M | S | S | M | S | S | S |
| CO 5 | S | M | S | M | M | S | S | M | M | S |

S-Strong M – Medium L- Low

| **Semester III** | **Core Paper VIII** |
|---|---|
| **Title of the Course:** | **SSSC058 RURAL COMMUNITY DEVELOPMENT** |
| Credits: | 4 |
| Course Objectives | 1. To Understand the community as a method, its specific approaches and models.<br>2. To develop ability to utilize appropriate approaches and skills to work with communities<br>3. To develop sensitivity and commitment towards issues of marginalized and oppressed groups.<br>4. To understand the concepts of rural fragments and its various community development programmes.<br>5. To provide more knowledge on the concepts of historical development of rural community programmes and its |
| | impact in the society |
| Course Outcomes | 1. The course provides knowledge on the rural issues and its problems like landlessness, agrarian issues, migration and joblessness.<br>2. The concept of rural governance is about the panchayat raj system (local governance) which is described in separate constitutional amendments of Indian Constitution.<br>3. The studentslearn about the rural administration and its development.<br>4. The outcome of the course is to make the students more knowledgeable on various government related community development programmes and its impact on the overall development of the rural area.<br>5. The course make the students to work more efficiently in the rural community settings. |
| Pre-requisites, if any: | |
| Units | |
| I | **Rural Community**<br>• Definition, types, characteristics, power structure; rural community issues: caste, rural poverty & indebtedness<br>• Land related issues: Systems of land tenure, Land reforms, Land alienation, Landlessness, Agrarian Movements & Struggles, problems of agriculture laborer, marginal and small farmers.<br>• Agro-based industries, rural marketing, urbanization, Industrialization, Globalization, migration and consequent social erosion. |

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| II | **Historical Development**<br>• Early pioneering period (Sriniketan, Marthandom, Guragon).<br>• Probation trial period (Baroda, Etawah, Nilohkeri and Firka).<br>• Five Year Plans and rural development; Critique of National and State Rural development programmes and policies Mahatma Gandhi<br>• National Rural Employment Guarantee Act, 2005. Indira AwazYojana, PradanMantri Gram SadakYojna, PURA, Pradhan MantriGramodayaYojona, NRHM (National Rural Health Mission) |
| III | **Rural Community Development**<br>Definition, scope, objectives, philosophy process. Approaches-Identifying leaders, resources mobilization, activating and mobilizing people, organizing and working with groups, influencing, lobbying, facilitating, negotiating, cooperation |
| IV | **Rural Administration**<br>• Rural Development Administration: Organization and administration of rural development from block to |
| | National level.<br>• Components of block administration, development programmes and their coordination. Functions of BDO and other functionaries. Training for community development functionaries.<br>• State Institute of Rural Development (SIRD) and National Institute of Rural Development(NIRD) |
| V | **Rural Governance**<br>• Panchayat systems and local self-government in ancient India, Balwantrai Mehta and Ashok Mehta Committee reports.<br>• Three-tier system, administrative set up and functions, finance and problems of Panchyati Raj, Tamil Nadu Panchayati Raj Act, 1994 and the 73rd amendment. |

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| Books For Reference | • Agrwarl A.N (2001) Indian economy, nature, problems and progress, VikasBiraj, Prakash, New Delhi.<br>• Dayal, Rajeshwar, (1974), C.D Programme in India, KitabMahalPvt, Ltd.,<br>• Desai, A.R., (1971), Rural Sociology, popular press,Bombay.<br>• Desai, vasanth, (1994), Dynamics of entrepreneurial development, Himalayas publishing house, NEWDELHI.<br>• Dudhashi, P.R.,(1977), Rural developmental Administration in India, popular press Mumbai.<br>• Jain, S.C., (1985), Rural development institute and strategies, Rawatpublication.<br>• Kartar Singh, (1986), Rural development-principles, policy and management, Sage publication, NewDelhi.<br>• Michael Lipton, (1982), Why poor people remain poor, Heritage publication, New Delhi.<br>• Mukerji, B.M (1961), Community development in India, Orient Longman,Chennai.<br>• Ministry Reports, Planning Commission Reports. |

Methods of assessment:

Recall (K1) – Simple definitions, MCQ, Recall steps, Concept definitions.

Understand/ Comprehend (K2) – MCQ, True/False, Short essays, Concept explanations, Short summary or overview.

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Mapping with Programme Outcomes:

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| | PO1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | S | S | M | S | M | M | S | M | S | S |
| CO 2 | S | M | S | M | S | S | S | S | S | M |
| CO 3 | S | S | M | S | S | S | S | S | M | S |
| CO 4 | M | S | S | S | S | S | M | S | S | S |
| CO 5 | S | S | S | S | S | M | S | M | S | M |

S-Strong M – Medium L- Low

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|---|---|
| Semester III | Core Paper VIII |
| Title of the Course: | SSSC058 COMMUNITY HEALTH – MPSW |
| Credits: | 4 |
| Course Objectives | 1. To make the students to understand and practice in clinical setting among the various fields of social work.<br>2. To provide knowledge about the role of social worker in mental healthcentres and hospitals.<br>3. To equip the students on the concept of health and hygiene for enhancedfunctioning and the mental health of people.<br>4. To enlighten the students on the concept of nutrition and diet, thus creating a healthier society.<br>5. To enhance their knowledge on communicable and non-communicable diseases and taking preventive measures that decrease the effect on the society |
| Course Outcomes | 1. The students gain knowledge about the administration of the basic health facilities in the country.<br>2. The students become knowledgeable about the social work practice on health and hygiene situation in India.<br>3. The students enhance their knowledge on the concept of health and hygiene to alleviate the level of diseases in the country.<br>4. The students gain comprehensive and holistic knowledge on health and hygiene.<br>5. The students work for the mental well-being of the society. |
| Pre-requisites, if any: | |
| Units | |
| I | **Concept of Health**<br>Definition of Health, Concept of Well being, Health Spectrum, Health indicators, Social Determinants of health; Hygiene, Sanitation and Health. Meaning of disease, sickness/illness, and |
| | Sick role; Definition of Public Health, Changing concepts in Public Health, Primary health care and Principles of Primary Health Care. Health Perspective - Human Development Index; The Millennium Development Goals & Sustainable Development Goals; Influence of Market focus on Community Health |
| II | **UNIT –2: Communicable and Non – Communicable Diseases**<br>Causes, Prevention and Treatment: Communicable diseases and mode of transmission - HIV/AIDS, T.B, Hansen's disease, Vector borne, Air borne and Water borne disease and Swine Flu; and Non – Communicable diseases - Diabetes, Cardiac diseases, Hepatitis and Cancer. Addiction and health: Alcoholism and Drug addiction – definition, characteristics and stages. Effects of addiction – the individual, family, health, social, economic, employment and moral |

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| III | **UNIT – 3: Maternal and Child Health**<br>Maternal and Child Health – Issues and problems, Gender and Health, definition and importance of IMR & MMR, Antenatal Intranatal and Post natal care; Breast feeding and its importance; Reproductive Health – Importance of Reproductive health; Family planning & its methods; Sex and Sexuality in terms of HIV/AIDS, LGBT; Sexual Reproductive Health Right. |
| IV | **UNIT – 4: Food, Nutrition, Immunization & Health**<br>Food, Nutrition & Health: Concept of balanced diet, Malnutrition, Vitamin and Protein deficiency disorders; Poverty, Health and Human Rights; Immunization and Health. |
| V | **Unit – 5: Health Care in India**<br>Health care systems in India - Administrative structure and functions of Primary Health Care centres (make a visit to PHC); Levels of Health Care-Primary, Secondary and Tertiary levels, NRHM, AYUSH. Health Education-Definition, Approaches, Models, Contents, Principles and practice of Health Education; Preventive, Curative and Social medicine |
| Books For Reference | Park J.E. & Park K. (2005), Textbook of Preventive and Social Medicine; M/s. BanarsidasBhanot, Jabalpur.<br>2. Banerjee (1998). Health Administration in a Metropolis; New Delhi: Abhinav Publications,.<br>3. Miller D.(1976). Dimensions of Community Health; Lowa : C. Brown Co. Publications.<br>4. Mohan Rao (1997) Disinvesting in Health – The World Bank's Prescriptions for Health.<br>5. Nanda V.K. (1997). Health Education, Delhi: Anmol Publications.<br>6. Pandey .R. &Kanhere V. (1997). Activists Handbook of Occupational Health and Safety; Society for Participatory Research in Asia, Delhi.<br>7. Phillips D.R. (1994). Primary Health Care- Health and Health Care in the Third World. |
| | 8. Pisharoti K.A, Thugnanasambandham C. Kapali V. &Parthasarathy T.K. (1986). Education for Better Health of Mother and Child in Primary Health Care. IUHE- EARB, Chennai.<br>9. Health for all now- The Peoples' Health Source Book (2004) AID India; Chennai.<br>10. Sanjivi K.S. (1971)Planning India's Health; Orient Longman, Chennai.<br>11. Smith.B.C. (1980) Community Health- An Epidemiological Approach, New York: McMillan Publishing Co. |

Methods of assessment:

Recall (K1) – Simple definitions, MCQ, Recall steps, Concept definitions.

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Evaluate (K5) – Longer essay/ Evaluation essay, Critique or justify with pros and cons.

Create (K6) – Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations.

Mapping with Programme Outcomes:

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| | PO1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | S | S | M | S | S | M | S | M | S | S |
| CO 2 | S | M | S | M | S | S | S | S | S | M |
| CO 3 | S | S | S | S | M | S | S | S | M | S |
| CO 4 | M | S | S | S | S | S | M | S | S | S |
| CO 5 | S | S | M | S | S | M | S | M | M | M |

S-Strong M – Medium L- Low

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|---|---|
| Semester III | CORE PAPER IX |
| Title of the Course: | SSSC059 LABOUR LEGISLATIONS – HRM |
| Credits: | 4 |
| Course Objectives | 1. Gain knowledge about labour legislation and labour welfare.<br>2. Understand the legal provisions of labour welfare.<br>3. Acquire the skills of working with corporate sector.<br>4. The knowledge of labour legislation increases the students capability in dealing with the labour issues legally.<br>5. To enable the students to gain more knowledge on labour rights. |
| Course Outcomes | 1. The students learn about labour legislation which plays a major role in the function of any organization.<br>2. The knowledge about the functions of labour court, Industrial tribunal and National tribunal increases the awareness of students and aids them to face any litigation claim for the rights of the organizations.<br>3. The outcome of the course is to make the students knowledgeable on labour laws and its impact on the functions of the organization.<br>4. The course develops the quality of HR in students for becoming an efficient HR professional in their future career.<br>5. The course enables the students to develop it during the internship period and implement the concept of labour legislation in the field work settings. |
| Pre-requisites, if any: | |
| Units | |
| I | **Concept and History of Labour Legislations**<br>• Origin and development; objectives and principles of labour laws; Labour legislations in the Indian Constitution, Industrial Jurisprudence, judicial activism in India; Impact of Liberalization and Globalization; Labour Policy of India;International Labour Organisation (ILO) and its role in labour welfare; Challenges in enacting and enforcing Labour Laws |
| II | **Legislations related to Labour**<br>• The Factories Act 1948; The Tamil Nadu Shops and Establishment Act 1947;<br>• New Legislation – Occupational Safety, Health and Working Conditions Code 2020 |
| III | **Legislations related to Industrial Relations and Wages**<br>• The Trade Union Act 1926, Industrial Employment Standing Order Act, 1946; The Industrial Dispute Act 1947;<br>• New Legislation - The Industrial Relations Code 2020 |
| IV | **Social Security Legislations**<br>• Employees State Insurance Act 1948, Employees Provident Fund Act 1952, Payment of Gratuity Act 1972, Maternity |

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| | Benefit Act 1961,Sexual Harassment of Women at Workplace (Prevention Prohibitions &Redressal) Act 2013; Unorganized Workers Social Securities Act, 2008<br>• New Legislation – Social Security Code 2020 |
| V | **Enforcement Authorities**<br>• Work Committees; Industry Conciliation officers; Board of Conciliation; Adjudication; Courts of Enquiry, Labour Court, Industrial Tribunal and National Tribunal; Powers of the Government – Procedures, Powers and Duties of enforcement authorities; Role of the Ministry of Labour and Employment |
| Books For Reference | • BabuSharath and Rashmi Shetty. 2007, Social Justice and Labour Jurisprudence. SAGE Publication. New Delhi.<br>• Bhatia, 2008 Strategic Industrial Relations and Labour Laws, Deep and Deep Publications, New Delhi.<br>• Jain J.N. and Ajay Bhola, 2009, Modern Industrial Relations and Labour Laws, Regal Publications, New Delhi.<br>• Kapoor, N.D. 1993. Elements of Industrial Law.Sultan Chand & Sons. New Delhi.<br>• Kapoor, N.D. 1995. Hand Book of Industrial Law. Sultan chand& Company. New Delhi<br>• M.R. Sreenivasan, 2006, Industrial Relations and Labour Legislations, Margham Publications, Chennai<br>• Ramaswamy, E.A. & Uma Ramaswamy. 1981. Industry and Labour: An Introduction Oxford University Press. New Delhi.<br>• Singh B. D. 2010, Industrial Relations and Labour Laws, Excel Books, New Delhi.<br>• Srivastava S. C., 2014, Industrial Relations And Labour Laws, Vikas Publishing House Pvt. Ltd, New Delhi.<br>• Tripathi, P.C.1994. Personnel Management and Industrial Relations. Sultan Chand & Co. New Delhi.<br>• Vaidyanathan, S. 1986. Factory Laws Applicable in Tamilnadu. Vols: 1,2,3. Madras Bood Agency. Madras. |

Methods of assessment:

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|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | S | S | S | M | S | S | M | S | M | S |
| CO 2 | S | M | S | S | S | M | S | M | S | S |
| CO 3 | S | S | S | S | S | S | S | S | S | S |
| CO 4 | S | S | M | M | M | S | S | S | S | S |
| CO 5 | M | S | S | S | S | M | M | S | S | M |

S-Strong M – Medium L- Low

| **Semester III** | **Core Paper IX** |
|---|---|
| **Title of the Course:** | **SSSC059 URBAN COMMUNITY DEVELOPMENT – CD** |
| Credits: | 4 |
| Course Objectives | 1. To enable students to gain an understanding about the urban poor.<br>2. To develop sensitivity and commitment for working with the urban poor.<br>3. To expose students to skills and techniques of working with urban poor.<br>4. To provide knowledge on the urban community development models and its various approaches of creating impact in the urbanization.<br>5. To enlighten the students through studies about the life of urban people and their various issues and problems. |
| Course Outcomes | 1. The outcome of the course is to make the students aware of the life conditions of urban community and its difference prevailing in the urban societies.<br>2. The course provides knowledge about the urban community development programmes to the students and makes them to use it for their development.<br>3. The students learn about the gap between the rich and poor in the urban society which indicates the socio-economic inequity prevailing in the urban community.<br>4. The outcome of the course is to make the students become knowledgeable on the concept of urbanization |
| | 5. The course makes the students aware about the various urban community development programmes. |
| Pre-requisites, if any: | |
| Units | |
| I | **Basic Concepts**<br>• Concept of Urban, Urban Development, Urban Community Development, Urbanization. Urbanism, Differences between urban development and Urban Community Development. Principles and Approaches of UCD. |
| II | **Slum**<br>• Definition, characteristics, types, causes and consequences of growth of slums.<br>• Theory of slums, Power structure of Slums.The Tamil Nadu Slum Areas (Slum Clearance and Improvement) Act, 1971 – Policies, structure and functions of the Tamil Nadu Slum Clearance.<br>• Problems of slum dwellers, squatter settlement dwellers, street children. – Programmes for the development of slum dwellers. Critical analysis of the Programmes and approaches. |

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| III | **Urban Community Development in India**<br>• Delhi and Hyderabad projects – Urban Community Development in Tamil Nadu – MUDP and TNUDP<br>• Governmental agencies in Urban Community Development – structure and functions of the Tamil Nadu Housing Board, HUDCO, Corporation of Chennai, CMDA – Non-Governmental agencies in Urban Community Development. |
| IV | **People's participation in Urban Community Development**<br>• Concept of involvement – importance and scope of people's participation – factors hindering promoting people's participation. |
| V | **Conscientization**<br>• Goal setting, identifying and developing leadership, resource mobilization, human resource development resolving group conflicts, programme planning and service delivery, eliciting people's participation, monitoring and evaluation. |
| Books For Reference | • Ashish Bose, (1971), India's Urbanisation : 1990 – 2001, McGraw Hill, New Delhi.<br>• Bhattacharya, B., (1979), Urban Development in India, Shree Publishing House, Delhi.<br>• BidyutMohanty, (1993), Urbanization in Developing Countries Basic Services and Community Participation, ISS and Concept Publishing Co., New Delhi.<br>• Clinard, Marshall, B., (1970, Slums and Urban Community Development, The Free Press, New York.<br>• Desai, A.R. &Devadas Pillai (ed.) (1972), Slums and Urbanization, Popular Prakashan, Bombay.<br>• Paul Wiebe, (1975), Social Life in an Indian Slum, Vikas Publishing House, Delhi. |

Methods of assessment:

Recall (K1) – Simple definitions, MCQ, Recall steps, Concept definitions.

Understand/ Comprehend (K2) – MCQ, True/False, Short essays, Concept explanations, Short summary or overview.

Application (K3) – Suggest idea/concept with examples, Suggest formulae, Solve problems, Observe, Explain.

Analyse (K4) – Problem-solving questions, Finish a procedure in many steps, Differentiate between various ideas, Map knowledge.

Evaluate (K5) – Longer essay/ Evaluation essay, Critique or justify with pros and cons.

Create (K6) – Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations.

Mapping with Programme Outcomes:

Map course outcomes for each course with programme outcomes (PO) in the 3-point scale of Strong, Medium and Low.

| | PO1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | S | S | M | S | M | S | M | M | S | M |
| CO 2 | S | M | S | M | S | M | S | S | S | S |
| CO 3 | S | S | S | S | S | S | S | S | S | S |
| CO 4 | M | S | S | S | S | S | S | S | M | S |
| CO 5 | S | M | M | S | S | M | M | S | S | M |

S-Strong M – Medium L- Low

| **Semester III** | **CORE PAPER IX** |
|---|---|
| **Title of the Course:** | **SSSC059 Mental Health - MPSW** |
| Credits: | 4 |
| Course Objectives | 1. To introduce the concepts and historical development in the field of Psychiatry to the students.<br>2. To impart knowledge on the various psychiatric disorders and the role of Social Workers.<br>3. To make the students gain more knowledge about the mental health of the society.<br>4. To enhance the knowledge of the students on the mental health problems existing in our country.<br>5. To become well aware of the concepts of mental illness and its various disorders. |
| Course Outcomes | 1. The students gain knowledge on Emerging researches in MentalHealth.<br>2. The students gain knowledge about the various behaviour disorders and childhood disorders.<br>3. The students enhance their knowledge about mental health disorders and take measures in creating a healthy society.<br>4. The students become aware of the concepts of normalcy and abnormal behaviour of people in the society.<br>5. The students are able to diagnose the disorders by practicing it in the hospital settings. |
| Pre-requisites, if any: | |
| Units | |
| I | **Normality & Abnormality**<br>• Concept of Mental Health, Psychiatric Social Work,Community mental health and Community Psychiatry.Historical development of psychiatry as a field of specialization, Attitudes and beliefs pertaining to mental illness (Ancient, Medieval and modern times), Positive mental health as social capital; Scope and trends of Psychiatric Social work in India & Abroad, Mental health problems in India, Misconceptions about mental illnesses. |
| II | **Classification & Assessment of Mental Health Disorders**<br>• Diagnostic statistical Manual-DSM-V, International classification of diseases-ICD-10,Psychiatric Assessment: Interviewing, Case history taking, Sources of intake, mental status examination, Formulation of psychosocial diagnosis, Use of computers in assessment |
| III | **Psychiatric Illness & Disorders**<br>• Classification of Mental Disorders: Organic, Toxic (Drug Abuse), Functional<br>• (Non-Organic)Organic Mental Disorders: Symptoms and Causes of Dementia, Delirium, other mental disorders due to brain damage and dysfunction and to physical disease.<br>• Toxic: Symptoms of Mental and Behavioural disorders due to |

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| | Psychoactive Substance Use.<br>• Functional (Non Organic) Mental Disorders: Signs, Symptoms, Etiology, Managementand types of Schizophrenia, Delusional Disorders, Mood (affective) Disorder, Neuroticstress related and Somatoform disorders and Personality Disorders |
| IV | **Behavioural Disorders and Child hood Disorders: Behaviour disorders**<br>• Eating Disorders: Anorexia Nervosa, Bulimia Nervosa, Non Organic Sleep Disorders Common Mental Health Problems and Disorders in Children: Mental Retardation,Disorders of Psychological Development: Speech Disorder, Developmental disorders andAutism, Behavioural and Emotional disorders,Role of Psychiatric Social Workers, Limitations and difficulties faced in psychiatric socialwork practice |
| V | **Research in Mental Health**<br>• Emerging research in mental health. WHO Evidence based researches in Mental Health. Difficulties in practice informed research & research informed practice. Analysis of Existing Policies related to Mental Health. |
| Books For Reference | • Coleman, James C. Abnormal Psychology and Modern Life. Bombay: Taporewala& Sons.<br>• Eden, D. J. (1976).Mental Handicap – An introduction. London: George Allan and Unwin.<br>• Edward. (1986). Understanding Mental Retardation. London: Cambridge University press.<br>• Gaind, R. N. & Hudson, B. L. (1981). Current Themes in Psychiatric: John Wiley and Sons.<br>• John, Howells G. (1971). Modern Perspective in International Child Psychiatry. New York: Brunner &Mazel publication.<br>• Venkatesan, S. (2004). Children with developmental disabilities: Sage Publications |

Methods of assessment:

Recall (K1) – Simple definitions, MCQ, Recall steps, Concept definitions.

Understand/ Comprehend (K2) – MCQ, True/False, Short essays, Concept explanations, Short summary or overview.

Application (K3) – Suggest idea/concept with examples, Suggest formulae, Solve problems, Observe, Explain.

Analyse (K4) – Problem-solving questions, Finish a procedure in many steps, Differentiate between various ideas, Map knowledge.

Evaluate (K5) – Longer essay/ Evaluation essay, Critique or justify with pros and cons.

Create (K6) – Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations.

Mapping with Programme Outcomes:

Map course outcomes for each course with programme outcomes (PO) in the 3-point scale of Strong, Medium and Low

| | PO1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | S | S | M | S | M | M | S | M | S | M |
| CO 2 | S | M | S | M | S | M | S | M | S | S |
| CO 3 | S | S | S | S | S | M | S | S | S | S |
| CO 4 | M | S | S | S | S | S | S | S | M | S |
| CO 5 | S | M | M | S | S | M | M | M | S | M |

S-Strong M – Medium L- Low

| **Semester III** | **Core Paper X** |
|---|---|
| **Title of the Course:** | **SSSC060 SOCIAL WELFARE ADMINISTRATION** |
| Credits: | 4 |
| Course Objectives | 1. To understand the environment and its impact on nature, structure and development of the social welfare administration of the organizations in corporate, public and voluntary sectors.<br>2. Understand policies and procedures involved in establishing and maintaining human service organization, need for change.<br>3. Acquire skills to network and participate in the management of resources – human material, environmental and network<br>4. To create awareness about the various concepts of management principles and techniques to students for becoming a professional HR<br>5. The knowledge of management principles makes the students highly skilled and professional in dealing with the social welfare administrative issues and its problems |
| Course Outcomes | 1. Gain knowledge about social welfare administration of service organizations.<br>2. Understand welfare programmes of the government.<br>3. Acquire the skill of establishing a human service organization.<br>4. The students will learn about the welfare of the employeesby the labour welfare officer.<br>5. The knowledge of historical perspective of various organizations motivates the students to use it in their working organization. |
| Pre-requisites, if any:Units | |
| I | **UNIT 1: Welfare State**: Concept and relevance. Indian Constitution: Fundamental rights and Directive principles of State Policy- Social Policy and Planned social change. National Policy on Voluntary sector (2007). |
| II | **UNIT 2: Social Welfare Administration-** Concept, Features - Non-Government, Non-Profit making and self –governing organizations. Human Service Organizations by Orientation, by Levels of operation and by Focus. Major programmes of Central Social Welfare Board and State Social Welfare Board. |
| III | **UNIT 3: Basic Administration Processes:** Planning, Organizing, staffing and directing. Elements of Directing: Supervision, motivation, leadership, communication, monitoring and evaluation. Administrative skills – Writing reports, letters and minutes of meetings. |
| IV | **UNIT 4: Finance Administration:** Budgeting, accounting and auditing. Maintenance of books and accounts, financial documents and records. Mobilization of financial resources - Grants in Aid. Foreign Contribution and Regulation Act – 1976 and Amendments. Exemptions under Income tax Act: 80G, 35AC & 35 (1) (iia). |

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| V | **UNIT 5: Registering of an Organization:** Procedures related to registering under Societies Registration Act 1860, Charitable Trust Act 1912 and Indian Companies Act 1956. Administrative Structure – Memorandum, Bye laws, Constitution, Deed, Functions and responsibilities of governing board, committees and office bearers. Case Study of a NGO with legal compliance and programme reporting. |
| Books For Reference | • AnandSirohi. 2003 Encyclopedia of Social Welfare Modern Perspective on Social Welfare.New Delhi: Domain.<br>• Batra, Nitin. 2004. Administration of social Welfare in India. Jaipur. Raj Publishing House.<br>• Bhattachary, Sanjay. 2009. Social Work Administration and Development. New Delhi. Rawat Publication.<br>• Chowdhry, D.Paul. 1992. Social Welfare Administration. Atmaram and Sons.<br>• Encyclopaedia of Social Work. Vol I & III Also for Units IV & V<br>• Kohli, A.S & S.R. Sharma. 1998. Encyclopedia of Social Welfare and Administration. New Delhi. Anmol Publication.<br>• Patel, N Vinod&Rana, K, Girish.2007. Personnel Management. Jaipur. Oxford Book Company.<br>• Sarita Sharma, Basotia G. R. Popalia A.K. 1997. Management, Function, financial Planning and Policy. Kanishka Publishers. New Delhi. |

Methods of assessment:

Recall (K1) – Simple definitions, MCQ, Recall steps, Concept definitions.
Understand/ Comprehend (K2) – MCQ, True/False, Short essays, Concept explanations, Short summary or overview.

Application (K3) – Suggest idea/concept with examples, Suggest formulae, Solve problems, Observe, Explain.

Analyse (K4) – Problem-solving questions, Finish a procedure in many steps, Differentiate between various ideas, Map knowledge.

Evaluate (K5) – Longer essay/ Evaluation essay, Critique or justify with pros and cons.

Create (K6) – Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations.

Mapping with Programme Outcomes:

Map course outcomes for each course with programme outcomes (PO) in the 3-point scale of Strong, Medium and Low.

| | PO1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | S | S | M | M | S | S | M | M | S | S |
| CO 2 | S | M | S | S | S | S | S | S | S | S |
| CO 3 | S | S | S | S | S | S | S | S | S | S |
| CO 4 | M | S | S | S | M | M | S | S | M | S |
| CO 5 | S | M | M | S | S | M | S | M | S | M |

S-Strong M – Medium L- Low

| **Semester III** | **Core Paper XI** |
|---|---|
| **Title of the Course** | **SSSC061 Field Work Practicum – III** |
| Credits | 6 |
| Community Development | Objectives:<br>1. To study the rural and semi-rural life in all its ramifications including group dynamics and power structure in rural community.<br>2. To develop an understanding of the process of programme formulation and programme management of the rural local bodies, government and non-government agencies.<br>3. To develop positive attitude to work in a rural community setting and to acquire the skills such as public relations, fact findings, leadership, networking, fund raising, budgeting, report writing, lobbying and advocacy required for a development worker.<br>4. To enable to work with disadvantaged groups in rural areas.<br>5. To enable to plan and implement methods, tools and techniques for intervention based on the needs of the community.<br><br>Tasks:<br>Administrative set up of Panchayati Raj Institutions (PRIs) |

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| | Panchayat Raj members, their socio-economic and caste status Coordination of block level administrative personnel with elected person at different levels.<br><br>Decision making process: type of problems that come before Panchayat Union and Village Panchayat, who initiates various development projects and process of assessing them. How decisions are made- manipulations, lobbying, pressure tactics used.<br><br>Current Major Programmes, budget allocations for the programmes, methods of implementation, participation of people, impact of development and social justice.<br><br>Application of the principles of Rural Community Development Application of methods of professional social work in rural setting.<br><br>Identify/ study/ explore the rural problems covering the following aspects:<br>a) The physical, ecological, socio-economic and political structure, living pattern, social roles, community power structure, occupation, housing, available social services.<br>b) The general nature of the problem, the pre-existing condition, the existing situation, and the major units of the client system concerned with the problem concerned with health, education and welfare (Social Audit).<br>c) The problem as perceived by the i) rural community/ village / client system ii) rural local body iii) field work agency and iv) professional social work trainee |
| Human Resource Management | Objectives:<br>1. To make the students a highly specialized human resource management personnel with adequate management skills and efficiency to excel in his future HR career<br>2. To enable the students in learning the theoretical concepts of Management principles and techniques and providing practical experiential exposure to students on industrial settings.<br>3. To elevate the standard of students professionalism and efficiency towards HR practice and enlarge their scope and vision in their HR career.<br><br>Tasks:<br>1. The students must visit the industrial settings on their assigned field work days to learn about the HR skills, techniques and principles<br>2. The students are evaluated by the respective faculty whether he/she has completed the field work days without missing any single day |

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| | 3. The students are monitored regularly even by the industrial setting supervisor for their evaluation of the completion of field work days without fail<br>4. The overall attendance of the students to field work visit is regularly and systematically monitored and evaluated by the respective faculty. |

Methods of assessment:

Recall (K1) – Simple definitions, MCQ, Recall steps, Concept definitions.

Understand/ Comprehend (K2) – MCQ, True/False, Short essays, Concept explanations, Short summary or overview.

Application (K3) – Suggest idea/concept with examples, Suggest formulae, Solve problems, Observe, Explain.

Analyse (K4) – Problem-solving questions, Finish a procedure in many steps, Differentiate between various ideas, Map knowledge.

Evaluate (K5) – Longer essay/ Evaluation essay, Critique or justify with pros and cons.

Create (K6) – Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations.

Mapping with Programme Outcomes:

Map course outcomes for each course with programme outcomes (PO) in the 3-point scale of Strong, Medium and Low.

| | PO1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | S | M | S | M | S | M | S | S | M | S |
| CO 2 | S | S | S | S | S | S | S | S | S | M |
| CO 3 | S | S | S | S | S | S | S | S | S | S |
| CO 4 | M | S | M | S | M | S | M | S | S | S |
| CO 5 | S | M | S | M | S | M | S | M | S | S |

S-Strong M – Medium L- Low

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| **Semester IV** | **Core Paper XII** |
| **Title of the Course:** | **SSSC062 DEVELOPMENT PLANNING** |
| Credits: | 4 |
| Course Objectives | 1. To develop theoretical understanding of development and planning<br>2. To enable students to gain an understanding of the administrative machinery involved in development.<br>3. To provide knowledge on various methods strategies and development efforts.<br>4. To understand the role and contribution of professional social worker in the development. |
| | 5. To make the students to well understand about the concept of participatory planning in panchayat raj institution to work for the welfare and development of the rural people |
| Course Outcomes | 1. The course will enable the students to gain more knowledge on Development planning and its various models and approaches<br>2. The students will learn more on the historical development of cooperative movement and its effect in the formation of cooperative society<br>3. The course will concentrate on the development of deprived and backward sections of Indian society<br>4. The outcome of the course is to provide knowledge on development planning for making the students to work for the development of rural areas and bring welfare and implement social policy with more effect<br>5. The course make the students to set development plans for the splendid growth of rural areas and work for their emancipation and achieve sustainable development goals through the government initiated development planning models and approaches |
| Pre-requisites, if any: | |
| Units | |
| I | **Development Planning**<br>• Planning – Concept – models, approaches – types planning process – need and importance of planning for development.<br>• Development – definition – concepts; indicators – types – models, social development and planning as a major development thrust in India. |
| II | **Participatory Planning**<br>• Participatory planning and development – history of participatory development in India – models and approaches – participatory planning in Panchayati Raj institutions. |

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| III | **Agriculture and Development**<br>• Government's plan for Agricultural development – agricultural productivity –causes and problems of agriculture in India – marginal and small farmers agricultural problems and strategies to solve them. |
| IV | **Co-operative Movement in India**<br>• History, Principles – legislations planning to cooperatives – Role and achievements of cooperative – problems and limitations of cooperatives –problems and limitations of cooperatives – types of cooperatives – Role of Cooperatives to develop the poor. |
| V | **Development of SC & ST**<br>• Concept, Definition of SC and ST, Constitutional provisions, problems and programmes for development of SCs and STs– Central and State schemes – Role of Professional Social Workers, NGO's in the development of SCs& STs, Development initiatives for Migrants, Refugees and Displaced. |
| Books For Reference | • Chakravarthy, Sukhamoy, (1996), Development Planning the Indian<br>• Experience, Oxford University Press.<br>• Cottrell, Stella, (2003), Skills for Success, The Personal Development<br>• Planning Handbook, Palgrave.<br>• Dahiya, S.B., (1988), Development Planning Models, Inter India.<br>• Kabra Kamal Nayan, (1997), Development Planning in India Exploring an<br>• Alternative Approach, Sage Publications, Delhi.<br>• Parman Mary, (1993), Development Planning in India, Reliance Publication. |

Methods of assessment:

Recall (K1) – Simple definitions, MCQ, Recall steps, Concept definitions

Understand/ Comprehend (K2) – MCQ, True/False, Short essays, Concept explanations, Short summary or overview

Application (K3) – Suggest idea/concept with examples, Suggest formulae, Solve problems, Observe, Explain

Analyse (K4) – Problem-solving questions, Finish a procedure in many steps, Differentiate between various ideas, Map knowledge

Evaluate (K5) – Longer essay/ Evaluation essay, Critique or justify with pros and cons

Create (K6) – Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations

Mapping with Programme Outcomes:

Map course outcomes for each course with programme outcomes (PO) in the 3-point scale of Strong, Medium and Low

| | PO1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | S | S | M | S | M | S | M | S | M | S |
| CO 2 | S | S | S | S | S | S | S | S | S | S |
| CO 3 | S | S | S | S | S | S | S | S | S | S |
| CO 4 | M | S | S | S | S | S | S | S | S | S |
| CO 5 | S | M | S | M | S | M | S | M | S | M |

S-Strong M – Medium L- Low

| **Semester IV** | **Core Paper XII** |
|---|---|
| **Title of the Course:** | **SSSC062 EMPLOYEE RELATIONS AND WELFARE** |
| Credits: | 4 |
| Course Objectives | 1. To gain knowledge about trade unions<br>2. To understand functions and activities of trade unions and concepts related to Labour welfare<br>3. To acquire the skill of working with the workers and unions.<br>4. To provide knowledge on the concept of labour welfare and benefits provided to them<br>5. To make the students a well-disciplined professional labour welfare officer |
| Course Outcomes | 1. The students will be more skilled in collective bargaining, conciliation and efficient arbitrator to settle the trade disputes amicably<br>2. The students gain more knowledge on labour welfare philosophies and work as a labour welfare officer in industrial settings<br>3. The outcome of the course is to provide knowledge and exposure to industrial relations and its effect on trade unions<br>4. The course make the students to gain lot more knowledge on the concept of arbitration and settlement of disputes in the industrial settings<br>5. The course make aware the students about the statutory procedures laid down for settling the industrial disputes through conciliation and certain statutory norms |
| Pre-requisites, if any: | |
| Units | |
| I | **Industrial Relations**<br>• Concept, characteristics, Industrial Relations at Plant and Shop Floor Level<br>• Industrial Conflicts: Concepts of industrial peace cause and consequence of industrial conflict, Strikes and Lock-outs; Meditation |
| II | **Conciliation**<br>• Arbitration and adjudication Statutory and Non-Statutory machinery for prevention and settlement of disputes.<br>• Trade Unions: Trade unionism in India, and its role in Industrial relations. Wage and Salary<br>• Administration: Definition wage theories, types, wage determination: structure, differentials. |
| III | **Collective Bargaining**<br>• Meaning, theories, goal, phases, pre-requisites, principles, strategies and negotiation skills, factors influencing collective bargaining. |
| IV | **Labor Welfare**<br>• Concept, Philosophies, need, objectives, principles, scope and limitations of labor welfare; Historical development of |

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| | labour welfare in India.<br>• Statutory and Non-Statutory Welfare Provisions: Industrial Counseling-Pre-retirement, Quality of work life. Social security, Social security measures. |
| V | **Employee Empowerment**<br>• Worker's Education – purpose, objectives, experiments in India: Workers' participation in Management: Concept – Aims and objectives – Scope – Levels of Participation – Conditions essential for working of the Scheme of workers' participation in Management |
| Books For Reference | • Krishna C.S., 1989, Labour Movement in Tamil Nadu, K.P. Bagchi& Co.<br>• Mamoria, C.B., 1991, Dynamics of Industrial Relations, Hill House Press.<br>• Mathur, A.S., Labour Policy and Industrial Relations in India, Asia<br>• Publishing House, Bombay.<br>• Moorthy. V. Principles of Labour Welfare, Gupta Brothers, Visakapatnam,<br>• Myers, C.A and Kannappa, S., Industrial relations in India, Asia Publishing<br>• House, Bombay.<br>• Nirmal Singh & Bhatia, 2000, Industrial Relations & Collective<br>• Bargaining, Dehorah Prayer Group.<br>• Panicker P.T.K. and Other, Employee Participation in Share Capital, Madras School of Social Work. Madras.<br>• Ajay bhola, J.N Jain. 2009. Modern Industrial Relations and Labour Laws. Regol Publications.<br>• BD Singh. 2010. Industrial Relations and Labour Laws. Excel Books Publications.<br>• Bhatia S.K. 2008. Industrial Relations and Labour Laws. 2008. Deep and Deep Publications.<br>• Jain J.N. 2009. Modern industrial Relations and Labour Laws. Regal Publications. New Delhi.<br>• MamkootamKuriakose. 1982. Trade Unions. Myth and reality. Oxford University press. New Delhi.<br>• Michael Armstrong ,2011, Strategic Human Resource Management (4th Ed), Kogan Page India Pvt Ltd, New Delhi<br>• Punekar, S. D. et. al. 1981. Lobour welfare. Trade Unions and Industrial Relations. Himalaya publishing house. Bombay.<br>• Tapomoy Deb ,2009, Managing Human Resources in Industrial Relations ,1ed Anurag Jain for Excel Books, New Delhi |

Methods of assessment:

Recall (K1) – Simple definitions, MCQ, Recall steps, Concept definitions

Understand/ Comprehend (K2) – MCQ, True/False, Short essays, Concept explanations, Short summary or overview

Application (K3) – Suggest idea/concept with examples, Suggest formulae, Solve problems, Observe, Explain

Analyse (K4) – Problem-solving questions, Finish a procedure in many steps, Differentiate between various ideas, Map knowledge

Evaluate (K5) – Longer essay/ Evaluation essay, Critique or justify with pros and cons

Create (K6) – Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations

Mapping with Programme Outcomes:

Map course outcomes for each course with programme outcomes (PO) in the 3-point scale of Strong, Medium and Low

| | PO1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | S | S | S | S | M | S | M | S | M | S |
| CO 2 | S | M | S | M | S | M | S | S | S | S |
| CO 3 | S | S | S | S | S | S | S | S | S | S |
| CO 4 | M | S | M | S | S | S | S | S | S | S |
| CO 5 | S | M | S | S | M | S | S | M | M | S |

S-Strong M – Medium L- Low

| **Semester IV** | **Core Paper XII** |
|---|---|
| **Title of the Course:** | **SSSC062 MEDICAL SOCIAL WORK** |
| Credits: | 4 |
| Course Objectives | 1. To introduce the historical developments of social work in medical settings, existing status and its development.<br>2. To highlight a holistic and integrated approach to social work practice in the field of Health.<br>3. To provide adequate knowledge on the concept of medical social work to prepare them for the hospital settings<br>4. To enlighten the students on the concept of psycho-social implication of mental disability and its effect in the society<br>5. To develop the students knowledge on the area of hospital management and its administrative procedures |
| Course Outcomes | 1. The Students will develop a deeper understanding of common Physical Diseases and Health problems of the Community<br>2. The Students will gain the capacity to perceive the relation of Environment and Socio Cultural and Psychological factors in the causation, treatment and prevention of diseases<br>3. The students can be well able to understand the concepts of role of medical social worker and their immense importance is needed in the hospital settings<br>4. The students can adequately work for the mental health of the society and make it a mentally happier society<br>5. The students can well study about the needs and problems of patients in their families and can give effective solution to their problems |
| Pre-requisites, if any: | |
| Units | |
| I | **Medical Social Work**<br>• 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**<br>• 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 |

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| III | **The Hospital as a Formal Organisation**<br>• 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**<br>• Causes, types and classification of physical handicaps: orthopaedic 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;<br>• Rehabilitation: definition, concept, principles, and process; role of the medical social worker in rehabilitation planning, resource mobilisation, and follow-up |
| | **Specific Needs and Problems of Patients and their Families** |
| V | • 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 |
| Books For Reference | • Bartlett, Harriett Moulton. (1961).Social work practice in the health field. NatlAssn of Social Workers Pr,<br>• Codey , Carol H,(1951). Social aspects of illness. W.B. Sounders Com.,<br>• Field, Minna. (1967)."Patients are people." A Medical Social approach to prolonged illness,<br>• Goldstine, Dora. (1955).Expanding horizons in medical social work. University of Chicago Press,<br>• Hamilton, Kenneth W. (1950). "Counseling the handicapped in the rehabilitation process." (1950).<br>• Hamilton, Kenneth W. (1950)."Counseling the handicapped in the rehabilitation process."<br>Hubschman,Lynn. 1983., |

Methods of assessment:

Recall (K1) – Simple definitions, MCQ, Recall steps, Concept definitions

Understand/ Comprehend (K2) – MCQ, True/False, Short essays, Concept explanations, Short summary or overview

Application (K3) – Suggest idea/concept with examples, Suggest formulae, Solve problems, Observe, Explain

Analyse (K4) – Problem-solving questions, Finish a procedure in many steps, Differentiate between various ideas, Map knowledge

Evaluate (K5) – Longer essay/ Evaluation essay, Critique or justify with pros and cons

Create (K6) – Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations

Mapping with Programme Outcomes:

Map course outcomes for each course with programme outcomes (PO) in the 3-point scale of Strong, Medium and Low

| | PO1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | S | S | S | S | S | S | M | S | M | S |
| CO 2 | S | M | S | M | S | M | S | S | S | S |
| CO 3 | S | S | S | S | M | S | S | S | S | S |
| CO 4 | M | M | M | S | S | S | S | S | S | S |
| CO 5 | M | M | S | S | M | S | S | M | M | S |

S-Strong M – Medium L- Low

| **Semester IV** | **Core Paper XIII** |
|---|---|
| **Title of the Course:** | **SSSC063 ORGANIZATION BEHAVIOUR AND DEVELOPMENT** |
| Credits: | 4 |
| Course Objectives | 1. To help students gain knowledge on the dynamics of human behavior in the organization setup.<br>2. To enable students to gain understanding on the factors influencing human behavior in organization<br>3. To help students to build knowledge and develop skill in implementation of OD practices<br>4. To teach the students about the concept of organization development and make them to well train on it for bringing effective change in the industrial settings<br>5. To provide knowledge about organization behavior for knowing its dynamic impact in the growth of organization |
| Course Outcomes | 1. The students will learn the concepts on organization behaviour and its effect in the growth and development of the organization<br>2. The students gain tremendous knowledge on the theories of organization behaviour and implement the theories in the industrial settings<br>3. The outcome of the course is to make the students well verse in the OD concepts and its intervention techniques<br>4. The course make the students to well understand about these concepts for making them a highly efficient professional HR<br>5. The purpose of the course is to elevate the position of students knowledge to the level of HR professional drastically |
| Pre-requisites, if any: | |
| Units | |
| I | **Introduction to Organization Behavior**<br>• History, evolution, concept, behavioural Sciences, Organizational types, conceptual models, Types of Personality, Contributing disciplines to the OB field. Emerging factors influencing the study of OB.<br>• Theoretical Frameworks of organizational behaviour (Cognitive, Behavioral, Social Learning) |
| II | **Key Pillars of Organization Behavior**<br>• Motivation: Meaning, Need, Theories of motivation - Content Theories (Maslow, Herzberg, Alderfer), Process |

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|---|---|
| | theories (Vroom, Porter & Lawler) and Contemporary theories (Equity theory, Attribution theory).<br>• Leadership: Meaning, Attributes, leadership styles, Theories (Trait theory, Behavioural theories [OhioState studies, Michigan Studies, Managerial Grid], Contingency theories [Fiedler Model, Hersey and Blanchard's Situational Theory, Leader-Member Exchange theory, Path-Goal theory], Contemporary Leadership Theories [Charismatic leadership theory, transformational leadership theory]), Substitutes and Neutralizers of Leadership. |
| III | **Foundations of Organization Behavior**<br>• Organization Structure (Concept, elements, Organisational designs and employee behaviour)<br>• Communication (Meaning, Process, Types, Barriers); Decision-making; Organizational culture; Organizational Climate; Organizational Citizenship Behavior**.** |
| IV | **Organization Development**<br>• Introduction to Organisation Development, Objectives, Characteristics, History and Foundations of Organisation Development. Phases of OD Programme (Entry, Contracting, Diagnosis, Feedback, Planning Change, Intervention and Evaluation). Institutionalizing Intervention; Measuring Intervention. |
| V | **OD Interventions**<br>• Individual Based: Coaching and Counseling, Behaviour Modelling Group based: Self-Directed work Team, Conflict management<br>• Inter-Group Based: Organisation Mirroring, Third Party Peace Making Intervention. Industrial Engineering, Business Process Reengineering, Process mapping, Restructuring Organizations; Employee Involvement; Work Design. |
| Books For Reference | • Robbins, S,P., Judge, T.A., Snaghi, S. (2007). "Organizational Behavior:" (12th Ed) Pearson / Prentice Hall of India Pvt ltd, New Delhi.<br>• Luthans, F. (2010). "Organizational Behavior" (12th Ed) Irwin McGraw Hill, Boston, 1998.<br>• Aswathappa, K. (2012). OrganisationalBehaviour (10th Ed). Himalaya Publishing House.<br>• Rao V.S.P and Narayana P.S, "Organization Theory and Behavior" Kanoark Publishers pvt, Delhi 1994<br>• John W. Newstrom and Keith Davis, "Organizational Behavior" (10th Ed) Mcgraw Hill, New York, 1997.<br>• Organizational Development – Behavioral Science Interventions for Organization Improvement, 6th Ed. by Wendell L French and Cecil H. Bell,Jr<br>• Management of change and organizational development – innovative Approach –Bhatia S.K.<br>• Organization Development – Interventions and Strategies – |

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|---|---|
| | Ramnarayan, T.V.Rao, Kuldeep Singh.<br>• Organizational Development and Change – Comings & Worley<br>• Training for Organizational Transformation – Rolf P. Lynton, PareekUdai.<br>• Dwivedi, R.S. (1982), Management of Human Resources, Oxford PublishingCo., Bombay.<br>• Frence, Wemdell and Cecil, (1995), Organization Development, Prentice Hall of India Ltd., New Delhi.<br>• Luthans, Fred, (1995), Organizational Behaviour, McGraw Hill Ltd.,Singapore.<br>• Maier, Norman, (1983), Psychology in Industry, Oxford Publishing Co.,Bombay.<br>• Ouchi, William, (1981), Theory Z, Avon Books, New York.<br>• Pareekh, Udai, (1998), Organizational Behaviour& Process, Rawat Publications, Jaipur.<br>• Robbins, Stephen, (1994), Essential Organizational Behaviour, Prentice Hallof India Ltd, New Delhi.<br>• Szilagyi, Andrew & Marc Wallance, (1997), Organizational Behaviour&<br>• Performance, Scott Foresman and Co., London. |

Methods of assessment:

Recall (K1) – Simple definitions, MCQ, Recall steps, Concept definitions

Understand/ Comprehend (K2) – MCQ, True/False, Short essays, Concept explanations, Short summary or overview

Application (K3) – Suggest idea/concept with examples, Suggest formulae, Solve problems, Observe, Explain

Analyse (K4) – Problem-solving questions, Finish a procedure in many steps, Differentiate between various ideas, Map knowledge

Evaluate (K5) – Longer essay/ Evaluation essay, Critique or justify with pros and cons

Create (K6) – Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations

Mapping with Programme Outcomes:

Map course outcomes for each course with programme outcomes (PO) in the 3-point scale of Strong, Medium and Low

| | PO1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | S | S | M | S | M | S | M | S | M | S |
| CO 2 | S | S | S | S | S | S | S | S | S | S |
| CO 3 | S | S | S | S | S | S | S | S | S | S |
| CO 4 | M | S | S | S | S | S | S | S | S | S |
| CO 5 | S | M | S | M | S | M | S | M | M | S |

S-Strong M – Medium L- Low

| **Semester IV** | **Core Paper XIII** |
|---|---|
| **Title of the Course:** | **SSSC063 ENTREPRENEURSHIP DEVELOPMENT** |
| Credits: | 4 |
| Course Objectives | 1. To enable students comprehend the role of entrepreneurship in economic development<br>2. To provide an understanding, nature and process of entrepreneurship development<br>3. To motivate the students to innovate and develop entrepreneurial initiatives<br>4. To make the students to well develop them for the initiation of entrepreneurship start-ups<br>5. To develop the entrepreneurship skills for progressing in their business career |
| Course Outcomes | 1. The students imbibe the entrepreneurship skills in their practical settings to become a great entrepreneur<br>2. The outcome of the course is to make the students to learn techniques, principles and models of Entrepreneurship<br>3. The course enable the students to have a entrepreneurial perspective when initiating their business start-ups<br>4. The course make the students to know about the significance of entrepreneurship and its characteristics for elevating the position of student to upcoming entrepreneur<br>5. The course teach competency skills to students for competing vibrantly in the business market to increase the GDP ratio of the country |
| Pre-requisites, if any: | |
| Units | |
| I | **Evolution of Entrepreneurship**<br>• Concept, Meaning, Nature, Elements, Interactive Process.<br>• Entrepreneur and Entrepreneurship: Importance of Entrepreneurs – Characteristics and Competencies – Enterprise culture – Role of Entrepreneurs in Economic development. |
| II | **Developing the Entrepreneurship Plan**<br>• Environmental Assessment, Opportunities in Education. Components of a plan, skills in planning |
| III | **Managing Entrepreneurship Growth**<br>• Development stages in the Entrepreneurship process. Financial aspects of Entrepreneurship. Role of Banks |
| IV | **Entrepreneurship Personality characteristics**<br>• Social and cultural determinants. Skills required. Entrepreneurship – Factors related to success and failure – |

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|---|---|
| | preparation of project proposal. |
| V | **Small Scale Industry**<br>• Definition and meaning – Classification – Characteristics. Importance of SSI. Exports and SSI Sector – financial institutions – SSIs. |
| Books For Reference | • Curtis, E.T., Megginson, L.C. Scott, C.R. Trueblodd, L.R. (1975), Effective Small Business Management, Business Publications, Dallas, Texas.<br>• Curtis, E.T., Megginson, L.C. Scott, C.R. Trueblodd, L.R. (1975), Successful Small Business Management, Business Publications, Dallas, Texas.<br>• Donald F. Kuratko, Richard M. Hodgetts, (2001), Entrepreneurship – A Contemporary Approach, Harcourt College Publisher, London.<br>• Gupta M.C., (1987), Entrepreneurship in Small Scale Industry, Anmol Publications, New Delhi.<br>• Lambden, Johnc and Targett, David, (1990), Small Business Finance – A Simple Approach, Pitman Publishing, London. |

Methods of assessment:

Recall (K1) – Simple definitions, MCQ, Recall steps, Concept definitions

Understand/ Comprehend (K2) – MCQ, True/False, Short essays, Concept explanations, Short summary or overview

Application (K3) – Suggest idea/concept with examples, Suggest formulae, Solve problems, Observe, Explain

Analyse (K4) – Problem-solving questions, Finish a procedure in many steps, Differentiate between various ideas, Map knowledge

Evaluate (K5) – Longer essay/ Evaluation essay, Critique or justify with pros and cons

Create (K6) – Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations

Mapping with Programme Outcomes:

Map course outcomes for each course with programme outcomes (PO) in the 3-point scale of Strong, Medium and Low

| | PO1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | S | M | S | S | M | S | M | M | S | S |
| CO 2 | S | S | S | S | S | S | S | S | S | S |
| CO 3 | S | S | S | S | S | S | S | S | S | S |
| CO 4 | M | S | M | S | S | S | S | S | S | S |
| CO 5 | S | M | S | M | S | M | M | S | M | S |

S-Strong M – Medium L- Low

| **Semester IV** | **Core Paper XIII** |
|---|---|
| **Title of the Course:** | **SSSC063 PSYCHIATRIC SOCIALWORK** |
| Credits: | 4 |
| Course Objectives | 1. To develop the knowledge of psychosocial treatment methods for person with emotional disorders.<br>2. To acquire knowledge and skill in the practice of community psychiatry and rehabilitation<br>3. To gain knowledge on the historical development of psychiatric social work and its importance in the current society<br>4. To make the students to well know about the magnitude of mental illness problems in the society<br>5. To enhance the students knowledge on the concept of psychological intervention provided to the mental ill patients |
| Course Outcomes | 1. The students can be enriched with knowledge on institutional and extra mural approaches to provision of mental health services.<br>2. The students can acquire the skill to understand the various settings in psychiatry<br>3. The students can use the various psychological treatment methods for different mentally affected disorder patients<br>4. The students can use the psychological therapies for curing the mental illness to make the society more healthier<br>5. The students can acquire specific knowledge on the policies and legislations of mental health in India<br>6. |
| Pre-requisites, if any: | |
| Units | |
| I | **Psychiatric Social Work**<br>• An Introduction Definition, Scope, Historical Development, Magnitude of mental health problems among men, women, aged, socio -economically disadvantaged in urban and rural population and the mental health issues due to disaster:<br>• Treatment for the mentally ill patients : Psychological intervention, individual interventions, family interventions, group intervention and medication |
| II | **Psychological Treatment Methods**<br>• Psychotherapy, supportive therapy, Re-educative and Reconstructive psychotherapy, Behaviour therapy, CBT,ERP or EX/RP, Psycho-analysis, Client centered therapy, Reality therapy, Gestalt therapy, Rational emotive therapy, Logo therapy, Hypnosis and Abreaction. |
| III | **Psychological Therapies**<br>• Group Therapy, Transactional Analysis, Marital Therapy, Family Therapy, Recreational and Relaxation Therapies, Occupational Therapy and Psychiatric Rehabilitation |
| | **Psychiatric Social Work Practice** |

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| IV | • Role of Psychiatric Social Worker in half way homes , Day care centers, Child guidance clinic, De-addiction, Suicide prevention, Community mental health programmes; Admission and discharge procedures in a Psychiatric Hospital. |
| V | **Mental Health Care Policies and Legislations**<br><br>• Policies and legislations related to mental health in India: National Mental health Policy for India; Present mental health care services; Identification of needs |
| Books For Reference | • Bhugra ,Gopinath, Vikram Patel, (2005) Handbook of Psychiatry- A South Asian Perspective.Mumbai: Byword Viva Publishers Pvt. Ltd.<br>• Harper A. Robert . (1975).The New Psycho therapies.New Jersey Prentice Hall, INC.<br>• Kaplan , Harold, I., Sadock, B.J., (1989). *Comprehensive Text Book of Psychiatry*. London: Williams & Wilkins<br>• Mane &Gandevia. (1998). *Mental Health in India: Issues and Concerns*.Mumbai: Tata Institute of Social Sciences.<br>• Verma, Ratna. (1991).*Psychiatric Social work in India*. New Delhi: Sage Pub<br>• WHO, (2004) The ICD-10 *Classification of Mental and Behavioral Disorders, Diagnostic Criteria for Research*.Delhi: AITBS Publishers and Distributors.<br>• Windy, Dryden. (2002). *Handbook of Individual Therapy*.New Delhi: Sage Publications. |

Methods of assessment:

Recall (K1) – Simple definitions, MCQ, Recall steps, Concept definitions

Understand/ Comprehend (K2) – MCQ, True/False, Short essays, Concept explanations, Short summary or overview

Application (K3) – Suggest idea/concept with examples, Suggest formulae, Solve problems, Observe, Explain

Analyse (K4) – Problem-solving questions, Finish a procedure in many steps, Differentiate between various ideas, Map knowledge

Evaluate (K5) – Longer essay/ Evaluation essay, Critique or justify with pros and cons

Create (K6) – Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations

Mapping with Programme Outcomes:

Map course outcomes for each course with programme outcomes (PO) in the 3-point scale of Strong, Medium and Low

| | PO1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | S | M | S | S | S | S | M | M | S | S |
| CO 2 | S | S | S | S | S | S | S | S | S | S |
| CO 3 | S | S | S | S | S | S | S | S | S | S |
| CO 4 | M | S | S | S | S | S | S | S | S | S |
| CO 5 | S | M | M | S | M | M | M | S | M | S |

S-Strong M – Medium L- Low

| **Semester IV** | **Core Paper XIV** |
|---|---|
| **Title of the Course** | **SSSC064 Field Work Practicum – IV** |
| Credits | 6 |
| Community Development | Objectives:<br><br>1. To focus on urban community life pattern – its social, economic, political and cultural aspects with specific focus to informal settlements, their needs and problems<br>2. To develop skills in identifying and utilizing urban community resources both governmental and non-governmental agencies<br>3. To sharpen the urban community development skills such as influencing grass root urban leaders, rapport building, organizing, resource mobilization, recording, advocacy and lobbying<br>4. To develop skills in communicating, fact finding, fund raising, budgeting, report writing, urban community project formulation, management, appraisal and evaluation<br>5. To help the trainee gain insight into the components of Urban Community Development<br>6. To enhance competencies to assess and analyze urban problems, needs and service delivery.<br>7. To enhance the capacity to recognize the linkage between urban community development and the practices in the field in terms of policy and programmes.<br><br>Tasks:<br>1. Observation visit to urban community / slums (informal settlements)<br>2. Analysis of their socio-economic conditions<br>3. Application of the principles of Urban community development<br>4. Application of professional social work methods in urban setting<br>5. Organizing and mobilizing urban community/ slums in participatory mechanisms/ structures<br>6. Identify/ study/ explore the urban problems covering the following aspects:<br>a) The physical, ecological, socio-economic and political structure, living pattern, social roles, community power structure, grass root urban leadership, occupation, housing, available social services etc.<br>b) The general nature of the problem, the pre-existing condition, the existing situation, and the major units of the client system concerned |

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| | with the problem<br>c) The problem as perceived by the i) urban community/ slum / client system ii) urban local body iii) field work agency and iv) professional social work trainee |
| Human Resource Management | Objectives:<br><br>1. To practically understand the concept of Industrial Relations and to acquire the related competencies<br>2. To familiarize with the Labor Legislations<br>3. To learn to apply the various methods of Social Work in various Industrial Settings<br>4. To observe the application of various Labor Welfare measures<br>5. To observe the practice of current trends in HR<br>6. To provide opportunity for the integration of class room learning and field practice<br>7. To acquire human resource management skills<br>8. To observe the CSR activities<br>9. To develop skills to organize people to meet their needs and solve their problems<br>10. To make innovative contributions to the organization functioning<br>11. To represent HR profession in inter disciplinary terms<br>12. To carry out application oriented mini – research projects<br>13. To utilize field instructions for enhancing and integrating professional growth in Human Resource<br><br>Tasks:<br><br>I Organizational Profile<br>History of the Agency, Organisation Chart, The Products/ Services, Branches/ Units, Workforce, Line and staff management, Structure and functions of the Human Resource Department<br><br>II Areas of Personnel Functions<br>Manpower Planning (Need Analysis)<br>Recruitment (Advertisement/ Consultancies /Campus /Other Bureaus/ Sources)<br>Types of Employees (Contract/ Temporary/ Permanent/ Part-Time)<br>Selection (Interview/ Written Test /Group Discussion / Physical examination<br>Induction and Placement, Promotion and Transfer<br>Training and Development (Need Analysis/ Types/Outsourcing)<br>Disengagement - Retention, Resignation/ Termination and Retirement (Exit Interviews)<br>Time Office (Daily Attendance/ Swiping Cards/ Attendance Register)<br>Hours of Work (Time In/Break/ Movement Register/Period of Rest/ Time Out)<br>Leave and Holidays (Casual Leave/ Medical Leave/ National and Festival Holidays etc.)<br>Wage and Salary Administration (Daily/ Monthly/ Hourly/ Time- Rate/ Piece- Rate) |

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| | Social Security Benefits (Social Insurance/ Social Assistance)<br>Employee Service Register, Communication<br>Employee Appraisal (Ranking/ Free Essay/ 360-degree Appraisal), Balance Score Card, Succession Planning<br><br>III Industrial Relations Functions<br><br>IR at Shop Floor & Plant Level (Works Committee/ Joint Production Committee/ Joint Management Councils<br>Grievance Handling - Grievance Settlement Procedure<br>Works Standing Orders (Employee Discipline/ Domestic Enquiry/Absenteeism/ Alcoholism/ Punishment)<br>Employers' Association, Trade Unions, Collective Bargaining - The Agreements, Strikes, Lock- Outs and Retrenchment<br><br>IV Labor Welfare Measures<br>Intra Mural and Extra Mural - Statutory and Non Statutory Measures (Housing/ Crèche/ Canteen/ Credit and Consumer Co-operatives)<br>Safety and Accident Prevention, Industrial Health and Hygiene (Occupational Diseases/Hazards), Industrial Mental Health (Screening and Detection/ Stress/ Fatigue/ Burn Out), Employee Counseling<br>Workers' Education, Recreation, Other Welfare Measures<br><br>V Labour Legislations<br>Legislations applicable to the Organisation<br><br>VI Others<br>1. TQM, ISO, Use of OD Techniques, CSR Activities. |

Methods of assessment:

Recall (K1) – Simple definitions, MCQ, Recall steps, Concept definitions

Understand/ Comprehend (K2) – MCQ, True/False, Short essays, Concept explanations, Short summary or overview

Application (K3) – Suggest idea/concept with examples, Suggest formulae, Solve problems, Observe, Explain

Analyse (K4) – Problem-solving questions, Finish a procedure in many steps, Differentiate between various ideas, Map knowledge

Evaluate (K5) – Longer essay/ Evaluation essay, Critique or justify with pros and cons

Create (K6) – Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations

Mapping with Programme Outcomes:

Map course outcomes for each course with programme outcomes (PO) in the 3-point scale of Strong, Medium and Low

| | PO1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | S | S | M | M | S | M | S | M | S | S |
| CO 2 | S | S | S | S | S | S | S | S | S | S |
| CO 3 | S | S | S | S | S | S | S | S | S | S |
| CO 4 | M | S | S | S | S | S | M | S | M | S |
| CO 5 | S | M | S | M | M | S | S | M | S | M |

S-Strong M – Medium L- Low

| **Semester IV** | **Core Paper XV** |
|---|---|
| **Title of the Course** | **SSSC065 DISSERTATION** |
| Credits | 4 |
| Every student is required to complete a research project report under the supervision and guidance of a Faculty of the Department who will guide the students on topics related to Social Work education, practice, or some aspects of the field of specialization chosen by him / her. A student is required a submit two copies of the project report to the college on or before March 31st, of which the college should forward one copy to the University at least 15 days before to commencement of examinations. | |

Methods of assessment:

Recall (K1) – Simple definitions, MCQ, Recall steps, Concept definitions

Understand/ Comprehend (K2) – MCQ, True/False, Short essays, Concept explanations, Short summary or overview

Application (K3) – Suggest idea/concept with examples, Suggest formulae, Solve problems, Observe, Explain

Analyse (K4) – Problem-solving questions, Finish a procedure in many steps, Differentiate between various ideas, Map knowledge

Evaluate (K5) – Longer essay/ Evaluation essay, Critique or justify with pros and cons

Create (K6) – Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations

Mapping with Programme Outcomes:

Map course outcomes for each course with programme outcomes (PO) in the 3-point scale of Strong, Medium and Low

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | S | M | S | S | S | S | S | M | M | S |
| CO 2 | S | S | S | M | M | M | S | S | M | S |
| CO 3 | S | S | S | S | M | M | S | S | S | S |
| CO 4 | S | S | S | M | S | M | M | S | S | S |
| CO 5 | S | M | S | M | S | S | M | S | S | S |

S-Strong M – Medium L- Low

| **Semester IV** | |
|---|---|
| **Title of the Course** | **BLOCK PLACEMENT / INTERNSHIP** |
| Credits | 2 |
| After satisfactory completion of concurrent field work during the two academic years and after the Final University Examination, every student of the MSW (Second year) is placed for Block Field Work for a period of 30 days for a full- time work in an approved agency or project in or outside Tamil Nadu. The Department approves agencies / projects from amongst a large number of them, keeping in mind the availability of learning opportunities for the students. The purpose of Block Field work is to broaden the student's perspectives of development and welfare concerns, offer pre-employment work experiences and enable him/her to assume professional responsibilities after graduation. A student is not eligible for the degree unless he/she has completed Block Field Work to the satisfaction of the Department. At the conclusion of Block Field Practicum, Agency Supervisor sends a Report about the performance of the student to the Department. The student on his /her part also submits a comprehensive report of the Block Field practicum. It carries two credits. | |
| Objectives:<br><br>1. Develop enhanced practice skill and integrate learning<br>2. Develop greater understanding of reality situations through involvement in day to day work<br>3. Develop appreciation of other's efforts and develop sensitivity to gaps in the programme<br>4. Enhance awareness of self in the role of a Professional Social Worker | |
| Duration: 1 month | |

Methods of assessment:

Recall (K1) – Simple definitions, MCQ, Recall steps, Concept definitions

Understand/ Comprehend (K2) – MCQ, True/False, Short essays, Concept explanations, Short summary or overview

Application (K3) – Suggest idea/concept with examples, Suggest formulae, Solve problems, Observe, Explain

Analyse (K4) – Problem-solving questions, Finish a procedure in many steps, Differentiate between various ideas, Map knowledge

Evaluate (K5) – Longer essay/ Evaluation essay, Critique or justify with pros and cons

Create (K6) – Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations

Mapping with Programme Outcomes:

Map course outcomes for each course with programme outcomes (PO) in the 3-point scale of Strong, Medium and Low

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | S | M | S | S | S | S | S | M | M | S |
| CO 2 | S | S | S | S | M | M | S | S | M | S |
| CO 3 | S | S | S | S | M | M | S | S | S | S |
| CO 4 | S | S | S | M | S | S | M | S | S | S |
| CO 5 | S | M | S | M | S | M | S | M | M | M |

S-Strong M – Medium L- Low

| **Semester I** | **Elective (Compulsory)** |
|---|---|
| **Title of the Course:** | **SSSE051 SOCIOLOGY AND PSYCHOLOGY FOR SOCIAL WORK PRACTICE - I** |
| Credits: | 3 |
| Course Objectives | 1. To give an understanding of concepts in Psychology and Sociology relevant to Social Work.<br>2. To understand the various stages of Human Growth and Development.<br>3. To enable the student to gain knowledge about the society and its dynamism<br>4. To learn the theories of psychology to understand about its different approaches in dealing with individuals psychic behaviour and mind<br>5. To learn about the sociological theories for understanding well about the social structures, systems and different institutions making great impact in the evolution of human society |
| Course Outcomes | 1. The outcome of the course is to get knowledge in regarding to the psychological development of the individual in respect of brain development and its intelligence<br>2. The students can understand well about the psychological theories which will help in looking over through the perspective of psychological aspect<br>3. Sociological perspective is also included to gain knowledge about the varied social institutions and social structures that make a great impact in the societies development<br>4. The course enable the students to know more about the important concepts of developmental psychology for creating the psychological perspective among them<br>5. The course make the students to be a practical social worker by knowing the various concepts of sociology and psychology |
| Pre-requisites, if any: | |
| Units | |
| I | **Developmental Psychology**<br>Definition, fields of Psychology; Definition and characteristics of behaviour; Relevance of Psychology to Social Work Practice Growth and development of the individual – principles of development, stages of human growth and development, needs, tasks, changes and problems in every stage, emphasis on socio- |

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| | cultural factors influencing development; Influence of heredity and environment. |
| II | **Theories Related to Personality**<br>Personality: Definition and nature of Personality, Psycho-Dynamic approach (Freud), Humanistic approach (Carl Roger and Maslow's) Psycho Social approach (Erik Erikson), Cognitive Development (Piaget), Moral Development (Kholberg), Social learning theory (Bandura) |
| III | **Understanding Behaviour and Mental Health**<br>• Sensation, Perception and learning (Classical and Operant learning theories)<br>• Memory process: Registration, retention and recall<br>• Intelligence – factors influencing intelligence, Mental Health; Mental Illness; Classification of minor and major mental illness, ICD 10 - Outline of common mental disorders, and Mental Retardation |
| IV | **Fundamentals of Sociology**<br>• Meaning, scope, significance and relevance,<br>• Basic sociological concepts: society-meaning, definition, types, structure, characteristics of society, community, social groups; association and institution<br>• Social structure and functions of social institutions - marriage, family, kinship, caste, religion and education<br>• Socialization: process and agents.<br>• Social control: concept, types and functions,<br>• Agents of social control: kinship, religion, law, education, traditions and customs.<br>• Social change: definition and meaning, urbanization, industrialization, westernization, sanskritisation, secularization, cultural lag and ethnocentrism. |
| V | **Social Movements in India**<br>Concept and characteristics, Social movements - peasant, tribal, Dalits, backward class, women, minority groups, working class and student; social change in India, social movements.<br>Social issues in India; concept, issues and causes, approaches in responding to issues: corruption, malnourishment, child abuse, violence against women & sexual minorities human trafficking, communalism, terrorism and environment degradation. current social issues, role of social worker |
| Books For Reference | • Bhatia, Hansraj, Elements of Social Psychology, Somaiya Publications, Bombay, 1970<br>• Christensen, I.P., Psychology, BIOS Scientific Publications, New York, 2001<br>• Engler, Barbara, Personality Theories- An Introduction,3rd edition, Houghton Muffin, Company, |

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| | Boston, 1991<br>• Gardner Murphy, An Introduction to Psychology, Oxford and IBH Publishing and Co., Calcutta, 1964.<br>• Morgan, Clifford, T, Introduction to Psychology, McGraw-Hill Book Company- New York, 1986<br>• Robert A. Baron, 2001, Psychology, Prentice Hall of India Pvt., Ltd., New Delhi.<br>• Verma, R.M. 2003, Foundation in Psychology, Common Wealth Publishers, New Delhi<br>• AbhijitDasgupta, 2012, On The Margins: Tribes, Castes And Other Social Categories (Fourth), Sage Publications, New Delhi<br>• Anthony Giddens, 1998, Sociology (Third), Polity Press, London<br>• Sachdeve D.R. And VidhyaBhushan, 2006, Introduction To Sociology, KitabMahal, Allahabad<br>• Frank N Magill, 1995, International Encyclopedia of Sociology, British Library, England<br>• Jainendra Kumar Jha, 2002, Basic Principles of Developmental Sociology, Anmol Publications, New Delhi<br>• Khare R.S., 2006, Caste, Hierarchy, Individualism, Oxford University Press, New Delhi<br>• Mohanty B. B., 2012, Agrarian Change and Mobalization, Sage Publications, New Delhi<br>• Sahu D.R., 2012, Sociology Of Social Movement, Sage Publications, New Delhi<br>• Shanger Rao C. N, 2012, Sociology Principles of Sociology With An Introduction To Social Thought, S Chand And Company, New Delhi. |

Methods of assessment:

Recall (K1) – Simple definitions, MCQ, Recall steps, Concept definitions

Understand/ Comprehend (K2) – MCQ, True/False, Short essays, Concept explanations, Short summary or overview

Application (K3) – Suggest idea/concept with examples, Suggest formulae, Solve problems, Observe, Explain

Analyse (K4) – Problem-solving questions, Finish a procedure in many steps, Differentiate between various ideas, Map knowledge

Evaluate (K5) – Longer essay/ Evaluation essay, Critique or justify with pros and cons

Create (K6) – Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations

Mapping with Programme Outcomes:

Map course outcomes for each course with programme outcomes (PO) in the 3-point scale of Strong, Medium and Low

| | PO1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | S | M | S | S | S | M | S | S | M | S |
| CO 2 | S | M | S | M | S | S | S | M | M | S |
| CO 3 | S | S | S | S | S | M | S | S | S | S |
| CO 4 | M | S | S | S | M | S | M | S | S | M |
| CO 5 | S | S | M | S | S | S | S | M | S | M |

S-Strong M – Medium L- Low

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| **Semester II** | **ELECTIVE PAPER - II** |
| **Title of the Course:** | **SSSE052 DISASTER RISK REDUCTION** |
| Credits: | 3 |
| Course Objectives | 1. To develop an understanding of eco system equilibrium and dis-equilibrium<br>2. To develop skills to analyze the factors contributing to disaster<br>3. To develop and understanding of the process of Disaster Management<br>4. To understand well about the effects of disaster on human lives and their living conditions<br>5. To enhance the knowledge on the disaster management techniques to cope effectively when disaster occurs |
| Course Outcomes | 1. The students can learn about the mitigation measures carried out by the Rescue force when disaster occurs<br>2. The disasters occurring make the students to learn about its different types and its effect making a huge impact on the lives of so many people<br>3. The students must learn how to rehabilitate the disaster affected people<br>4. The students will learn to protect them from disaster whether it is man-made or natural<br>5. The course enable the students capacity to cope effectively when any disaster affect their living conditions and livelihood |
| Pre-requisites, if any: | |
| Units | |
| I | **Concept and Definition**<br>• Basic disaster aspects, types of disaster – natural, instantaneous, creeping, technological disasters and their interaction. Refugees/ Repatriates-Issues and concerns of causes of disasters; Principles of Disaster Management |
| II | **Disaster Management cycle**<br>• Prevention, mitigation, preparedness, response, recovery and rehabilitation. |
| | • Stages in Disaster – pre, during and post disaster, Psycho social aspects of disaster;<br>• Disaster Management Cycle: Prevention, Mitigation, Preparedness, Response,Recovery and Rehabilitation |
| III | **Disaster Mitigation**<br>• Guiding principles of mitigation,<br>• Problem areas – mitigation measures, risk management, vulnerability analysis, cost – effective analysis, risk reducing measures. Formulation and implementation of mitigation programmes |

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| IV | **Disaster Management**<br>• Disaster Management Authority Act, 2005 – Importance and special features. Management Policy / Legislation, Relief, Recovery (Rehabilitation management policy, legislation), National / International resources (funding agencies)<br>• Intervening parties – Government, Voluntary organization,<br>• Local groups – Community participation, volunteers, social workers. |
| V | **Stress management of Emergency workers**<br>• Role of the Social Worker in Disaster Management Implications of the HUGO model, Intersectional approaches in Utilization of resources / training and public awareness |
| Books For Reference | • Bose, B.C Disaster Management in India, New Delhi, Rajat Publication. 2007<br>• Goel S.L Encyclopedia of Disaster Management, New Delhi, Deep & deep Publications Pvt. Ltd, 2005<br>• Goel S.L Disaster Management Organisations and Management of Health Management of Human Being and Animals, New Delhi, Deep & Deep Publications. 2001<br>• Prabhas, Chandra, Sinha Disaster Management Process,Law, Policy & Strategy, New Delhi, SBS.Publications, 2006<br>• Prabhas, Chandra, Sinha Disaster Mitigation, Preparedness, Recovery & Response, New Delhi, SBS Publications.2006<br>• Sanjay,K. Roy Refugees and Human Rights, Jaipur, Rawat Publications, 2001<br>• Singh, R.B Disaster Management, Jaipur, Rawat Publications. 2000<br>• Verma, K, Manish, Development, Displacement and Resettlement,Jaipur, Rawat Publications. 2004<br>. |

Methods of assessment:

Recall (K1) – Simple definitions, MCQ, Recall steps, Concept definitions

Understand/ Comprehend (K2) – MCQ, True/False, Short essays, Concept explanations, Short summary or overview

Application (K3) – Suggest idea/concept with examples, Suggest formulae, Solve problems, Observe, Explain

Analyse (K4) – Problem-solving questions, Finish a procedure in many steps, Differentiate between various ideas, Map knowledge

Evaluate (K5) – Longer essay/ Evaluation essay, Critique or justify with pros and cons

Create (K6) – Check knowledge in specific or offbeat situations, Discussion, Debating or

Presentations

Mapping with Programme Outcomes:

Map course outcomes for each course with programme outcomes (PO) in the 3-point scale of Strong, Medium and Low

| | PO1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | S | S | S | S | M | M | S | S | M | M |
| CO 2 | S | M | S | M | S | S | S | M | M | S |
| CO 3 | S | S | S | S | S | S | S | S | S | S |
| CO 4 | M | S | M | S | M | M | S | S | S | S |
| CO 5 | M | S | M | S | S | M | M | S | S | M |

S-Strong M – Medium L- Low

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| **Semester II** | **ELECTIVE PAPER - III** |
| **Title of the Course:** | **SSSE052 COUNSELLING – THEORY AND PRACTICE** |
| Credits: | 3 |
| Course Objectives | 1. To develop a basic understanding of theory and skills in counselling<br>2. To learn the different approaches and to develop an eclectic approach to counselling<br>3. To integrate counselling skills in Social work practice<br>4. To enable the students in knowing about the techniques of providing psycho-social therapy to clients<br>5. To make the students in learning the art of counselling to solve the psycho-social maladjustment problems |
| Course Outcomes | 1. The students can learn the theory of counselling and can apply it in their practical work settings<br>2. The different approaches of counselling can emancipate the standard of students ability and capacity in solving the clients problems<br>3. The techniques and skills of counselling can ensure the students to apply it in their daily practical life<br>4. The various approaches and theories of counselling bring new perspective and outlook to students in solving the individuals coping issues<br>5. The outcome of the course is to make the students a capable and efficient counsellor in providing effective counselling therapy to clients |
| Pre-requisites, if any: | |
| Units | |
| I | **Concept of Counselling**<br>• Definition, principles and goals; factors influencing counselling process; Counsellor as a professional: attitudes, values, beliefs, relationship, burn–out stress management, self-renewal.<br>• Client as a person: voluntary and non – voluntary client, expectations, client's behaviour. |
| II | **Different Approaches of Counselling:**<br>• Approaches**:** Over view of alternate approaches: yoga, meditation, storytelling, art therapy, psychodrama, medical clowning, laughter therapy, movement therapy. Need for Eclectic approach to counselling |
| III | **Types and Techniques to Counselling**<br>• Types: directive counselling, non-directive counselling, individual counselling, group counselling, community counselling, peer counselling.<br>• Counselling Techniques: Initiating contact, intake, rapport building, establishing structure, interaction, attending behaviour, observation and responding, SOLER |

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| IV | **The Eagan Model of Counselling:**<br>Stage- 1: Problem exploration and clarification- Part I – Attending & listening, orienting oneself to the present, Micro skills- active listening- verbal and non-verbal messages and behaviour; Part II – Helper's response and clients self-exploration, Helper's skills- accurate empathy (primary level), respect, genuineness, concreteness, Clients' skills – self exploration<br>Stage- 2: Integrative understanding/ dynamic self-understanding, Part I- focusing, summarizing, probing for missing experiences, behaviour feelings. Part II- Helper's skills- skills of stage-1, self-disclosure, immediacy, confrontation, Client's skill - non-defensive listening, dynamic self-understanding<br>Stage- 3: Facilitating action; developing new perspective; preferred scenario, Part I - helping clients see alternatives; choose and formulate action plan; implement and evaluate. |
| V | **Counselling in different settings**<br>• Marital, family, HIV/AIDS, pastoral counselling, student guidance and counselling, career guidance and grief counselling, counselling suicidal clients, gerontological counselling, adolescent counselling, de-addiction counselling and disaster counselling |

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| Books For Reference | • Association of Psychological and Educational Counsellors of Asia (APECA) (1982): Counselling in Asia, Perspectives and Practices.<br>• Bianca Cody Murphy, Carolyn Dillion (2003): Interviewing in Action Relationship, Process and Change.2nd Ed. USA: Thompson Brooks/Cole.<br>• Colin Feltham (2010): Brief Counselling, New Delhi: Tata McGraw Hill.<br>• David R. Evans, Margret T. Hearn, Max R. Ullmann& Allen E. Ivey (2008): Essential Interviewing: A Programmed Approach To Effective Communication (7th Ed.), USA: Thompson Brooks/Cole.<br>• DalaganjanNaik. (2004): Fundamentals of Guidance and Counselling. Delhi: Adhyayan.<br>• Gibson L. Robert & Mitchell. (2008): Introduction to Counselling and Guidance. New Delhi: Prentice Hall of India.<br>• Jacobs, E., Masson, L., Harvill, L., (1998): Group Counselling Strategies and Skills, USA: Brooks/Cole Publishing Company.<br>• John, McLeod An Introduction to Counselling (3rd Ed.), Jaipur: Rawat Publications.<br>• John, McLeod (2007), Counselling Skills (1st Ed.), Jaipur: Rawat Publications.<br>• Lawrence, Shulman (2006): The Skills of Helping-Individuals, Families, Groups, and Communities (5th Ed.), USA: Thompson Brooks/Cole. .<br>• Rao, S. Narayana. (1981): Counselling Psychology. Tata McGraw Hill.<br>• Reeves, Andrew. (2013): Counselling and Psychotherapy. New Delhi: SAGE.<br>• Sharma Ramnath and Sharma Rachana. (2004): Guidance and Counselling in India. New Delhi: Atlantic. |

Methods of assessment:

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Analyse (K4) – Problem-solving questions, Finish a procedure in many steps, Differentiate between various ideas, Map knowledge

Evaluate (K5) – Longer essay/ Evaluation essay, Critique or justify with pros and cons

Create (K6) – Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations

Mapping with Programme Outcomes:

Map course outcomes for each course with programme outcomes (PO) in the 3-point scale of Strong, Medium and Low

| | PO1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | S | S | M | S | M | M | S | S | M | S |
| CO 2 | S | M | S | S | S | S | S | S | S | S |
| CO 3 | S | S | S | S | S | S | S | S | S | S |
| CO 4 | M | S | S | S | S | S | M | S | S | S |
| CO 5 | S | S | S | M | M | S | S | M | S | M |

S-Strong M – Medium L- Low

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| **Semester II** | **ELECTIVE PAPER - IV** |
| **Title of the Course:** | **SSSE053 GENDER AND DEVELOPMENT** |
| Credits: | 3 |
| Course Objectives | 1. To develop an understanding of the perspective of gender and development<br>2. To develop and ability to identify areas of work with women and men<br>3. To understand strategies and interventions that change the situation<br>4. To understand well about the concepts of gender development and their empowerment through the gender perspective<br>5. To enhance the students knowledge on gender role and its significance in the development of the society |
| Course Outcomes | 1. The concept of gender empowerment is globally making a significant note in most of the organizations and its development. The students can well understand about this emerging topic thoroughly.<br>2. The part of contribution of women to the development of the nation is recognised and motivated in various countries. This course modernise the thoughts of young generation on women empowerment.<br>3. The outcome of the course is to comprehend well about the concept of feminism and social work.<br>4. The course make the students to know about the various concepts of gender empowerment and its issues that to be dealt with<br>5. The course provide knowledge on the significance of gender |
| | and their development in the global arena |
| Pre-requisites, if any: | |
| Units | |
| I | **Gender Concepts**<br>• Sex and gender, gender identity; gender relations, men and masculinity; gender division of labour, gender roles and responsibilities, gender stereotyping, productive work, reproductive work, equity and equality; gender mainstreaming; gender sensitization, feminization of poverty; empowerment-types,<br>• Gender development indicators - sex ratio, GER, GDI, GEM |
| II | **Feminism**<br>• Concept, meaning and definition; types of feminism women's movements: pre and post-independence perspectives in India, landmarks in women's movement in India;<br>• Feminist Social Work: Meaning, Concept and Definition, Feminist Perspectives in Social Work Practice; Women'sAgenda for Social Work; Principles in Women Centred<br>Practice |

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| III | **Protective Measures for Women in India**<br>• Constitutional and Legal Provisions for women; Rights with reference to entitlements, political participation, education, employment, health, inheritance, marriage, adoption, divorce, maintenance, Protective Laws ; Hindu Succession Act- 1956 with Amendment in 2005; Prohibition of Child Marriage Act-2006, Protection of Women From Domestic Violence Act – 2005; Sexual Harassment of women at Workplace Act-2013**,** |
| IV | **Global Perspectives in Women's Development**<br>• Convention on Elimination of All Forms of Discrimination against Women; and Girls (CEDAW) 1982 – Implementation in India; Global Impact of CEDAW;<br>• Role of UN-WOMEN; UN Timeline in Women's Progress; INGOs and NGOs in Women's Development, Policy Approaches for Women; UN Agenda on Post Development and Sustainable Development Goals; Women as Agents of Peace and Security |
| V | **Special Initiatives and Programmes**<br>• Status of women in India, problems specific to Indian women; discrimination against the girl child;<br>• National and State Commissions for Women; Ministry for Woman and Child Development; the National Plan of Action for the Girl Child (1991-2000); National Policy for the Empowerment of Women-2001; Reservation for Women in Local Self Government; Five Year Plans, Gender Budgeting |
| Books For Reference | • Bhatia Anju, Women's Development and NGOs, Jaipur: Rawat, 2000.<br>• Dominelli, L., Feminist Social Work Theory and Practice, New York: Palgrave Macmillan, 2002. |

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| | • MikkelsenBritha, Methods for Development Work and Research – A Guide for Practitioners, New Delhi: Sage, 1995.<br>• Moser O.N Caroline, Gender Planning and Development, Theory, Practice and Training, London: Routledge, 1993.<br>• Banerjee Paula, Women in Peace Politics, New Delhi: Sage, 2008.<br>• Bansal, D, K.; Gender Justice, New Delhi: Mahaveer and Sons, 2006.<br>• Bhatia Anju, Women's Development and NGOs, Jaipur: Rawat, 2000.<br>• Datta, R and Kornberg, J., Women in Developing Countries-Assessing Strategies For Empowerment, New Delhi: Viva Books, 2005.<br>• Dominelli, L., Feminist Social Work Theory and Practice, New York: Palgrave Macmillan, 2002.<br>• Evans Kathy M, Introduction to Feminist Therapy, New Delhi: Sage, London, 2011.<br>• Heywood, L., The Women's Movement Today, Vol. 1 and 2, Jaipur: Rawat, 2007.<br>• Karl Marilee, Women and Empowerment- Participation and Decision Making, New Delhi: Zed Books Ltd, 1995.<br>• MikkelsenBritha, Methods for Development Work and Research – A Guide for Practitioners, New Delhi: Sage, 1995.<br>• Moser O.N Caroline, Gender Planning and Development, Theory, Practice and Training, London: Routledge, 1993. |

Methods of assessment:

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Evaluate (K5) – Longer essay/ Evaluation essay, Critique or justify with pros and cons

Create (K6) – Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations

Mapping with Programme Outcomes:

Map course outcomes for each course with programme outcomes (PO) in the 3-point scale of Strong, Medium and Low

| | PO1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | S | S | M | S | M | S | S | S | M | M |
| CO 2 | S | M | S | M | S | M | S | M | S | S |
| CO 3 | S | S | S | S | S | S | S | S | S | S |
| CO 4 | M | S | S | S | S | S | M | S | S | S |
| CO 5 | S | S | M | S | M | S | S | M | M | S |

S-Strong M – Medium L- Low

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| **Semester II** | **ELECTIVE PAPER - V** |
| **Title of the Course:** | **SSSE053 HUMAN RIGHTS AND SOCIAL WORK** |
| Credits: | 3 |
| Course Objectives | 1. To provide a perspective and foundation for a human rights culture among students.<br>2. To create awareness on the Indian legal system, rule of law, human rights related to custody and detention.<br>3. To equip students with knowledge about the human rights movements and new rights gained.<br>4. To provide knowledge on human rights would make the students more empowered in knowing their rights<br>5. To enhance the students perspective on human rights issues and its violations in the society |
| Course Outcomes | 1. The students can gain more knowledge on the human rights and can raise their voice for human rights protection and advocate for it<br>2. The outcome of the course is to make aware about the significance and necessity of knowledge about human rights and its influence in protecting the rights of the common people<br>3. The knowledge of human rights empower the students community, women community and unprivileged sections of society<br>4. The outcome of the course is to make the student a better human rights activist for claiming the rights of common people<br>5. The course will enable the students in knowing the various international laws and its bodies making impact in the global arena and influencing the socio-politico development of various countries |
| Pre-requisites, if any: | |
| Units | |
| I | **Introduction to Human Rights**<br>• Categories and foundation of human rights, International Human Rights Law and how to use it; Indian Constitution and human rights protection and enforcement; Writ jurisdiction and Public Interest Litigation. |
| II | **Understanding law and the State**<br>• The relationship between human rights, democracy, sustainable development, equality, sovereignty, secularism and non-discrimination;<br>• The Indian Legal System, Indian Penal Code, Criminal |

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| | Procedure Code and Civil Procedure Code; Human rights in relation to custody and detention. |
| III | **Global Market and Human Rights**<br>• Business corporations and human rights standards Science, technology and human rights; Protection and regeneration of natural resources. Intellectual Rights |
| IV | **Rights of the Marginalized Sections**<br>• Children rights, rights of coastal Communities, women's rights, dalits rights, workers' rights, unorganized labour rights, victims of displacement and resettlement. Law and Strategy regarding protecting the environment, consumer protection, Right to information. |
| V | **Human rights Movement in India**<br>• Statutory Commission and Human Rights Courts for the protection of rights, Procedures for intervening in this process. Strategies and skills for human rights advocacy. |
| Books For Reference | • Baxi, Upandra, (2005) Future of Human Rights Oxford University Press, London<br>• Chandra, Sathish (1996) International Documents of Human Rights, Mittal Publications, New Delhi.<br>• Chakrborthy, Somen, (2004) Human Rights Trainer's Manual, Indian Social Institute, New Delhi.<br>• Donnelly, Jack (1989) Universal Human Rights in Theory and Practice, Cornell University, Press, USA.<br>• Mathew P.D & Mathew, P.M (2005) Indian Legal System: An overview, Indian Social Institute, New Delhi<br>• Shanmugavelayutham, K. Social Legislation and Social Change, VazhgaValamudan Publishers, Chennai<br>• Srivastava and Narayan (2002) United Nations on Human Rights, Indian Publishing Distributors, New Delhi.<br>• United Nations, 1994: Human /Rights and Social Work, A Manual for Schools for Social Work and the Social Work Profession, Centre for Human Rights United Nations, Geneva. |

Methods of assessment:

Recall (K1) – Simple definitions, MCQ, Recall steps, Concept definitions

Understand/ Comprehend (K2) – MCQ, True/False, Short essays, Concept explanations, Short summary or overview

Application (K3) – Suggest idea/concept with examples, Suggest formulae, Solve problems, Observe, Explain

Analyse (K4) – Problem-solving questions, Finish a procedure in many steps, Differentiate between various ideas, Map knowledge

Evaluate (K5) – Longer essay/ Evaluation essay, Critique or justify with pros and cons

Create (K6) – Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations

Mapping with Programme Outcomes:

Map course outcomes for each course with programme outcomes (PO) in the 3-point scale of Strong, Medium and Low

| | PO1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | S | M | S | S | M | S | M | M | S | S |
| CO 2 | S | S | S | S | S | S | S | S | S | M |
| CO 3 | S | S | S | S | S | S | S | S | S | S |
| CO 4 | M | S | M | S | S | S | S | S | S | S |
| CO 5 | S | M | S | M | M | S | S | M | S | S |

S-Strong M – Medium L- Low

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| **Semester III** | **ELECTIVE PAPER - VI** |
| **Title of the Course:** | **SSSE054 CORPORATE SOCIAL RESPONSIBILITY** |
| Credits: | 3 |
| Course Objectives | **- Gain knowledge about Corporate Social Responsibility**<br>**- Understand the functions and activities of Social Audit**<br>**- Acquire the skills of promoting and working in CSR programms.** |
| Course Outcomes | 1) The students will learn about the importance of the Corporate social responsibility in the society<br>2) The outcome of the course is to teach the different elements consist in the unit of society and defining its significance<br>3) The course is teaching about the social audit of organization and disorganization to students for knowing about its importance and values<br>4) The outcome of the course is to provide knowledge about the concept of corporate responsibility.<br>5) The course is to make aware on the various types of responsibilities by the corporate sectors to students for better knowing about the values and significance of social responsibility and social audits. |
| Pre-requisites, if any: | |
| Units | |
| I | **UNIT 1: Corporate Social Responsibility** – Concept, and significance – Evolution of CSR – The Triple Bottom Line Approach - |
| | CSR Issues: Environmental, Social, Labor related, Ethical and Governance. |
| II | **UNIT 2: Organizational environment** - Meaning - Types - Organizational Life Cycle - Impact of technology - impact of cultural values on managerial effectiveness - Social responsibilities of business. |
| III | **UNIT 3: Role of 'Standards and Codes' in CSR:** ISO – 14001(Environmental Management System), Occupational Health and Safety Management Systems (OHSAS) – 18001, Global Compact-UN, Stakeholder Engagement Standard -AA – 1000 (Stakeholder Engagement Standard). |

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| IV | **UNIT 4: NGO and CSR** – Indian Companies Act2013 from CSR perspective- Program for the neighborhood: Health, Education, Employment, Social Entrepreneurship and Environment.<br>Communication: Annual Reports and Sustainability Reports. |
| V | **UNIT 5: CSR- Success Stories in Indian Context** – Infosys, TISS, TISCO, USHA. ASSOCHAM Reports in CSR. CSR Awards. |
| Books For Reference | **Reference**<br>1. Akhileshwar Pathak, 2014, Legal Aspects Of Business (Sixth), Mcgraw Hill Publications, New Delhi.<br>2. Garg K.C. And V.K. Sareen and Mukesh Sharma and R.C.Chawla, 2008, Legal Environment of Business, Kalyani Publications, Chennai.<br>3. Jeffrey A Mello, 2011, Strategic Management of Human Resource (Third), Cingage Learning Ind Pvt Ltd, New Delhi.<br>4. John D Daniels and Lee H Radebaugh and Daniel P Sullivan, 2005, International Business (Tenth), Pearson Eduction Pvt Ltd, New Delhi.<br>5. John R Baotright, 2003, Ethics and Conduct of Business (Fourth), Dorling Kindersley Ind Pvt Ltd, New Delhi.<br>6. Mahajan C.P., 2008, Concepts and Solutions of Business Ethics, ABD Publishers, Jaipur.<br>7. Neelamegam V., 2008, Business Environment, Vrinda |

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| | Publications, New Delhi.<br>8. Sankaran S., 2013, Business Environment, Margham Publications, Chennai.<br>9. Saravanavel P. And S.Sumathi, 2009, Legal Aspects of Business, Himalaya Publishing House, Mumbai.<br>10. Sharma R.K. And PuneetGoel and PoojaBhagwan, 2009, Business Ethics And Corporate Governance, KalyaniPublications, Chennai. |

Methods of assessment:

Recall (K1) – Simple definitions, MCQ, Recall steps, Concept definitions

Understand/ Comprehend (K2) – MCQ, True/False, Short essays, Concept explanations, Short summary or overview

Application (K3) – Suggest idea/concept with examples, Suggest formulae, Solve problems, Observe, Explain

Analyse (K4) – Problem-solving questions, Finish a procedure in many steps, Differentiate between various ideas, Map knowledge

Evaluate (K5) – Longer essay/ Evaluation essay, Critique or justify with pros and cons

Create (K6) – Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations

Mapping with Programme Outcomes:

Map course outcomes for each course with programme outcomes (PO) in the 3-point scale of Strong, Medium and Low

| | PO1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | S | M | S | M | S | M | S | S | S | S |
| CO 2 | S | S | S | S | S | S | S | M | M | S |
| CO 3 | S | S | S | S | S | S | S | S | M | S |
| CO 4 | M | S | M | S | M | S | M | S | S | S |
| CO 5 | S | M | S | M | S | M | S | M | S | M |

S-Strong M – Medium L- Low

| **Semester III** | **ELECTIVE PAPER - VII** |
|---|---|
| **Title of the Course:** | **SSSE054 HEALTH AND HOSPITAL ADMINISTRATION IN INDIA** |
| Credits: | 3 |
| Course Objectives | 1. To establish a meaningful understanding of nature of health, scope and meaning of health administration.<br>2. To help the students to acquire the knowledge about the union, state and local level Primary Health Centers and their functioning.<br>**3.** To gain knowledge on the hospital services available for the in the society**.**<br>4. To provide knowledge on the legal laws and value of health to students.<br>5. To teach students on the primary relationship of family and its allied institutions |
| Course Outcomes | 1) The students will learn about the importance of the health and primary health care units.<br>2) To teach the different health care services in the union, state and local levels.<br>3) The course is teaching about the importance of legal issues and laws to students.<br>4) The outcome of the course is to provide knowledge about the concept of health and its quality in the hospitals in India. |
| Pre-requisites, if any: | |
| Units | |
| I | **Unit- I: Introduction**<br>Nature, Scope and Meaning of Health Administration- the Basis for Public Health Government and Public Health- law and Public health. |
| II | **Unit- II: Health Organization**<br>Organization of Health care Administration at the Union-State and Local Levels Administration of Primary Health Care health Centre- Voluntary –Health Agencies |
| III | **Unit- III: Policy Making and Planning for Health Care**<br>Policy Making for Health care Administration- Planning for Health Care- Personnel Management-Financial Management-Public Relations. |
| IV | **Unit- IV: Hospital Administration**<br>Hospital Planning and Administration- Administration of Out-Patient and In- Patient (wards)<br>Services- Emerging services in Hospitals- Manpower Planning in Hospitals-Medical Practice<br>and Law- Medical Legal Cases. |
| V | **Unit- V: Trends in Hospital Administration**<br>Modernizing Health Administration- Evaluation of Medical Services in Hospitals- Role of World Health Organization-Quality Health Care in India- Health insurance. |

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| Books For Reference | 1. Goel, S.L. and R.Kumar (1986) Hospital Administration and Management, (in three volumes), New Delhi: Deep and Deep.<br>2. Goel, S.L:, (1984) Hospital Administration., Delhi: Sterling Publishers Pvt, Ltd.<br>3. Kumar, Arun., ( 2000) Health Administration, New Delhi: Anmol Publications.<br>4. Kumar, Arun., (2000) Encyclopedia of Hospital Administration and Development, (in Three Volumes), |
| | Delhi: Anmol Publications. |

Methods of assessment:

Recall (K1) – Simple definitions, MCQ, Recall steps, Concept definitions

Understand/ Comprehend (K2) – MCQ, True/False, Short essays, Concept explanations, Short summary or overview

Application (K3) – Suggest idea/concept with examples, Suggest formulae, Solve problems, Observe, Explain

Analyse (K4) – Problem-solving questions, Finish a procedure in many steps, Differentiate between various ideas, Map knowledge

Evaluate (K5) – Longer essay/ Evaluation essay, Critique or justify with pros and cons

Create (K6) – Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations

Mapping with Programme Outcomes:

Map course outcomes for each course with programme outcomes (PO) in the 3-point scale of Strong, Medium and Low

| | PO1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | S | M | S | M | S | M | S | S | S | S |
| CO 2 | S | S | S | S | S | S | S | M | M | S |
| CO 3 | S | S | S | S | S | S | S | S | M | S |
| CO 4 | M | S | M | S | M | S | M | S | S | S |
| CO 5 | S | M | S | M | S | M | S | M | S | M |

S-Strong M – Medium L- Low

| **Semester III** | **ELECTIVE PAPER - VIII** |
|---|---|
| **Title of the Course:** | **SSSE055 SOCIAL POLICY AND SOCIAL LEGISLATION** |
| Credits: | 3 |
| Course Objectives | 1. To develop an understanding of the social policy in the perspective of the National Goals as stated in the Constitution<br>2. To develop the capacity to recognize the linkage between development issues and social policy in terms of the plans and programmes<br>3. To develop an understanding of the concepts of social policy and social welfare policy<br>4. To gain knowledge on the social policy and its various implications making impact in the social institutions<br>5. To enhance the students knowledge on the concept of social legislation for solving the social problems legitimately |
| Course Outcomes | 1. The students can learn about the social policy and constitution and its relation within it<br>2. The outcome of the course is to make the students to be aware about the social legislations in India and its impact on the welfare of the people<br>3. The course teach about the policy formulation and policy planning to gain more knowledge about it<br>4. The course make aware the students on the social welfare policy and its implementation in the social institutions<br>5. The outcome of the course is to make the students a responsible citizen in knowing lot more about the social policy and its legislations |
| Pre-requisites, if any: | |
| Units | |
| I | **Social Policy and Constitution**<br>• Social policy, social welfare policy, its relation to the constitution, fundamental rights and Directive Principles of State Policy and Human Rights.<br>• Definition, needs and contents, evolution of social policy in India, social policy and planned social change and development. |
| II | **Policy Formulation and approaches**<br>• Unified, integrated and sectoral; models of social policy and their application to Indian situation, process of formulation, social policies, plans and programmes,<br>• Policies in India – a historical perspective- policies- backward classes, scheduled classes. scheduled tribes, denotified communities, women, children, youth, handicapped, aged, populations, family welfare, urban & rural development, education, health, poverty alleviation, Review of Five year Plans, Programmes and policies of Twelfth (12) Five Year Plan.<br>• |

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| III | **Policy and Planning**<br>• Concept, Scope, linkages between social policy and planning. Social work and social planning; Planning – historical perspective.<br>• Political systems. Political process, co-ordination of center and state, Panchayati Raj, Peoples participation. Political judiciary, social movement and voluntary action, legal aid and public interest litigation. Planning Machinery and Monitoring, process of social planning in India; Implementation at various levels, Monitoring and evaluation |
| IV | **Major Social Legislation in India I**<br>• Legislation pertaining to marriage, divorce and succession, Hindu Marriage Act 1955, Hindu Adoption and Maintenance Act 1956, Hindu Minority and Guardianship Act 1956, Hindu Succession Act 1956. |
| | Special Marriage Act 1954, Provision regarding marriage and divorce in Mohammedan law.Medical Termination of Pregnancy Act 1971, Dowry Prohibition Act 1961, Tamil Nadu Prohibition of Eve teasing Act 1988. |
| V | **Major Social Legislations in India II**<br>• Protection of Civil Rights Act (1976), SC/ST. Prevention of Atrocities Act, 1989. Immoral Traffic Prevention Act (1956) Tamil Nadu Slum Areas (Improvement and Clearance) Act (1971) the Mental Health Act, 1987, Manual Scavenging and Dry Latrines (prohibition) Act 1993, Bonded Labour Abolition Act 1976, Transplant of Human Organs Act 1994, Family Court's Act 1984, Protection of Human Rights Act, 1993 Tamil Nadu Prohibition of Ragging Act 1997, Persons with Disabilities Act 1995. Legislation pertaining to children: Child Labour (abolition & regulation) Act 1986. Juvenile Justice Act 2001. |

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| Books For Reference | • Adams Robert, (2002), Social Policy for Social Work, Palgrave.<br>• Baldock John, (2000), Social Policy, Oxford, Oxford University Press.<br>• Dubey S.N. (1979), Administration of Social Welfare Programmes in India, Soymaiya Publications, Bombay.<br>• Gangrade, K.D., (1991), Social Legislation in India, Concept Publishing, New Delhi.<br>• Kulbarai P.D., (1999), Social Policy of Social Development in India, ASSWI.<br>• Kulkarni. P.D., (1965), The Central Social Welfare Board, Asia Publishing House, New Delhi.<br>• Nair, T. Krishnan (ed.) (1976), Social Work Education & Development of Weaker Sections, Madras-Association of Schools of Social Work in India.<br>• Shanmugavelayutham .K. (1998) Social Legislation and Social Change, Chennai, VazhgaValamudan Publishers<br>• Yeetes Nicole, (2001), Globalization of Social Policy, London Sage Publication. |

Methods of assessment:

Recall (K1) – Simple definitions, MCQ, Recall steps, Concept definitions

Understand/ Comprehend (K2) – MCQ, True/False, Short essays, Concept explanations, Short summary or overview

Application (K3) – Suggest idea/concept with examples, Suggest formulae, Solve problems, Observe, Explain

Analyse (K4) – Problem-solving questions, Finish a procedure in many steps, Differentiate between various ideas, Map knowledge

Evaluate (K5) – Longer essay/ Evaluation essay, Critique or justify with pros and cons

Create (K6) – Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations

Mapping with Programme Outcomes:

Map course outcomes for each course with programme outcomes (PO) in the 3-point scale of Strong, Medium and Low

| | PO1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | S | S | M | S | M | S | M | S | M | S |
| CO 2 | S | S | S | S | S | S | S | S | M | S |
| CO 3 | S | S | S | S | S | S | S | S | S | S |
| CO 4 | M | S | M | S | S | S | S | S | S | S |
| CO 5 | S | M | S | M | S | M | M | S | S | M |

S-Strong M – Medium L- Low

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| **Semester III** | **ELECTIVE PAPER - IX** |
| **Title of the Course:** | **SSSE055 ENVIRONMENTAL SOCIAL WORK** |
| Credits: | 3 |
| Course Objectives | • To help the students to learn basic facts about Ecology, Environment and Energy resources.<br>• To increase the knowledge on various issues on Environment and the roles of Movements for the Environment Protection.<br>• To provide an understanding roles and responsibilities of Social Workers to protect the nature. |
| Course Outcomes | 1) The students can learn about the ecology and social work connection.<br>2) The students will orient themselves with roles of different social movements protecting the environment.<br>3) Students will learn about their roles and responsibilities to protect the nature. |
| Pre-requisites, if any: | |
| Units | |
| I | **UNIT–I: Eco system &Environmental Issues:** Environment degradation and pollution of Natural Resources- Air, Soil, Water, Population, Sanitation, Housing, Encroachments over Common Property Resources, Energy crisis and Rural Poverty. |
| II | **UNIT –II: Environment Consciousness-** NGOs, Social Workers and Ecological Movements: Global level, People's initiatives to save their environment- Chipko Movement - Save forests movement – MittiBachaoAndolan - Movements against big dams-Narmada and Tehri - Eco farming- Natural farming efforts. |
| III | **UNIT–III: Environment Action and Management:** State and the Environment preservation - Rio Summit and its implications - Government Policies and programmes - Grassroots Organization - Women and Conservation of Environment -Panchyats and Environment. Environment Management: Role of Traditional - State controlled - people controlled and jointly managed systems - Waste Management. |

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| IV | **UNIT – IV: Environment Protection Laws and Role of Social Worker:** The Environment Protection Act 1986 - Air Pollution Act 1987 - Water Pollution Act 1974. Power and functions of Central and State Pollution Control Boards: Type of offences by companies, procedures, and penalties. (Latest amendments may be considered while teaching these laws). |
| V | **UNIT – V: Environment and Field Action Visit of a local area for documenting environmental assets-** River, forest grass land, Hill etc., Visit to a polluted site, Study of flora and fauna, Study of simple eco system, Forest conservation, Standards and tolerance levels – Unplanned urbanization- Environmental movements in India - Role of NGOs in Environmental issues – Government agencies in environmental protection – Social work initiatives at different levels. |
| Books For Reference | 1. Abbasi. S.A. 1998. Renewable energy sources and their Environmental Impact. Prentice Hall London.<br>2. Agarwal S.K. 1993.Environmental protection. Himalaya Publishers, New Delhi.<br>3. Andromeda. 1995. New Science encyclopedia: Ecology and environment. Oxford Publishers. London<br>4. Benny Joseph. 2005. Environmental studies. Tata McGraw Hill |

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| | Publishers. New Delhi:<br>5. Cutter Susan L. 1998. Environmental Risks and Hazards. Prentice Hall London.<br>6. Dash Sharma P. 1998. Environment Health and development. Anmol Publishers. New Delhi.<br>7. Gadgil, Madhav and RamchandraGuha, 1995 Ecology and Equity; the use and Abuse of Nature in Contemporary India, New Delhi, Penguin Publishers.<br>8. GuhaRamchandra, 1991 The Unquiet woods, Ecological Change and Peasant Resistance in the Himalayas, New Delhi: Oxford University Press<br>9. Gupta Sunil. 1997. Environment Population and resources. Anmol Publishers. New Delhi.<br>10. Kannan 1991. Fundamentals of Environmental pollution. S. Chand. New Delhi.<br>11. Krishan. 1994. Fundamentals of Environmental pollution. S. Chand and Company. New Delhi<br>12. Luoma Samuel N. 1984. Introduction to environmental Issues. Macmillan Publishers. Calcutta. |

Methods of assessment:

Recall (K1) – Simple definitions, MCQ, Recall steps, Concept definitions

Understand/ Comprehend (K2) – MCQ, True/False, Short essays, Concept explanations, Short summary or overview

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Evaluate (K5) – Longer essay/ Evaluation essay, Critique or justify with pros and cons

Create (K6) – Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations

Mapping with Programme Outcomes:

Map course outcomes for each course with programme outcomes (PO) in the 3-point scale of Strong, Medium and Low

| | PO1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | S | S | M | S | M | S | M | S | M | S |
| CO 2 | S | S | S | S | S | S | S | S | M | S |
| CO 3 | S | S | S | S | S | S | S | S | S | S |
| CO 4 | M | S | M | S | S | S | S | S | S | S |
| CO 5 | S | M | S | M | S | M | M | S | S | M |

S-Strong M – Medium L- Low

| Semester IV | ELECTIVE PAPER - X |
|---|---|
| **Title of the Course:** | **SSSE056 INTERNATIONAL SOCIAL WORK** |
| Credits: | 3 |
| Course Objectives | 1. To help the students to understand the international perspectives of social work.<br>2. Students will understand the role of global organizations, inter cultural competencies and global challenges in social work. |
| Course Outcomes | 1. To introduce students to the concept of the International dimensions of Social work and Connections between the local and global.<br>2. To make cross – cultural comparisons in examining responses to global issues.<br>3. To enhance cross-cultural competency among students. |
| Pre-requisites, if any: | |
| Units | |
| I | **Unit -1: International Social Work**<br>Concept, Importance of International Social work, Social work as an International Profession, International Professional Action. |
| II | **Unit -2: Social Work and International Social Development**<br>Global Interdependence and Social work –Environmental Interdependence, Cultural Interdependence, Economic Interdependence, Security Interdependence, Social Welfare Interdependence International Relief and Development practice; Role of International Social Welfare Organization and their functions. |
| III | **Unit –3: Cross Cultural Competencies**<br>Meaning of Cultural Competence, Cultural awareness, Knowledge acquisition, Skill Development, Inductive Learning, Advancing Social and Economic justice Standards for Cultural Competence in Social Work Practice (NASW 2001) |
| IV | **Unit –4: Global Challenges**<br>Social Work and Global Economy, Poverty, Global Greying, Racism, Ethnic Conflict and Violence, Refugees, Displacement & Forced Migration, AIDS, Human Trafficking, Climate Change, Disaster Response. |

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| Books For Reference | 1. Cox, D and Pawar, M (2006) International Social Work: Issues, strategies & Programmes; New Delhi: Vistaar Publications<br>2. Dominelli, Lena (2012), Green Social Work, UK: Polity Press<br>3. Drolet, Julie (2014), Social Protection and Social Development – International Initiatives, New York: Springer<br>4. Drolet, Julie, Natalie Clark & Helen Allen (2012), Shifting Sites of Practice – Field Education in Canada, Toronto: Pearson Canada Inc.<br>5. Healy, Lynne M. & Rosemary J. Link (Editors.) (2012), Handbook of International Social work: Human Rights, Development and The Global Profession, New York: Oxford University Press. 46 Department of Social Work, Madras Christian College, Chennai- 600059<br>6. Healy, Lynne M. (2001), International Social work: Professional Action in an Interdependent World, New York: Oxford University Press.<br>7. Hockenstand, M.C, Midgley James (2004), Issues in International Social work-Global Challenges for a new Century, NASW press.<br>8. ILO (2012), The Strategy of the International Labour Organization Social Security for AllBuilding social protection floors and comprehensive social security systems, Geneva: ILO<br>9. Lyons, K. (1999). International Social work: Themes and Perspectives. Brookfield, USA: Ashgate<br>10. Lum, Doman (2003) Culturally Competent Practice – A framework for Understanding Diverse Groups and Justice Issues; Thomson-Brooks/Cole Publishers. |

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Understand/ Comprehend (K2) – MCQ, True/False, Short essays, Concept explanations, Short summary or overview

Application (K3) – Suggest idea/concept with examples, Suggest formulae, Solve problems, Observe, Explain

Analyse (K4) – Problem-solving questions, Finish a procedure in many steps, Differentiate between various ideas, Map knowledge

Evaluate (K5) – Longer essay/ Evaluation essay, Critique or justify with pros and cons

Create (K6) – Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations

Mapping with Programme Outcomes:

Map course outcomes for each course with programme outcomes (PO) in the 3-point scale of Strong, Medium and Low

| | PO1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | S | S | M | M | S | S | M | S | M | S |
| CO 2 | S | S | S | S | S | S | S | S | S | S |
| CO 3 | S | S | S | S | S | S | S | S | S | S |
| CO 4 | M | S | S | S | M | S | S | S | S | S |
| CO 5 | S | M | S | M | S | M | S | M | S | M |

S-Strong M – Medium L- Low

| **Semester IV** | **ELECTIVE PAPER - XI** |
|---|---|
| **Title of the Course:** | **SSSE056 INTERNATIONAL HUMAN RESOURCE MANAGEMENT** |
| Credits: | 3 |
| Course Objectives | Objectives:<br>• To introduce the students to the International Business Environment.<br>• To give necessary exposure to International Human Resource Management.<br>• To impart necessary skills required Human Resource Management with regard to the management of International business organizations. |
| Course Outcomes | 1. Students will get the proper understanding of international business environment.<br>2. Students will get exposure to the international human resource management. |
| Pre-requisites, if any: | |
| Units | |
| I | **UNIT-I: Globalization and International Business.** (9 hours)<br>Global business environment- Globalism & Globalization, Drivers of Globalization. International regulation of Trade- WTO, GATT, IMF and World Bank. Managing in the global market place. Globalization, Labor policies and the Environment; Globalization and National Sovereignty; Globalization and World power. Trends in Globalization process. Regional Trading Blocs- The TRIAD; Strategies, choices for firms to enter international environment- International, Multi domestic, Multinational, Global, Transnational; Social responsibility, ethics & code of conduct of MNCs. |
| II | **UNIT-II: International / Global Human Resource Management.** (9 hours)<br>Concept, meaning and definition of International Human Resource Management (IHRM) - Difference between Domestic Human Resource Management and International Human Resource Management. Types of employees of an international firm. Reasons for emergence of IHRM. Importance for learning about IHRM. Strategic role of IHRM. Management of International HR cycle. |
| III | **UNIT-III: Staffing, Training and Performance management for Global operations.** (9 hours)<br>Staffing philosophies for global operations- Ethnocentric approach, Polycentric approach, Global staffing / Geocentric approach, Regiocentric approach; Global selection Expatriate selection, Factors influencing foreign posting; Problems with expatriation & International personnel problems. Aligning Training and |

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| | Development with Business strategies; Training and Development for Global work / Multinational organizations- Cultural shock, sub-culture, Cross-cultural training, Language training, Practical training, Diversity training; Training techniques; Repatriation of Expatriates. Expatriate Performance Appraisal- issues and guidelines. Expatriate Performance Management- strategic importance, scope and practices. Criteria for effective Performance Management. |
| IV | **UNIT-IV: International Compensation**. (9 hours)<br>Significance of International compensation. Cost and Benefit / Balance sheet approach to International compensation. National differences in compensation. Components of an expatriate compensation package, Compensating host country nationals. Executive pay policies for global managers. |
| V | **UNIT-V: Contemporary Issues in IHRM.** (9 hours)<br>The concern of organized labor / Trade unions and international firm. The strategy of organized labor. Approaches to labor relations. Employers Associations and international firm. Collective Bargaining, Grievance, Discipline, Termination and Industrial conflict. Motivation and leading: The meaning of work-Need hierarchy in international contextReward system- Role of culture in motivation- Leading. Women in international management. IHRM in developing countries- IHRM in 21 st century. |
| Books For Reference | 1. Charles W.L. Hill, "International Business," Tata McGraw Hill Publishing Co, New Delhi.<br>2. Helen Deresky, " International Management- Managing Across Borders and Cultures," Prentice Hall of India Pvt. Ltd.,<br>3. Janet Morrison, "The International Business Environment: Global and Local Market Places in a Changing World," Palgrave MacMillan, New York, 2006.<br>4. Hugh Scullion and Margaret Lineham, " International Human Resource Management- A critical Text," Palgrave MacMillan, New York |

Methods of assessment:

Recall (K1) – Simple definitions, MCQ, Recall steps, Concept definitions

Understand/ Comprehend (K2) – MCQ, True/False, Short essays, Concept explanations, Short summary or overview

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Evaluate (K5) – Longer essay/ Evaluation essay, Critique or justify with pros and cons

Create (K6) – Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations

Mapping with Programme Outcomes:

Map course outcomes for each course with programme outcomes (PO) in the 3-point scale of Strong, Medium and Low

| | PO1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | S | S | M | M | S | S | M | S | M | S |
| CO 2 | S | S | S | S | S | S | S | S | S | S |
| CO 3 | S | S | S | S | S | S | S | S | S | S |
| CO 4 | M | S | S | S | M | S | S | S | S | S |
| CO 5 | S | M | S | M | S | M | S | M | S | M |

S-Strong M – Medium L- Low

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| **Semester IV** | **ELECTIVE PAPER - XII** |
| **Title of the Course:** | **SSSE057 MIGRATION ISSUES AND HUMAN SECURITY** |
| Credits: | 3 |
| Course Objectives | 1. Understand migration in the context of development and displacement<br>2. Explore current and emerging trends on internal and International migrations<br>3. Acquire knowledge on determinants of migration and rights of Migrants<br>4. Provide knowledge about the impact of migration in the international platform and making change in the global stand towards migration and its issues<br>5. The students can gain abundant knowledge about the migration policy of various countries and their outlook and perspective towards handling migration issue |
| Course Outcomes | 1) The course make aware the students on the issues of migration and its problem faced by refugees<br>2) The students study about the migration within the country and its impact in the rural-urban divide on the economic aspect<br>3) The students well understand about the rising crisis of human trafficking in the Indian borders and giving threat to the security of the nation<br>4) The outcome of the course is to well understand about the concept of internal and external migration occurring in the various countries<br>5) The course make the students to know about the causes and effects of migration for addressing it in the near future |
| Pre-requisites, if any: | |
| Units | |
| I | **Migration**<br>• Basic Concepts and Definition of Migration, Causes and Consequences of Migration, Historical Migration in India, Types, Issues and Challenges- Poverty, Seasonal, Displacement, Unemployment. |
| II | **Migration in India**<br>• Labour Migration in India, Brain Drain, Feminization of Migration, Internal and International Migrants - Push and Pull Factors, Patterns and Trends, Illegal Migrants and Human Trafficking, Refugees |
| III | **Globalisation and Migration**<br>• Trends in International Migration; Skill and Gender , Composition of Migration Flows - India Diaspora – Remittances – Socio Cultural Implications, |
| IV | **International Migration**<br>• Policies UN Convention 1990- UN International Migration Policies, Role and Functions of Ministry of Overseas Affairs, IOM (International Organisation for Migration), International Migration Law |

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| V | **Migration and Human Security**<br>• Meaning and Concept, Need and Importance Multi-Lateral Protection and Migration Issues, Colombo Process, Indian Emigration Policy, Indian Passport Act 2008, the Inter-State Migrant, Workmen (Regulation of Employment and Conditions of Service) Act, 1979 |
| Books For Reference | • AmalDatta, (2003): Human Migration. A Social Phenomenon. India: Mittal.<br>• Caroline B. Brettel, James F. Hollifield, (2000): Migration Theory: Talking Across Disciplines, Routledge.<br>• DeveshKapur.(2010):Diaspora, Development, and Democracy: The Domestic Impact of International Migration from India. India: Princeton University Press.<br>• David.J.Siddle. (2012): Migration, Mobility and Modernisation.Liverpool: Routledge.<br>• R. Mansell Prothero and Murray Chapman.(1983): Circulation in Third World Countries. London: Routledge and Kegan Paul. |

Methods of assessment:

Recall (K1) – Simple definitions, MCQ, Recall steps, Concept definitions

Understand/ Comprehend (K2) – MCQ, True/False, Short essays, Concept explanations, Short summary or overview

Application (K3) – Suggest idea/concept with examples, Suggest formulae, Solve problems, Observe, Explain

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Create (K6) – Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations

Mapping with Programme Outcomes:

Map course outcomes for each course with programme outcomes (PO) in the 3-point scale of Strong, Medium and Low

| | PO1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | S | S | M | M | S | S | M | S | M | S |
| CO 2 | S | S | S | S | S | S | S | S | S | S |
| CO 3 | S | S | S | S | S | S | S | S | S | S |
| CO 4 | M | S | S | S | M | S | S | S | S | S |
| CO 5 | S | M | S | M | S | M | S | M | S | M |

S-Strong M – Medium L- Low

| | |
|---|---|
| **Semester IV** | **ELECTIVE PAPER - XIII** |
| **Title of the Course:** | **SSSE057 NGOs MANAGEMENT AND DEVELOPMENT PRACTICES** |
| Credits: | 3 |
| Course Objectives | 1. Students will learn about the Ngo Registration and planning and projects.<br>2. Will understand the roles and functions of non-governmental organizations.<br>3. Students will learn about the fund raising and monitoring and evaluation of the projects. |
| Course Outcomes | Learning Outcome: *The students will…*<br>- Gain knowledge about establishing and managing a nongovernmental organization<br>- Understand the functions and activities of a nongovernmental organization<br>- Acquire the skill of working with nongovernmental organization |
| Pre-requisites, if any: | |
| | |
| I | UNIT 1: Understanding about NGO as nonprofit organizations involved in development work. Registering an organization, Strategic Planning of NGOs- Developing Vision, Mission and Goals and translating them into programs and projects. Interfacing with community, community based organizations, corporate and government. Importance and strategies of Networking of NGOs. |
| II | UNIT 2: Programme Planning and project planning - The project |
| | cycle - Project cycle phases – identification, design, implementation, evaluation. Project Cycle Management. Detailed operational plan, GANTT chart - Role of Operational planning in running program and projects. Writing Concept note. |
| III | UNIT 3: Fund Raising: Fund Raising strategy & techniques. Classification of donors, Creating donor profile. Developing appropriate marketing tools, Presentation to donors, developing a funding proposal, Developing and maintaining donor relationship. Documentation- Maintaining records and data banks. |

| | |
|---|---|
| IV | UNIT 4: Monitoring & Evaluation: Concept & Need. Role of Logical Framework Analysis (LFA) in monitoring and evaluation. Developing Objectively Verifiable Indicators and Means of Verification - Gathering quantitative & qualitative information - Reporting information for action and accountability. Auditing: Social Auditing, Financial Auditing and Data Quality Auditing. |
| V | UNIT 5: Finance Management: Budgeting, accounting and auditing. Banking procedures & practices. Maintenance of books, accounts and financial documents and records. Cost benefit analysis - Allocations and restrictions in budget. Maintaining inventory. Financial Reporting to donors and other stakeholders. |
| Books For Reference | 1. Asok Kumar Sarkar,2008, Ngo's and Globalization, Rawat Publications, New Delhi.<br>2. Chandra Prasanna. 2003. Projects: Planning, Analysis, Selection, Financing, Implementation and Review. 5th Edition. Tata Mcgraw Hill Pub.Co. Ltd. New Delhi.<br>3. Emmanuel S. Fernando, 1999, Fund 100, Jupiter, Mumbai.<br>4. Gangrade K.D, SooryaMoorthy.R. 2006. Ngos in India. PremRawat Publication. New Delhi.<br>5. Ghosh.K..A and Prem Kumar. 1997. Project Management. Anmol Publishing Ltd. New Delhi.<br>6. Joel S.G.R.Bhose, 2003, Ngo and Rural Development, Concept |

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|---|---|
| | Publishing Company, New Delhi.<br>7. Jose Murickan SJ &R.Mohan Raj & Kurian K. Katticaren, 2000, Paradigm Shifts In Development Cooperation, Indian Social Institution and Bangalore.<br>8. Malleswari B., 2010, Micro- Finance and Women Empowerment, Serials Publications, Coimbatore<br>9. Michael Norton & Murray Culshaw, 2008, Getting Started in Fundraising, Sage Publications, New Delhi.<br>10. Vijay Padaki&ManjulikaVaz, 2003, Institutional Development in Social Interventions, Sage Publications, New Delhi.<br>11. Winfo, 2004, a Hand Book for Ngo's On Fund Raising, Winfo, Coimbatore. |

Methods of assessment:

Recall (K1) – Simple definitions, MCQ, Recall steps, Concept definitions

Understand/ Comprehend (K2) – MCQ, True/False, Short essays, Concept explanations, Short summary or overview

Application (K3) – Suggest idea/concept with examples, Suggest formulae, Solve problems, Observe, Explain

Analyse (K4) – Problem-solving questions, Finish a procedure in many steps, Differentiate between various ideas, Map knowledge

Evaluate (K5) – Longer essay/ Evaluation essay, Critique or justify with pros and cons

Create (K6) – Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations

Mapping with Programme Outcomes:

Map course outcomes for each course with programme outcomes (PO) in the 3-point scale of Strong, Medium and Low

| | PO1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | S | S | M | M | S | M | S | M | S | S |
| CO 2 | S | S | S | S | S | S | S | S | S | S |
| CO 3 | S | S | S | S | S | S | S | S | S | S |
| CO 4 | M | S | S | S | M | S | M | S | M | S |
| CO 5 | S | M | S | M | S | M | S | M | S | M |

S-Strong M – Medium L- Low

| Course I | Soft Skill |
|---|---|
| **Title of the Course:** | **Communication Skills – Skills Lab** |
| **Credits:** | 2 |
| **Course Objectives** | 1. To make the students acquire knowledge in the field of communication<br>2. To delineate Non-verbal communications and its types.<br>3. To understand the role of communication in creating a new world<br>4. To enable the students to understand the barriers of communication and miscommunication.<br>5. To make the students to excel in effective communication skills |
| **Course Outcomes** | 1. Acquire knowledge about communication and its various forms.<br>2. Understand the communication process and levels.<br>3. Learn different types of skills required<br>4. Interpret the method of listening and reading skills.<br>5. Able to understand the utility of communication in day-today life, business life etc. |
| **Pre-requisites, if any:** | |
| **Units** | |
| **I** | **Introduction to Communication:**<br>Need and Nature of Effective Communication<br>**The Process of Communication:** Levels of communication; Flow of Communication; Use of language in communication; Communication Networks; Significance of technical communication.<br>**Non-verbal Communication and Body language:**<br>Forms of Non-verbal communication; Interpreting body language cues, Kinesics and Effective use of body language. |
| **II** | **Barriers to Communication:**<br>Types of barriers; Miscommunication; Noise; Overcoming measures. |
| **III** | **Listening Skill:**<br>Listening as an active skill; Types of Listeners: Listening for general content; Listening to fill up information; Intensive Listening; Listening for specific information; Developing effective listening skills; Barriers to effective listening skills. |
| **IV** | **Reading Skills**:<br>Identifying the topic sentence; interfering lexical and contextual meaning; recognizing coherence and sequencing of sentences; Improving comprehension skills. |
| **V** | **Developing Skills**<br>Developing skills for communication in working life, business life and |

| | |
|---|---|
| | social life. Managing the Event. |
| Books for Reference | • Vilanilam, J.V., Growth and Development of Mass Communication in India, New Delhi: National Book Trust, 2003.<br>• Denis McQuail, Mass Communication Theory an Introduction, New Delhi: Sage Publications, New Delhi, 1998<br>• Monippally, Matthukutty, M. Business Communication Strategies. New Delhi: Tata McGraw-Hill Publishing Company Ltd., 2001.<br>• Moore, Ninja-Jo, et al. Nonverbal Communication: Studies and Applications. New York: Oxford University Press, 2010. |

**Methods of assessment:**
**Recall (K1) -** Simple definitions, MCQ, Recall steps, Concept definitions

**Understand/ Comprehend (K2) -** MCQ, True/False, Short essays, Concept explanations, Short summary or overview

| Course I | Soft Skill |
|---|---|
| **Title of the Course:** | **Personal and Interpersonal Skills** |
| **Credits:** | 2 |
| **Course Objectives** | 1. To enhance the healthy personal and interpersonal skills among students.<br>2. This course attempts to impart necessary skills needed to the individuals. It assesses the types of personality, behavioural development and various kinds of interpersonal skills also.<br>3. To identify the self and interpersonal behavior<br>4. To differentiate healthy and unhealthy relationships<br>5. To promote self-confidence and assesses self-identity |
| **Course Outcomes** | 1. After the completion of course the student will be able to interpret behaviour and personality developments.<br>2. Analyse self and relational developments in various institutions.<br>3. Understand and describe the stress management, uncertainty, problem solving and decision making.<br>4. Display different types of communication and process of communication development such as attitude and barriers to communication.<br>5. Able to explain interpersonal relationships in multiple social backgrounds |
| **Pre-requisites, if any:** | |

| **Units** | |
|---|---|
| **I** | **Behavioural Development**<br>• Self-Assessment<br>• Friendliness - Enthusiasm – Empathy<br>• Work-Life Balance |
| **II** | **Self and Relationship Development**<br>• Relationships (healthy & unhealthy), Universal values, Character development<br>• Family Crisis, Sexual Behaviour and Domestic Violence<br>• Self Confidence - Adaptability – Resilience<br>• Assertiveness - Competitiveness - Self-Leadership |
| **III** | **Emotional Development**<br>• Development of Emotional Intelligence - Self-Awareness - Emotion Management<br>• Stress Management - Tolerance of Change and Uncertainty - Taking Criticism<br>• Decision making, Problem solving |
| **IV** | **Communication Development**<br>• Communication skills and Levels of communication<br>• Communication barriers<br>• Effect of attitude on communication |

| | |
|---|---|
| **V** | **Interpersonal Development**<br>• Concepts: Networking and Connection to Careers in society – Interpersonal Relationships<br>• Dealing with Difficult People - Conflict Resolution<br>• Personal Branding – Dealing with Office Politics, Jealousy and Infidelity |
| Books for Reference | • Goleman, Daniel (1998), *Working with Emotional Intelligence.* New York: Bantam Books.<br>• Hoffman, Edward. (2002), *Psychological Testing at Work.* New York: McGraw-Hill.<br>• Jones, Dixie A. (1997), "Plays Well with Others, or the Importance of Collegiality Within a Reference Unit," *The Reference Librarian* no. 59, 163-175.<br>• Pearson, Christine M., Andersson, Lynne M., and Porath, Christine L. (2000). "Assessing and Attacking Workplace Incivility," *Organizational Dynamics* 29 no. 2 (November). |

**Application (K3) -** Suggest idea/concept with examples, Suggest formulae, Solve problems, Observe, Explain

**Analyse (K4) -** Problem-solving questions, Finish a procedure in many steps, Differentiate between various ideas, Map knowledge

**Evaluate (K5) -** Longer essay/ Evaluation essay, Critique or justify with pros and cons

**Create (K6) -** Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations

**Mapping with Programme Outcomes:**

**Map course outcomes for each course with programme outcomes (PO) in the 3-point scale of Strong, Medium and Low**

| | **PO 1** | **PO 2** | **PO 3** | **PO 4** | **PO 5** | **PO 6** | **PO 7** | **PO 8** | **PO 9** | **PO 10** |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO 1** | S | S | S | S | S | S | S | S | S | S |
| **CO 2** | S | S | M | S | S | S | S | S | S | S |
| **CO 3** | S | S | S | S | S | M | S | S | S | S |
| **CO 4** | S | S | S | S | S | S | S | S | S | S |
| **CO 5** | M | S | S | S | S | S | S | S | M | S |

**S-Strong M-Medium L-Low**

**Methods of assessment:**
**Recall (K1) -** Simple definitions, MCQ, Recall steps, Concept definitions

**Understand/ Comprehend (K2) -** MCQ, True/False, Short essays, Concept explanations, Short summary or overview

**Application (K3) -** Suggest idea/concept with examples, Suggest formulae, Solve problems, Observe, Explain

**Analyse (K4) -** Problem-solving questions, Finish a procedure in many steps, Differentiate between various ideas, Map knowledge

**Evaluate (K5) -** Longer essay/ Evaluation essay, Critique or justify with pros and cons

**Create (K6) -** Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations

**Mapping with Programme Outcomes:**

**Map course outcomes for each course with programme outcomes (PO) in the 3-point scale of Strong, Medium and Low**

| | **PO 1** | **PO 2** | **PO 3** | **PO 4** | **PO 5** | **PO 6** | **PO 7** | **PO 8** | **PO 9** | **PO 10** |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO 1** | S | S | S | S | S | S | S | S | S | S |
| **CO 2** | S | S | S | S | S | S | S | S | S | S |
| **CO 3** | S | S | S | S | S | S | S | S | S | S |
| **CO 4** | S | M | S | S | S | M | S | S | S | S |
| **CO 5** | S | S | S | S | S | S | S | S | M | S |

**S-Strong M-Medium L-Low**

| | |
|---|---|
| **Course I** | Soft Skill |
| **Title of the Course:** | **LEADERSHIP & TEAM BUILDING** |
| **Credits:** | 2 |
| **Course Objectives** | 1. To enable students, learn team building and conflict management skills using OBT (Out Bound Training) methodology<br>2. To develop leadership skills through training and motivation<br>3. To improve communication and interpersonal for grooming overall personality enrichment<br>4. To increase the pro-activeness ability of the students for developing leadership skills<br>5. To teach them principles of team building and efficiency among them for leading the team with more spirit and positivity |
| **Course Outcomes** | 1. Demonstrate team building and conflict management skills using Out Bound Training methodology.<br>2. Articulate the basic skills necessary for leadership, communication and task execution in teams.<br>3. Increase high level cohesiveness and togetherness for leading the team with the quality of leadership ability and capacity<br>4. Make the students to manage the conflict issue and solve it with cordial approach and better managing capacity<br>5. Groom the quality of the leader among the students for making them a best leader |
| **Pre-requisites, if any:** | |
| **Units** | |
| **I** | **Interpersonal Skills**<br>• Pro-activeness – getting along better – learning to communicate and cooperate – giving and getting**.** |
| **II** | **Conflict Management**<br>• Attitudes towards conflict – two responses of conflict: fight or flight – styles of conflict management – dealing with hot buttons – skills of conflict resolution. |
| **III** | **Team Building –1**<br>• Principles of team building – getting to know – building trust among people – focusing on other people with awareness – reaching out and helping team members. |
| **IV** | **Team Building – 2**<br>• Group identity – high level cohesiveness and its dynamics – spirit of team work and creativity – working together and performing – managing change as a team. |

| | |
|---|---|
| **V** | **Leadership**<br>• Basics of leadership – leader vs. manager & balancing both – understanding competition and power – understanding your style and strengths – problem solving and creativity as sources – emotional intelligence for leaders. |
| **Books for Reference** | • Christopher, E. M. & Smith, L.E. (1999). Leadership Training. New Delhi: Viva books.<br>• Dale Carnegie. (1936). How to Win Friends and Influence People. Simon & Schuster.<br>• Lambert and Selma Myers. (1999). 50 Activities for Conflict Resolution – Group Learning and Self Development Exercises. Published by Human Resource Development Press, Inc.<br>• Leil Lowndes. (2003). How to talk to anyone. New Delhi: Tata McGraw-Hill Company Limited. |
| | • Newstrom, J. &Scannell, E (2004). The big book of team building games. New Delhi:Tata McGraw-Hill CompanyLimited.<br>• Peter R. Scholtes. (1998). The Leader's Handbook Making – Things Happen, Getting Things Done. New York: McGraw-Hill.<br>• Stephen R. Covey. (1989) Seven habits of highly effective people. Free Press.<br>• Stephen R. Covey. (2011) The leader in me. Free Press |

**Methods of assessment:**

**Recall (K1) -** Simple definitions, MCQ, Recall steps, Concept definitions

**Understand/ Comprehend (K2) -** MCQ, True/False, Short essays, Concept explanations, Short summary or overview

**Application (K3) -** Suggest idea/concept with examples, Suggest formulae, Solve problems, Observe, Explain

**Analyse (K4) -** Problem-solving questions, Finish a procedure in many steps, Differentiate between various ideas, Map knowledge

**Evaluate (K5) -** Longer essay/ Evaluation essay, Critique or justify with pros and cons

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| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO 1** | S | S | S | S | S | S | S | S | S | S |
| **CO 2** | S | S | S | S | S | S | S | S | S | S |
| **CO 3** | S | S | S | S | S | S | S | S | S | S |
| **CO 4** | S | M | S | S | S | M | S | S | S | S |
| **CO 5** | S | S | S | S | S | S | S | S | M | S |

**S-Strong M-Medium L-Low**

| | |
|---|---|
| **Course I** | Soft Skill |
| **Title of the Course:** | **Creativity and Professional Skills** |
| **Credits:** | 2 |
| **Course Objectives** | 1. To enhance the healthy personal and interpersonal skills among students.<br>2. This course attempts to impart necessary skills needed to the individuals. It assesses the types of personality, behavioural development and various kinds of interpersonal skills also.<br>3. To identify the self and interpersonal behavior<br>4. To differentiate healthy and unhealthy relationships<br>5. To promote self-confidence and assesses self-identity |
| **Course Outcomes** | 1. It will help students in problems solving and critical thinking.<br>2. It interprets professional updating.<br>3. It describes professionalism in organizational skills and time management<br>4. It summarizes professional development –knowledge management and customer service<br>5. It enumerates the scientific report writing and proposal that will help the students in presenting scientific report and proposal in their vocational life. |
| **Pre-requisites, if any:** | |
| **Units** | |
| **I** | **Personal Creativity**<br>• Problem Solving nature and Critical Thinking, Innovation of workable ideas<br>• Troubleshooting - Design Sense - Artistic Sense |
| **II** | **Professional Updating**<br>• Technology Savvy - Technology Trend Awareness<br>• Business Trend Awareness – Self, Business and Market Research<br>• Business Etiquette - Business Ethics<br>• Diversity Awareness - Disability Awareness - Intercultural Competence |
| **III** | **Professionalism**<br>• Organizational Skills - Planning - Scheduling<br>• Time Management - Meeting Management |
| **IV** | **Professional Development**<br>• Training and development - Process Improvement<br>• Knowledge Management<br>• Customer Service - Entrepreneurial Thinking |

| | |
|---|---|
| **V** | **Professional Development**<br>• Training and development - Process Improvement<br>• Knowledge Management<br>• Customer Service - Entrepreneurial Thinking |
| Books for Reference | • Perkins, D. (1995). Outsmarting IQ: The emerging science of learnable intelligence. NY: The Free Press.<br>• Sternberg, R. (1988). The triarchic mind: A new theory of human intelligence. NY<br>• Yoder, S., &Moursund, D. (1995). Introduction to ClarisWorks 4.0: A tool for personal productivity. Eugene |

**Methods of assessment:**
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**Understand/ Comprehend (K2) -** MCQ, True/False, Short essays, Concept explanations, Short summary or overview

**Application (K3) -** Suggest idea/concept with examples, Suggest formulae, Solve problems, Observe, Explain

**Analyse (K4) -** Problem-solving questions, Finish a procedure in many steps, Differentiate between various ideas, Map knowledge

**Evaluate (K5) -** Longer essay/ Evaluation essay, Critique or justify with pros and cons

**Create (K6) -** Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations

**Mapping with Programme Outcomes:**

**Map course outcomes for each course with programme outcomes (PO) in the 3-point scale of Strong, Medium and Low**

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|---|---|---|---|---|---|---|---|---|---|---|
| **CO 1** | S | S | S | S | S | S | S | S | S | S |
| **CO 2** | S | S | S | S | S | S | S | S | S | S |
| **CO 3** | S | S | S | S | S | S | S | S | M | S |
| **CO 4** | S | M | S | S | M | S | S | S | S | S |
| **CO 5** | S | S | S | S | S | S | S | S | S | S |

**S-Strong M-Medium L-Low**

**S.A.C. SEPT'2022**

APPENDIX – **(i)**18(R)

# University of Madras

**Chepauk, Chennai - 600 005.**

***[Est. 1857, State University, NAAC 'A' Grade, NIRF 2021 Rank: 28]***

**Website: www.unom.ac.in, Tel.** 044-2539 9000

# Postgraduate Programme in Microbiology

**CHOICE BASED CREDIT SYSTEM**

## Regulations

***(With effect from the Academic Year 2022- 2023)***

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| PROGRAMME EDUCATION OBJECTIVE (PEO) | 05 |
| PROGRAMME OUTCOMES (POs) | 05 |
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| REGULATIONS | |
| COURSE STRUCTURE | 06 |

**PREAMBLE**

Microbiology is the branch of Science that deals with microorganisms. Microbiology is a broad term that includes Bacteriology, Virology, Mycology, Parasitology, and other branches. The programme M.Sc. in Microbiology, is a promising branch in the field of Life Sciences. It is all about the microorganisms and their behavior in different environments such as aquatic, terrestrial, and atmosphereand their associations with other living organisms. This programme includes Clinical, Food & Dairy Microbiology, Industrial and Fermentation Technology, Environmental Microbiology, Microbial Biotechnology, and Agricultural Microbiology. There is a continuous demand for microbiologists as workforce in education, industry, and research. Hence, microbiological tools and techniques are used in almost all fields which are indispensable for people working in fields like Agriculture, FoodIndustry, Medical Sciences, Environmental Science, Pharmaceutical Science etc.The syllabi for the two-year M.Sc. degree course in Microbiology areframed in such a way that the students at the end of the course, can be adept at Microbiological techniques for pursuing higher studies and can also apply Microbiologicalmethodsjudiciously to the various types of industrial needs.

**PROGRAMME LEARNING OUTCOME NATURE**
**AND EXTANT OF THE PROGRAMME**

The postgraduate programme in Microbiology course focuses on advanced studies in Microbiology, Molecular Biology, Microbial Technology, Food, etc. This course provides wider arena for research in various fields. It is beneficial for the aspiring researchers in various fields of Life Sciences including Biotechnology and Pharmaceutical Industries. After obtaining this degree, a Microbiologist may enter into the job market or opt for undertaking further higher studies in the subject and the students may join industry, academia, or public health departments and effectively contribute as Microbiologists, not only to the enrichment of the existing fund of knowledge but also contribute largely to the welfare of the society. Thus the postgraduate level degree in microbiology must prepare the students for all these objectives. The LOCF curriculum has been developed encompassing all the diversified aspects of Microbiology with reasonable depth of knowledge and skills, so to as to specialize them in the various aspects of the subject. It also equips them with the expected professional expertise.

## AIM OF THE PROGRAMME

The aim of the postgraduate degree in Microbiology is to make students knowledgeable about the various advanced concepts, in a wide-ranging context that involve the use of knowledge and skills of Microbiology. Their understanding, knowledge, and skills in Microbiology need to be developed through a systematic teaching-learning process in the class, practical skills and research work through the hands-on, their presentation and articulation skills, exposure to industry and interaction with industry experts.

## GRADUATE ATTRIBUTES

The students graduating in this degree must have an intricate knowledge of the advanced level of Microbiology as applicable to wide ranging contexts. They should have the appropriate skills of Microbiology, so as to perform their duties as Microbiologists. They must be able to analyze the problems related to microbiology and come up with most suitable solutions. As Microbiology is an interdisciplinary subject, the students might have to take inputs from other areas of expertise. So the students must develop the spirit of team work. Microbiology is a very dynamic subject and practitioners might have to face several newer problems. To this end, the Microbiologists must be trained to be innovative to solve such newer problems. Several newer developments are taking place in Microbiology. The students are trained to pick up leads and see the possibility of innovations, translating their ideas into prototypes and products, culminating in successful entrepreneurship. Furthermore, the students are made to interact with industrial experts, transforming them to budding entrepreneurs. They are also made aware of the requirements of developing a Microbiology enterprise by acquiring knowledge of patentship, copyright and various regulatory processes.

Besides attaining the attributes related to the profession of Microbiology, the postgraduates in this discipline should also develop ethical awareness which is mandatory for practising a scientific discipline including ethics of working in a laboratory and ethics followed for scientific publishing of their research work in future. The students graduating in Microbiology should also develop excellent communication skills both in the written as well as spoken language, managerial skills and computing skills which is indispensable for them to pursue higher studies from some of the best and internationally acclaimed Universities and Research Institutions spread across the globe.

## PROGRAMME EDUCATION OBJECTIVE (PEO)

- This course provides an introduction to the significance and effect of microorganisms in various fields of Life Sciences.
- This course explains the advanced sections of Microbiology like Microbial Taxonomy, Immunology, Microbial Genetics, Food Microbiology, Medical Microbiology, Agricultural Microbiology, Environmental Microbiology, Industrial Microbiology and Bioinformatics.
- This course provides necessary theoretical and practical experience in all divisions of microbiology to become an efficient professional.
- The course helps to work in research organizations, hospitals, biotechnological, agricultural, food and pharmaceutical industries.
- This course provides an in-depth understanding of the role of microbes in human, animals, plants & environment and also creates opportunities for higher studies.

## PROGRAMME OUTCOMES (POs)

- To have a better understanding on key principles of microbial functioning at an advanced level of Taxonomy, Molecular, Biochemical, Industrial, Medical and other Basic and Applied applications.
- To understandthe fundamental principles of biology include central dogma, diversity of life, inheritance and how these principles related to microorganisms.
- To familiarize with the role of microbes in human, animal and plant diseases and also with the environment.
- To develop proficiency in the quantitative skills, necessary to analyze biological problems with knowledge of specialized techniques used in the field of Life Sciences.
- To provide broad exposure to various microbial communities, ecological and commercial issues related to the field of Microbiology.
- To collect, analyze, interpret scientific data, and carry out the research experiments,using microbiological laboratory techniques and safety procedures.
- To get an awareness about career opportunities and ethical concerns in Microbiological research.

## PROGRAMME SPECIFIC OUTCOMES (PSOs)

**PSO 1:** The Postgraduate students will acquire fundamental and applied knowledge in history, classification, morphology and physiological characteristic of Microorganisms.

**PSO 2:** Understand the epidemiological status, pathogenesis, immune response, diagnosis, treatment, prevention and control of Microbial diseases in Human being and plants.

**PSO 3:** Understand the role of Microorganism in Medical, Food, Pharmaceutical, Industrial, Soil, Agricultural and Environmental Microbiology.

**PSO 4:** Become an expertise with Good Manufacturing Practices and Good Laboratory Practicesin advanced Microbiological, Immunological and Molecular techniques.

**PSO 5:** Enhance the skills in Entrepreneurship and career opportunities in various fields of Life Sciences.

**PSO 6:** Develop social accountability through Microbiological importance for the betterment of the environment and mankind at National and Global perspective.

## SCHEME OF EXAMINATIONS:

### FIRST SEMESTER

| Semester | Course component | Name of the Subject | Hour allotment /week | Credits | Exam hour | Maximum Mark | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Internal | External | Total |
| I | Core I – Theory | Microbial Diversity and Taxonomy | 5 | 4 | 3 | 25 | 75 | 100 |
| I | Core II – Theory | General Microbiology and Laboratory Animal Science | 5 | 4 | 3 | 25 | 75 | 100 |
| I | Core III – Theory | Immunology | 5 | 4 | 3 | 25 | 75 | 100 |
| I | Core IV– Practical* | General Microbiology and Immunology | 6 | 4 | 6 | 40 | 60 | 100 |
| I | Elective I – Theory | Microbial Metabolic Pathways | 4 | 3 | 3 | 25 | 75 | 100 |
| I | Elective II– Theory | Pharmaceutical Microbiology | 4 | 3 | 3 | 25 | 75 | 100 |
| **I** | **Soft Skills I** | **Soft Skills I** | **1** | **2** | **3** | **25** | **75** | **100** |

## SECOND SEMESTER

| Semester | Course component | Name of the Subject | Hour allotment /week | Credits | Exam hour | Maximum Mark | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Internal | External | Total |
| II | Core V – Theory | Virology | 5 | 4 | 3 | 25 | 75 | 100 |
| II | Core VI – Theory | Medical Bacteriology | 5 | 4 | 3 | 25 | 75 | 100 |
| II | Core VII – Theory | Medical Mycology and Parasitology | 5 | 4 | 3 | 25 | 75 | 100 |
| II | Core VIII – Practical* | Medical Bacteriology, Medical Mycology & Parasitology and Virology | 6 | 4 | 6 | 40 | 60 | 100 |
| II | Elective III – Theory | Industrial and Fermentation Technology | 4 | 3 | 3 | 25 | 75 | 100 |
| II | Extra disciplinary Elective I – Theory | Biostatistics, Bioinformatics and Bioinstrumentation | 4 | 3 | 3 | 25 | 75 | 100 |
| II | **Soft Skills II** | **Soft Skills 2** | **1** | **2** | **3** | **25** | **75** | **100** |

## THIRD SEMESTER

| Semester | Course component | Name of the Subject | Hour allotment /week | Credits | Exam hour | Maximum Mark | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Internal | External | Total |
| III | Core IX – Theory | Microbial Genetics | 5 | 4 | 3 | 25 | 75 | 100 |
| III | Core X – Theory | Genetic Engineering | 5 | 4 | 3 | 25 | 75 | 100 |
| III | Core XI – Theory | Molecular Biology | 5 | 4 | 3 | 25 | 75 | 100 |
| III | Core XII – Practical* | Microbial Genetics, Molecular Biology & Genetic Engineering | 6 | 4 | 6 | 40 | 60 | 100 |
| III | Elective IV– Theory | Soil and Agricultural Microbiology | 4 | 3 | 3 | 25 | 75 | 100 |
| III | Extra Disciplinary Elective II | Microbial Remediation | 4 | 3 | 3 | 25 | 75 | 100 |
| III | **Internship** | **Internship**** | **-** | **2** | **-** | **-** | **-** | **100** |
| III | **Soft Skills III** | **Soft Skills 3** | **1** | **2** | **3** | **25** | **75** | **100** |

## FOURTH SEMESTER

| Semester | Course component | Name of the Subject | Hour allotment /week | Credits | Exam hour | Maximum Mark | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Internal | External | Total |
| IV | Core XIII – Theory | Food, Dairy and Environmental Microbiology | 5 | 4 | 3 | 25 | 75 | 100 |
| IV | Core XIV – Practical* | Soil, Agricultural, Food and Environmental Microbiology | 6 | 4 | 6 | 40 | 60 | 100 |
| IV | Elective V– Theory | Research Methodology | 4 | 3 | 3 | 25 | 75 | 100 |
| IV | Core XV Project viva voce* | Research Project*** | 14 | 4 | 3 | 40 | 60 | 100 |
| IV | Soft Skills IV | Soft Skills 4 | 1 | 2 | 3 | 25 | 75 | 100 |

*Practical Examinations will be conducted in Even Semester only.

** Internship will be carried out during the summer vacation of the Second Semester (Minimum period of 21 days) and thereport will be evaluated by Two Examiners within the Department of the College and the marks should be included in the Third-Semester statement of marks.

*******Industrial Visit should be incorporated along with the Project work as a report (minimum of 10 pages) possibly with geo-tagged photographs.

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**S.SENATE. SEPT'2022**

**APPENDIX – 18(S)**

**UNIVERSITY OF MADRAS**

**M.Sc. DEGREE COURSE IN MICROBIOLOGY**

# CHOICE BASED CREDIT SYSTEM
**SYLLABUS**

**(w.e.f.2022- 2023)**
**FIRST SEMESTER**

## CORE I - THEORY: MICROBIAL DIVERSITY AND TAXONOMY

### COURSE OUTCOME

**CO-1** Introduce basic concepts in Biodiversity.

**CO-2** Learn the classification and applications of extremophiles includingthermophiles, archaebacteria and methanogens.

**CO-3** Get insight on extremophiles including alkaliphiles, acidophiles, halophiles, and barophiles.

**CO-4** Gain basic knowledge on microbial taxonomy and its classification.

**CO-5** Get familiarize with bacterial classification according to Bergey's manual.

### UNIT I

Biodiversity: Introduction to microbial biodiversity- ecological niche. Types – Bacterial, Archaeal and Eucaryal.Conservation of Biodiversity.

### UNIT II

Thermophiles: classification, Extremely Thermophilic Archaebacteria and its applications. Methanogens: Classification, Habitats, applications.

**UNIT III**

Alkaliphiles and Acidophiles - Classification, discovery basin, cell walls and membranes. Barophiles - Classification and its applications. Halophiles - Classification, discovery basin, cell walls and membranes – purple membrane, compatible solutes, Osmoadaptation/ halotolerance - Applications of halophiles.

**UNIT IV**

Taxonomy, systematics, identification: Taxonomical hierarchy – binomial nomenclature. Systems of classification- phenetic, numerical taxonomy – similarity matrix, dendrograms with examples; phylogenetic with examples. Five kingdom, six kingdom and eight kingdom systems.

**UNIT V**

Classification of bacteria according to Bergey's Manual of systematic bacteriology $9^{th}$ edition (up to level of section); characteristics of major sections. classification of archaea, photosynthetic bacteria, Enterobacteriaceae, Mollicutes.

**MAPPING OF CO WITH PSO**

| CO / PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 | PSO6 |
|---|---|---|---|---|---|---|
| **CO 1** | S | L | L | L | M | M |
| **CO 2** | S | M | L | M | M | M |
| **CO 3** | S | L | L | L | M | M |
| **CO 4** | S | L | M | L | M | M |
| **CO 5** | S | L | L | M | M | M |

**S- Strong; M-Medium; L-Low**

**Reference Books:**

1. Atlas, R.M. 2000. Microbiology Fundamentals and Application, Macmillan Publish Company, New York.

2. Kreig, N.R. 1984. Bergeys Manual of Systematic Bacteriology Vol I: Sneath, P.H.A., Ed 1986, Vol II: Staley, J.T. Ed., 1989. Vol III, William, S.T., Ed., 1989, Vol IV William and William, Baltimore.
3. Madigan, M.T., Martinka, M., Parker, J. and Brock, T.D. 2000. Twelth Edition, Biology Microorganisms, Prentice Hall, New Jerry.
4. Mark Wheelis, 2010. Principles of Modern Microbiology, Jones & Bartlett IndiaPvt. Ltd., New Delhi.
5. Prescott L.M. Harley J.P. and Klein D.A. 2003. Microbiology (5th edition) McGraw Hill, New York.

6. Stanier, R., Lingraham, Y., Wheelis, M.L. and Painter, R.P. 1999. General Microbiology, Fifth Edition, Macmillan, London.
7. Tortora G.J., Funke, B.R. and Case, C.L. 2009. Microbiology, Ninth Edition, Dorling Kindersely (India) Pvt. Ltd., Noida.

**Text Books:**

1. Dubey, R.C. and Maheswari, D.K. 2013. A text book of Microbiology, Revised S. Chand and Company Ltd, New Delhi.
2. Pelczar, M.J., Schan, E.C. and Kreig, N.R.2010. Microbiology – An application based approach, Fifth Edition, Tata McGraw Hill Publishing Company Limited, New Delhi.

## CORE II - THEORY: GENERAL MICROBIOLOGY AND LABORATORY ANIMAL SCIENCE

**COURSE OUTCOME**

**CO-1** Throws light on working principles of different microscope and their applications.

**CO-2** Provides insights on bacterial anatomy, nutritional requirements and an overview of actinomycetes.

**CO-3** A thorough understanding of different staining procedures, pure culture techniques and sterilization methods.

**CO-4** Imparts basic knowledge of algae – including life cycles and reproduction of algae.

**CO-5** An in-depth study of laboratory animals including handling and testing procedures with microorganisms.

**UNITI**

History and Scope of Microbiology.Microscope – Its principles and application: Bright field, Dark-field,Phase-contrast,Fluorescencemicroscope, Atomic force, Confocal Microscope, Transmission Electron Microscope (TEM) and Scanning Electron Microscope (SEM). Micrometry – Stage, Ocular and its applications.

**UNIT II**

Bacterial anatomy - structure,propertiesandbiosynthesis of cellularcomponents. Sporulation, Growthandnutrition: Nutritional requirements, Growth curve, Kinetics of growth, Batch culture, Synchronous growth, Measurementofgrowthandenumeration ofcells. Actinomycetes - distribution, morphology, classification, reproduction and economic importance.

**UNIT III**

Microbial techniques - Safety guidelines in Microbiology Laboratories. Sterilizationand Disinfection. Stainingmethods–Simple, Differentialand Special staining - Automated Microbial identification system - Pure cultures techniques - Maintenance and preservation of pure cultures - culture collection centers - National and International. Principles, operation and maintenanceof Ultracentrifuges, Spectrophotometer andLyophilizers.

**UNIT IV**

Algae - distribution, morphology, classification, reproduction and economic importance. Isolation of algae from soil andwater. Media and methods used for culturing algae, Strain selection and large scale cultivation.Lifecyclepatternsinalgae: *Chlamydomonas*, *Volvox*(Green algae), *Nostoc – Spirogyra* (BGA), *Ectocarpus*, *Sargassum*(Brownalgae), *Polysiphonia*, *Batrachospermum*(Redalgae).

**UNIT V**

Laboratory Animal Science - Modern methods of care, management,breeding and maintenance of laboratory animals. Handling, uses of differentlaboratory animals -rabbits,mice,rats,guineapigs,monkeys,hamsters,fowl,sheep.

Transgenicanimalmodels– methodology and uses. Disposal of animal house wastes and usedanimals – Laboratoryusesofanimals: pathogenicity testing, antibody production, toxin/toxoidtesting,hypersensitivitytesting - Gnotobiotic animals in Life Science research.

**MAPPING OF CO WITH PSO**

| CO / PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 | PSO6 |
|---|---|---|---|---|---|---|
| **CO 1** | S | L | L | S | S | M |
| **CO 2** | S | M | M | L | L | M |
| **CO 3** | L | S | S | S | S | M |
| **CO 4** | L | L | M | M | S | S |
| **CO 5** | L | M | L | S | S | S |

**S- Strong; M-Medium; L-Low**

**Reference Books:**

1. Gerard J. Tortora, Berdell R. Funke, Christine L. Case (2015) Microbiology: An Introduction (12th Edition). PEARSON, London, United Kingdom.

2. Joanne Willey, Linda Sherwood and Christopher J. Woolverton (2013) Prescott's Microbiology, McGraw-Hill Education; 10th Edition (2017).
3. Prescott L.M. Harley J.P. and Klein D.A. (2003). Microbiology (5th edition) McGraw Hill, New York.
4. J. Webster and R.W.S. Weber (2007). Introduction to Fungi. (3rd edition).Cambridge University press, Cambridge.
5. Schaechter M and Leaderberg J (2004). The Desk encyclopedia of Microbiology. Elseiver Academic press, California.

**Text Books:**

1. Jayaram Paniker C. K. and Ananthanarayan R. (2017). Textbook of Microbiology. (10th Edition). Universities Press (India) Pvt. Ltd.
2. Bernard D. Davis. Renato Dulbecco. Herman N. Eisen and Harold, S. Ginsberg. (1990).Microbiology (4th edition). J.B.Lippincott company, New York.
3. Alexopoulus C.J. and C W. Mims. (1993). Introductory Mycology (3rd edition).Wiley Eastern Ltd, New Delhi.
4. Elizabeth Moore - Landecker. (1996). Fundamentals of the fungi. (4th edition). Prentice Hall International, Inc, London.
5. Heritage, J. Evans E.G.V. and Killington, R.A. (1996). Introductory Microbiology. Cambridge University Press.
6. Holt, J.S., Kreig, N.R., Sneath, P.H.A and Williams, S.T. Bergey's Manual of Determinative Bacteriology ($9^{th}$ Edition), Lippincott, Williams & Wilkins, 2000.
7. Larry Mc Kane.and Judy Kandel (1996). Microbiology-Essentials and applications. ($2^{nd}$edition). Mc Fraw Hill Inc, Newyork.
8. Michael T. Madigan, John M. Martinko, Jack Parker (2009) Biology of Microorganisms.($12^{th}$ edition). Prentice Hall International Inc, London.
9. Nester, E.W., Roberts, C.V. and Nester, M.T. (1995). Microbiology, A human perspective. IWOA, U.S.A.
10. Chan E.C.S., Michael J. Pelczar, Jr.,Noel R. Krieg (2010). Microbiology. ($5^{th}$ edition). Mc. Graw Hill. Inc, New York.
11. Salle, A.J. (1996). Fundamental principles of Bacteriology.(7th edition).Tata McGraw - Hill publishing company Ltd, New Delhi.

12. Caldwell, D.R. (1999). Microbial Physiology and metabolism, Wm. C. Brown Publishers, U.S.A.
13. Lansing M. Prescott, John P. Harley and Donald A. Klein. (2004). Microbiology (6th edition). McGraw - Hill company, New York.
14. David White, James Drummond, and Clay Fuqua (2011). The physiology and biochemistry of Prokaryotes, Oxford University Press, Oxford, New York.
15. Ketchum, P.A. (1984) Microbiology: Concepts and Applications. John Wiley and Sons, New York.
16. Mandelstam, J., McQuillen, K. and Dawes, L. (1992). Biochemistry of Bacterial Growth, 3rd Edn. Blackwell Scientific Publications, Oxford.
17. Moat, A.G. and Foster, J.W. (1995) Microbial Physiology, 3rd Edn. John Wiley and Sons, New York.
18. Gottschalk, G. (1986) Bacterial Metabolism, 2nd Edn. Springer-Verlag, New York.
19. Ingraham, J.L. and Ingraham, C.A. (2000) Introduction to Microbiology, 2nd Edn. Books / Cole Thomson Learning, UK.
20. Schelegel, H.G. (1993) General Microbiology,7th Edn. Cambridge University Press, Cambridge.
21. Dubey RC (2000). Textbook of Microbiology. S. Chand, Limited.
22. Singh, P.K., Dhar, D.W. Pabbi, S., Prasanna R., Arora, A. (2000). Biofertilizers- Blue Green Algae and Azolla, National Center for Conservation of Blue Green Algae, IARI, New Delhi.
23. Kashyap and Kumar, H.D. (1994). Recent advances in phycology-Rastogi Company.
24. Janet R Stein (1975). Phycological methods. Cambridge university press.
25. Chapman, V.J. and chapman, D.J. (1973). The Algae. English language book society & MacMillan.
26. Samuel Singer (2001). Experiments in Applied Microbiology. Academic Press.
27. Collins, C.H., Tatrica M. Lyne& Grange, J.M. (1999). Microbiological methods. Arnold publishers.

## CORE III- THEORY: IMMUNOLOGY

**COURSE OUTCOME**

**CO-1** Understand the fundamental concepts of immunity, the role of the different organs and cells in immune responses.

**CO-2** Acquire the knowledge of antigens, antibodies, complement and their role in Immunology.

**CO-3** Understand the mechanisms of antigen and antibody reactions and gain the knowledge of Immunohistochemistry andImmunohaematology.

**CO-4** Comprehend the overreaction by our immune system leading to hypersensitivity and its consequences; gain knowledge on autoimmunity, how it develops in a host and concepts of transplantation and tumor immunology.

**CO-5** Understand the unique properties of vaccines and types.

**UNITI**

Immune system and immunity: History and Scope of Immunology; Immunity- types - innate and acquired, active and passive; herd immunity, Plasma therapy. Cells and organs involved in immune system – T cells, B cell activation and types, macrophages, antigen-processing cells, eosinophils, neutrophils, mast cells and natural killer cells- lymphoid organs. T and B cell epitopes - immune responses – cell mediated and humoral immunity. Clonal selection theory and nature of immune response.

**UNIT II**

Antigen: types, structure, propertiesand functions –Antibody ( Immunoglobulin): structure, properties, types and function – techniquesof antibody purification. Antibodyproduction – Polyclonal and Monoclonalantibodies - regulation and diversity. Complement and its role in immune responses-Classical, alternate, lectin pathway of complement activation.

**UNIT III**

Antigen – Antibody reactions - Factors governing Ag - Ab interactions; Affinity, Avidity, Valency, Cross reactivity. Agglutination, Precipitation & Flocculation

reactions. ELISA, Radioimmunoassay (RIA), Immunofluorescence (IFT), Immunoelectrophoresis and Flow cytometry in Immunologyand their applications.

Immunohistochemistry (IHC) – an overview of Immunohaematology – ABOandRHincompatibility.

**UNIT IV**

Hypersensitivity – typesand manifestations. Immune deficiencies and autoimmunity.Transplantation immunology - MHC, types of grafts, grafts rejection, GVH reactions, mechanism of graft rejection, and prevention of graft rejection.Tumorimmunology - an overview - HLA tissuetyping – Lymphokines and Cytokines – Assay methods.

**UNIT V**

Vaccines: Live, Killed, Subunit, Recombinant and Edible vaccines; Peptide vaccines; Vaccination methods. Immunization-itsrationale,schedules andimportance inpublic health.

| CO / PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 | PSO6 |
|---|---|---|---|---|---|---|
| **CO 1** | L | S | L | S | M | M |
| **CO 2** | L | S | L | S | M | M |
| **CO 3** | L | M | L | S | S | S |
| **CO 4** | M | S | M | M | M | M |
| **CO 5** | M | S | L | S | S | S |

**MAPPING OF CO WITH PSO**

**S- Strong; M-Medium; L-Low**

**Reference Books:**


1. Essentials of Immunology by Riott I .M. 1998. ELBS, Blackwell Scientific Publishers, London.
2. Immunology 2 nd Edition by Kuby J. 1994. W.H. Freeman and Co. New York.
3. Immunology - Understanding of Immune System by Claus D. Elgert. 1996. Wiley-Liss, NewYork.
4. Fundamentals of Immunology by William Paul.
5. Cellular and Molecular Immunology. 3rd Edition by Abbas.
6. Immunobiology: The Immune System in Health and Disease. 3rd Edition by Travers.
7. Immunology- A short Course. 2nd Edition by Benjamin.
8. Manual of Clinical Laboratory and Immunology 6th Edition. 2002 by Noel R. Rose, Chief Editor: Robert G. Hamilton and Barbara Detrick (Eds.), ASM Publications.
9. Pocket Guide to Clinical Microbiology. 2nd Edition. 1998 by Patrick R. Murray, ASM Publications.
10. Weir, D.M. (1995). Experimental Techniques in Immunology. Blackwell Scientific Publications, Oxford.
11. Topley and Wilson (1995). Principles of Bacteriology Virology and Immunity. 9th Edn. VolI, Edward Arnold, London.
12. Balows, A., Hausler. W.J., Ohashi. M. and Turano. A. (Eds) (1988) Laboratory Diagnosis of Infectious Diseases: Principles and Practice, Vol1 Springer-Verlag, NewYork.
13. Jayapal, V.(2007). Fundamentals of Medical Immunology. Jay Pee Brothers Medical Publications, New Delhi.


**Text Books:**


1. Weir, D.M. and Steward J. (1993) Immunology,7thEdn. ELBS, London.
2. Abbas, A.K., Lichtman, A.H. and Pober, J.S. (1994). CellularandMolecularImmunology,2ndEdn.WBSaunders,USA.
3. Humphrey,J.H. and White, R.G. (1995). ImmunologyforStudentsofMedicine,5th Edn.ELBS,London.

4. Kannan,I.(2007). Immunology.MJPPublishers,Chennai.
5. Prescott,L.M.,Harley, J.P andKlein,D.A.(1999). Microbiology. McGrawHill,NewDelhi.
6. Ananthanarayan,R. and JeyaramPaniker, C.K. (1994). TextBook of Microbiology, 6thEdn.OrientLongman,Chennai.
7. Kuby, J. (1994) Immunology, 2ndEdn. H.W.FreemanandCompany,NewYork.
8. Elgert, K.D. (1996) Immunology:Understanding the ImmuneSystem.Wiley–Liss,NewYork.
9. Pelczar,M.J.,Jr.,Chan,E.C.SandKreig,N.R.(1993)Microbiology. McGrawHill,NewYork.
10. Jayaraman,J.(2000). Laboratory Manual ofBiochemistry.WileyEasternLimited,NewDelhi110002.
11. Humphrey,J.H.andWhite,R.G.(1995). ImmunologyforStudentsofMedicine,5thEdn.ELBS,London.

## CORE IV – PRACTICALS : GENERAL MICROBIOLOGY AND IMMUNOLOGY

**COURSE OUTCOME**

**CO-1** Know how to perform sterilization techniques and handling of microscope for different microbiological work.

**CO-2** Learn technical skills on staining methods and different types of media preparation for identification ofbacteria.

**CO-3** Know how to perform pure culture techniques and anaerobic culturing methods.

**CO-4** Expertise with serological techniques.

**CO-5** Analyze the components of human sera by performing centrifugation, precipitation and chromatography techniques.

**UNIT I**

Washing and cleaning of glassware: Sterilization – principles - methods: Moist heat, Dry heat, Filtration. Quality control check for each method: Microscopic techniques - Light microscopy: Hay infusion broth, Wet mount and hanging drop. Dark field microscopy: To show motility of spirochetes and others. Phase contrast microscopy: To show Eukaryotic Cell division, morphology etc., Fluorescence microscopy: Fluorescent staining techniques.

**UNIT II**

Staining techniques: Smear preparation - Simple staining, Gram's staining, Acid fast staining & Metachromatic granule staining. Cell wall, Spore, Capsule (positive, negative) and Flagella staining. Media Preparation: Preparation of liquid, solid and semisolid media; Agar deeps, slants, plates. Preparation of Basal, Enriched, Enrichment, Transport, Differential and Selective media. Quality control and uses. Preparation of Biochemical test media. Enzymatic activities – amylase, lipase, gelatinase, phosphatase and protease.

**UNIT III**

Pure culture techniques: Purification and maintenance of microbes. Streak plates,

Pour plate, and Slide culture technique. Aseptic transfer, growth and growth requirements: Cell number and cell proteins. Direct counts, Viable counts, Bacterial growth curve–Turbidimetry, Anaerobic culture methods.

**UNIT IV**

Agglutination &Haemagglutination reactions: Latex Agglutination -RF, ASO, CRP. Blood grouping, RH - Typing / IHA / RPHA. Precipitation reactions in gels: SRID (Single Radial Immunodiffusion). Double Immunodiffusion. Immunoelectrophoresis and staining of precipitation lines. ELISA technique – HBsAg/or other Viral Markers.

**UNIT V**

Preparation of Lymphocytes from peripheral blood by density gradient centrifugation. Purification of Immunoglobulins: Ammoniumsulphate precipitation. Separation of IgG by chromatography using DEAE cellulose or Sephadex.

**MAPPING OF CO WITH PSO**

| CO / PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 | PSO6 |
|---|---|---|---|---|---|---|
| **CO 1** | S | S | S | S | M | M |
| **CO 2** | S | S | M | M | L | S |
| **CO 3** | M | S | M | M | M | L |
| **CO 4** | L | M | S | S | S | S |
| **CO 5** | L | S | L | S | M | M |

**S- Strong; M-Medium; L-Low**

**Reference Books:**


1. Cappuccino J G and Welsh CT (2017). Microbiology: A Laboratory Manual (11th Edition). Pearson Education, Noida.
2. Aneja KR (2018). Laboratory Manual of Microbiology and Biotechnology. (1st Edition). Bio-Green Publisher.
3. Talib VH (2019). Handbook Medical Laboratory Technology. (2nd Edition). CBS Publishers.

## ELECTIVE – I –THEORY-MICROBIAL METABOLIC PATHWAYS

**COURSE OUTCOME**

**CO-1** Imparts the fundamentals of Enzyme – mechanism, inhibition and regulation of enzyme action.

**CO-2** Gain knowledge on the generation of energy source.

**CO-3** Explains the concepts of carbohydrate metabolism.

**CO-4** Comprehend the concepts of Lipid metabolism.

**CO-5** Understand the biosynthetic pathways of peptidoglycan, aminoacids, purines and pyrimidines.

**UNIT I**

Enzymes – IUBMB classification and nomenclature, components Mechanism of enzyme reactions- Lock and key Mechanism and induced fit hypothesis, Factors influencing enzymatic activity-Inhibition of enzyme action –Regulation of enzyme synthesis.

**UNIT II**

Principles of Bioenergetics - Structural features of biomembranes -Oxidation–reduction reactions- Generation of energy – Substrate Level and oxidation phosphorylation – Electron transport chain.

**UNIT III**

Carbohydrate catabolism – Glycolysis – Pentose phosphate pathway - ED pathway – The Kreb`s cycle. Energy yielding glucolysis and aerobic respiration – Anaerobic respiration – Lactic acid fermentation - Alcohol fermentation.

**UNIT IV**

Lipid Metabolism – Oxidation of lipids*;* biosynthesis of fatty acids; triglycerides; phospholipids; sterols. Protein and aminoacid catabolism – Oxidation of inorganic molecules – Photophosphorylation.

**UNIT V**

Biochemical pathways of energy use – Photosynthetic fixation of $CO_2$–Biosynthesis of peptidoglycan. Biosynthesis of aminoacids – proline, serine, methionine, valine, tryptophan, histidine, Bio synthesis of purines and pyrimidines.

**MAPPING OF CO WITH PSO**

| CO / PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 | PSO6 |
|---|---|---|---|---|---|---|
| **CO 1** | S | M | M | M | S | S |
| **CO 2** | S | S | M | M | S | S |
| **CO 3** | M | S | M | M | M | S |
| **CO 4** | L | M | S | S | M | M |
| **CO 5** | L | S | L | S | L | L |

**S- Strong; M-Medium; L-Low**

**Reference Books:**


1. Nelson, D.L. and Cox, M.M. 2021. Lehingers's Principles of Biochemistry, Eighth Edition, Mac Millan worth Publishers, New Delhi.
2. Deb, A.C. 2006. Fundamentals of Biochemistry, New Central Book Agency Pvt.Ltd., Kolkata.
3. Donald Voet and Judith G. Voet, 2016. Biochemistry. Fifth Edition, John Wiley and Sons, Inc. New York.
4. Stryer, L. 2019. Biochemistry, Ninth Edition, W.H. Freeman and Company, New York.
5. Moat, A.G. and Foster, W.2002. Microbial Physiology, Fourth Edition, JohnWiley and Sons, New York.
6. Madigan, M.T., Martinka, M., Parker, J. and Brock, T.D. 2000. 12$^{th}$Edition,Brock's biology Microorganisms, Prentice Hall, New Jerry.

**Text Books:**


1. Satyanarayana, U. and Chakrapani, U. 2020. Biochemistry, Fifth Edition Bookand Allied Pvt. Ltd., Kolkata.
2. Jain, J.L. 2016. Fundamentals of Biochemistry, Fifth Edition, S. Chand andCompany Ltd, NewDelhi.
3. Srivastava, M.L. 2008. Microbial Biochemistr**y,** Narosa Publishing House, New Delhi.

## ELECTIVE – II – THEORY-PHARMACEUTICAL MICROBIOLOGY

### COURSE OUTCOME

**CO-1** Throws light on importance of monitoring the sterility control during the manufacturing process till the final products in pharma industries.

**CO-2** Imparts knowledge on new technology and production of some important pharmaceutical products.

**CO-3** Understand the basic concepts on pharmacological principles of drug metabolism and the need of developing new drugs.

**CO-4** Learn the methodology of testing the antimicrobial properties of substances used as drugs as per the standard guidelines.

**CO-5** Learn and understand the role of various regulatory guidelines, policies in manufacturing quality products, the significances of clinical trial studies & its outcome and accreditation processes.

### UNIT I

Introduction to pharmaceutical Microbiology - Ecology of microbes - Microbial contamination and spoilage of pharmaceutical products – infection, risk and contamination control - Sterilization control and sterility testing- Chemical and biological indicators. Packaging and quality assurance.

### UNIT II

Production of pharmaceutical products: Antibiotics – Cephalosporin, Antifungal: Voricanozole, Anti-parasitic: Metronidazole and Antitumor substances.New vaccine technology - DNA, RNA, synthetic peptide and multivalent subunit vaccines.

### UNIT III

Pharmacology of Drugs: Routes of drug administration, Pharmacokinetics: Absorption, Distribution, Metabolism, Oxidation, reduction, hydrolysis, conjugation and Elimination, absorption enhancement / solubility factor/ bioavailability; Pharmacodynamics; Need for developing new drugs.

**UNIT IV**

Bioassay of antibacterial agents in liquid media and in agar media using standard guidelines (e.g. (NCCLS) / (CLSI)) - Factors affecting bioassay, Laboratory methods to assess activity of antimicrobial combinations (antagonism, synergism and additive effect). Methodologies for testing of antibacterial, antifungal and antiviral drugs *(in vitro*and *in vivo*infectivity models).

**UNIT V**

Government regulatory practices and policies, Regulatory aspects of quality control. Regulatory authorities for introduction of medicines in market – Role of Food and Drug Administration (FDA), Drug Controller of India (DCI), Validation (GMP, GLP, GCP). Brief introduction to ISO standards and accreditation in healthcare systems (NABL & NABH auditing). Outline of clinical trials.

**MAPPING OF CO WITH PSO**

| CO / PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 | PSO6 |
|---|---|---|---|---|---|---|
| **CO 1** | S | L | M | S | M | S |
| **CO 2** | M | L | S | M | M | L |
| **CO 3** | M | L | L | M | S | M |
| **CO 4** | L | L | L | M | M | M |
| **CO 5** | M | L | M | S | M | S |

**S- Strong; M-Medium; L-Low**

**References Books**


1. Heinrich Klefenz, "Industrial Pharmaceutical Biotechnology", WILEY-VCH Publication, Germany, 2002.
2. Jay P Rho, Stan G Louie, "Hand book of Pharmaceutical Biotechnology", Pharmaceutical products press, New York, 2003.
3. Lachman L Lieberman, HA, Kanig, J, "Theory and practice of industrial pharmacy", 3rdEdition, Varghese publishing & Co, New Delhi, 1986.
4. Stephen P Denyer, Norman A Hodges, Sean P Gorman, Brendan F Gilmore (2011).
5. Hugo and Russell‟s Pharmaceutical Microbiology, John Wiley and Sons, 8thEdition.
6. Frederick Kavanagh (2014). Analytical Microbiology, Elsevier.
7. Vyas SP and Dixit VK (2010). Pharmaceutical Biotechnology, CBS Publishers & Distributors, New Delhi.
8. Joseph D Nally (2016). Good Manufacturing Practices for Pharmaceuticals, CRC Press, 6thEdition.
9. Chakrabarty AM, Omenn and Gilbert S (1990). Biopharmaceuticals in Transition: Advances in Applied Biotechnology, Portfolio publisher, Vol. 10.
10. Hill RG (2012). Drug Discovery and Development-E-Book: Technology in Transition, Elsevier Health Sciences.
11. Tille P (2015). Bailey & Scott's Diagnostic Microbiology-E-Book, Elsevier Health Sciences.
12. Saravanamuthu R (2010). Industrial Exploitation of Microorganisms, IK International Pvt Ltd.
13. Kim SK (2012). Marine pharmacognosy: Trends and applications, CRC Press.
14. Dhanasekaran D, Thajuddin N and Panneerselvam A. eds., (2015). Antimicrobials: synthetic and natural compounds, CRC Press.

15. Denyer S, Russell A (2004). Non- Antibiotic Antibacterial Agents: Mode of Action and Resistance, Hugo and Russell's: Pharmaceutical Microbiology, 7thEdition, 306-22

**Text Books:**

1. DaanCrommelin, Robert D Sindelar, "Pharmaceutical Biotechnology", Tailor and Francis Publications, New York, 2002.
2. Remington‟s Pharmaceutical sciences, 18th Edtion, Mack publishing & Co., Easton, PA (20 Ed, 2000).

## SECOND SEMESTER

## CORE V –THEORY- VIROLOGY

**COURSE OUTCOME**

**CO-1** Learn the viral classification, taxonomy, properties and its cultivation.

**CO-2** Gain knowledge of the different types of bacteriophages, its life cycle, oncogenic viruses and its transformation.

**CO-3** Acquire a thorough knowledge of viral diseases of economically important crop plants and brief account on virus infection of hosts other than plants – cyanobacteria, fungi and insects.

**CO-4** Learn the various medically important viral diseases prevalent throughout the world and understand the pathogenesis and diagnosis of emerging and reemerging diseases in 21$^{st}$ century.

**CO-5** Imparts knowledge on the current trends and modern approaches in studying the epidemiology, diagnosis and treatment of viral diseases.

**UNIT I**

Discovery of virus and Importance of studying modern virology - Virus taxonomy, nomenclature, evolution, classification and ICTV. General properties of viruses, general methods of diagnosis, cultivation and serology. Viriods, prions, satellite RNAs and virusoids.

**UNIT II**

Bacterial viruses-ΦX174, M13, MU, T4, lambda, Pi; structural organization, Lifecycle of phages: Lytic & Lysogenic cycle. Oncogenesis: oncogenic viruses, viral transformation by activation of cellular signal transduction pathways, via cell cycle control pathways.

**UNIT III**

Plant viruses-TMV- general characters- morphology-replication-RNA as its initiator of infection. Cauliflower mosaic virus; Transmission of plant viruses by vectors and without vectors; common viral diseases of crop plants- paddy, cotton, tomato, and sugarcane. - name of the disease, pathogens and symptoms. Brief account on viruses of cyanobacteria, algae, fungi and insects.

**UNIT IV**

DNA Viruses- Pox, Herpes, Adeno, Papova& Hepatitis B viruses; RNA Viruses: Picorna, Orthomyxo**:** Influenza(H1N1), Paramyxo**:**Rubula, Parainfluenza and Pneumovirus, Toga and other Arthropod-borne viruses- (Chikungunya, Dengue, West Nile and Yellow fever), Rhabdo, Rota, HIV and hepatitis C viruses. General account on pathogenesis and diagnosis of Emerging and re-emerging viral diseases – SARS, MERS, Ebola, Zika, Nipah and Monkey pox.

**UNIT V**

Epidemiology, Pandemic infection control and Diagnosis of viral diseases – importance of rapid diagnosis approach, and newer, emerging testing methods (in brief), Modern approaches of virus control: Antisense RNA, siRNA, ribozymes, viruses to destroy other viruses. Treatment of Viral Diseases**:** Antiviral agents, Viral Vaccines and Repurposed drug therapy. Viruses as therapeutic agents, viruses for gene delivery.

**MAPPING OF CO WITH PSO**

| CO / PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 | PSO6 |
|---|---|---|---|---|---|---|
| **CO 1** | S | M | L | L | M | M |
| **CO 2** | S | M | L | L | M | M |
| **CO 3** | S | M | M | L | M | M |
| **CO 4** | S | S | M | L | M | M |
| **CO 5** | M | M | M | L | M | M |

**S- Strong; M-Medium; L-Low**

**Reference Books:**


1. Flint S.J., Racaniello V.R., Enquist L.W., Rancaniello V.R., Skalka. A.M. (2015) Principles of Virology, 4th Edition, 2 Vol. American Society for Microbiology, USA.
2. Knipe D.M. and Howley P.M. (2013). Fields Virology, 6$^{th}$Edition 2 Vol. Wolters Kluwer Health/Lippincott Williams & Wilkins, Philadelphia.
3. Martinez J. Hewlett (2018). Basic Virology, 4$^{th}$Edition. Wiley, USA.
4. Flint. S.J, Enquist. L.W, King. R.M, Racaniell. V.R and Shalka. A.M (2000). Principles of Virology - Molecular Biology, pathogenesis and control. ASM Press, Washington DC.
5. Khan. J.A and Dijkstra. J (2002). Plant viruses as molecular pathogens. CBS publishers and Distributors. New Delhi.
6. Maloy. S.R, Cronan. Jr. JE, Freifelder. D. (1994). Microbial genetics. Jones and Bartlett publishers.
7. Robert. G. Welstar and Allan Garnoll. (1994).Encyclopaedia of Virology. Vol I, II & III Academic Press inc. San Diego, CA 92101.
8. Timbury. M.C. (1994) Medical Virology. X edition. Churchill Livingston.
9. Topley and Wilson‟s. (1990).Principles of Bacteriology, Virology and Immunity. VIII edition Vol. IV Virology, Edward Arnold, London.
10. Saravanan. P. (2006). Virology. MJP Publishers.
11. John. B.C and Venetia. A.S. (2007). Virology, Principles and Applications. John Wiley and Sons limited. England.


**Text Books:**


1. Saravanan. P. (2006). Virology. MJP Publishers.
2. Timbury. M.C. (1994) Medical Virology. 10$^{th}$ Edition. Churchill Livingston.
3. Dimmock. N.J and Primrose. S.B. (1994). Introduction to Modern Virology. IV edition. Blackwell Scientific Publications, Oxford.

## CORE VI -THEORY – MEDICAL BACTERIOLOGY

**COURSE OUTCOME**

**CO-1** Students will learn the interrelationship between normal flora and hosts and how the virulence factors of the pathogens evades the immune system and disease syndromes.

**CO-2** Learn and familiarize with the terminologies, basic principles of specimen collections, diagnostic methods – conventional, molecular and automated system.

**CO-3** Learn the various important zoonotic diseases and Nosocomial infections prevalent in our country, the role of microbiologists in hospital and waste disposal practices.

**CO-4** Learn the concept, etiology, differential diagnosis, epidemiology and prevention of various medically important gram positive and related bacterial diseases.

**CO-5** Learn the concept, etiology, differential diagnosis, epidemiology and prevention of various medically important gram negative and other bacterial diseases.

**UNIT I**

Host Parasite relationships – Nonspecific host immune mechanisms. Philosophy and General approach to clinical conditions of various syndromes – general and specific syndromes. Indigenous normal microbial flora of human body. General attributes and virulence factors of bacteria causing infections.

**UNIT II**

Definition – Epidemiology, epidemic, pandemic, endemic and sporadic diseases. Carriers and types. Ground rules for collection and dispatch of clinical specimens for microbiological diagnosis - Molecular diagnosis and Automated bacterial identification system (2D, MALDI-TOF MS) and Laboratory Automation (LIMS).

**UNIT III**

Zoonotic diseases and their control: Anthrax, Brucellosis, Leptospirosis, Cat scratch

disease & Salmonellosis. Nosocomial infections – Hospital Infection control committee and its functions – Hospital waste disposal practices.

**UNIT IV**

Gram positive bacteria:Morphology, classification, cultural characteristics, pathogenicity, pathology, laboratory diagnosis and prevention – Control and treatment of diseases caused by the following organisms: Staphylococci, Streptococci, Pneumococci, Neisseriae (Gonococci &Meningococci), *Corynebacteriumdiphtheriae*, *Mycobacterium tuberculosis*, *Mycobacterium leprae*, *Clostridium tetani*, *Clostridium botulinum*.

**UNIT V**

Gram negative bacteria: Morphology, classification, cultural characteristics, pathogenicity, pathology, laboratory diagnosis and prevention – Control and treatment of diseases caused by the following organisms Shigella, Vibrios, Yersinia, Haemophilus. Gram negative anaerobes (Lactobacillus, Mobiluncus, Bacteroides&Fusobacterium), Spirochetes (Treponema, Borrelia), Rickettsiae, Chlamydia, Mycoplasma and ureaplasma.

**MAPPING OF CO WITH PSO**

| CO / PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 | PSO6 |
|---|---|---|---|---|---|---|
| **CO 1** | M | S | L | L | L | M |
| **CO 2** | S | S | M | S | M | M |
| **CO 3** | L | S | M | L | S | M |
| **CO 4** | M | S | M | L | M | L |
| **CO 5** | S | S | M | L | M | M |

**S- Strong; M-Medium; L-Low**

**Reference Books:**


1. Mehrotra, R.S. and Aneja, K.R., 2006. An introduction to Mycology. Reprinted and Published by New Age International (P) Ltd, Publishers, New Delhi.
2. Greenwood, D., Slack, R.B. and Peutherer, J.F. (2002) Medical Microbiology, 16th Edition. Churchill Livingstone, London.
3. Topley and Wilson (1995) Principles of Bacteriology Virology and Immunity. 9th Edition. Vol I, Edward Arnold, London.
4. Chakraborty, P., 2003. A Text Book of Microbiology. 2nd edition, Published by New Central Agency (P) Ltd., Kolkata.
5. Dey, N.C., Dey, T.K. and Sinha, D., 1999. Medical Bacteriology including Medical Mycology and AIDS. 17th edition, New Central Book agency. Kolkatta.


**Text Books:**


1. Ananthanarayan and Paniker's Text book of Microbiology (1978) Universities Press (9thedition), Hyderabad.
2. Jawetz, Melnick, &Adelberg's. (2013). Medical Microbiology. 26th Edition. McGraw-Hill.

## CORE VII – THEORY - MEDICAL MYCOLOGY AND PARASITOLOGY

### COURSE OUTCOME

**CO-1** Understand the basics of fungi – morphological features, taxonomy, and classification systems used.

**CO-2** Imparts knowledge on the etiological agents, its disease mechanism associated with various types of fungal infections in humans and with special reference to immunocompromised patients.

**CO-3** Familiarize with the methods used in diagnosis of fungal infections and its treatment.

**CO-4** Learn all aspects of medically important protozoans causing diseases in human.

**CO-5** Imparts knowledge about medically important helminth causing diseases in humans and immunocompromised individuals.

### UNIT I

Introduction to Medical mycology – Structure, Morphology, cell differentiation and reproduction. Taxonomy, Classification of fungi – Alexofolus and Mims (1979) & Blackwell (1996).

### UNIT II

Superficial mycoses: Dermatophytic infections. Subcutaneous mycoses - Fungi causing Eumycotic Mycetoma, Systematic mycosis: Dimorphic fungi. Dematiaceous fungi, Opportunistic fungal infections- Candidiasis, Aspergillosis, Cryptococcosis and Mucormycosis.

### UNIT III

Detection and recovery of fungi from clinical specimens. Newer methods in diagnostic mycology. Immunity to fungal infections .Mycotoxins. Antifungal agents- testing methods and quality control.

**UNIT IV**

Introduction to Medical parasitology – classification, host-parasite relationships. Epidemiology, life cycle, pathogenic mechanisms, lab diagnosis and treatment: Protozoa causing human infections–Entamoeba, Aerobic and Anaerobic amoebae. Toxoplasma, Cryptosporidium, Leishmania, Trypanasoma, Giardia, Trichomonas and Balantidium.

**UNIT V**

Classification, lifecycle, pathogenicity, laboratory diagnosis and treatment of: Helminths: cestodes – *Taeniasolium, T.saginata, T.echinococcus*. Trematodes– *Fasciola hepatica*, *Fasciolopsis buski*,Paragonimus, Schistosomes. Nematodes: Ascaris, Ankylostoma, Trichuris,Trichinella, Enterobius, Strongyloides, Wuchereria. Other parasites causing infections in immunocompromised hosts and AIDS.

**MAPPING OF CO WITH PSO**

| CO / PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 | PSO6 |
|---|---|---|---|---|---|---|
| **CO 1** | S | M | S | M | W | M |
| **CO 2** | S | M | M | M | S | L |
| **CO 3** | M | M | M | S | S | L |
| **CO 4** | S | S | M | M | L | L |
| **CO 5** | S | S | M | M | L | L |

**S- Strong; M-Medium; L-Low**

**Reference Books:**


1. John P. (2007). Harley Microbiology Lab Manual 7th Edition McGraw Hill Medical Publication division.
2. Prescott, Harley**,** Klein's. (2007). Microbiology 7th Edition McGraw Hill Medical Publication division.

3. Cathleen park Talaro. (2005). Foundations in Microbiology 6th Edition, McGraw Hill Medical Publication division.
4. David Greenwood, Richard Slack and John Peutherer. (2000). MedicalMicrobiology.15th Edition, Church Hill Living stone Publication.
5. Kenneth J. Ryan, C. George Ray, 2014. Sherris Medical Microbiology, 4th Edition. McGraw-Hill Medical Publishing Division. New York.
6. Alexopoulos C. J. and Mims C. W. and Blackwell M. (2010). Introductory Mycology, John Wiley and Sons Inc.
7. Carlile M. J., Watkinson S. C. and Gooday G.W. (2001). The Fungi, 2ndEdition, Academic Press.
8. Webster J. and Weber R. W. S. (2007). Introduction to Fungi, 3rdEdition, Cambridge University Press.
9. Agrios G. N. (2005). Plant Pathology, 5thEdition, Elsevier.

**Text Books:**

1. Ananthanarayanan and JeyaramPaniker. 2016. Textbook of Microbiology, 7thEdition, Orient Publication, New Delhi.
2. Jawetz, Melnick and Adelberg‟s (2013) Medical Microbiology 22nd Edition McGraw Hill Medical Publication division.
3. Ainsworth G.C. (2009). Introduction to the History of Mycology, 2ndEdition, Cambridge University Press.
4. Chatterjee K.D (2007). Medical Parasitology, 7th Edition.
5. Sharma P. D. (2005). Fungi and Allied Organisms. Alpha Science International Publishers.

## CORE VIII – PRACTICAL - MEDICAL BACTERIOLOGY, MEDICAL MYCOLOGY & PARASITOLOGY AND VIROLOGY

**COURSE OUTCOME**

**CO-1** Gain knowledge about the standard operating procedure to be followed in diagnosis of bacterial diseases.

**CO-2** Learn how to isolate and identify the specific pathogen associated with the disease, standard methodology in determination of antimicrobial activity of the drugs against the bacterial pathogens for treatment purpose.

**CO-3** Facilitate the student to isolate and identify the various medically important fungal agents associated with different forms of fungal diseases.

**CO-4** Isolate and identify the various medically important parasitic agents cause diseases in human and learn the role of arthropod vectors in disease transmission.

**CO-5** Acquire knowledge on the propagation, cell culture methods and characterization of virus types from different sources.

**UNIT I**

Collection and transport of clinical specimens – Prerequisites-Proforma - Methodologies. Direct examinations – wet films / staining for Faeces (*V.cholerae, Shigella, Salmonella*) Pus, Sputum, Throat/ear/nasal/wound swabs, CSF and other body fluids. Simple, differential and special staining methods.

**UNIT II**

Cultivation methods -Transport media - Isolation methods – Basal, differential enriched, selective media & special media for the pathogenic bacteria. Biochemical identification. Tests for the respective bacteria upto species level.Antibiotic sensitivity tests- Stokes & Kirby Bauer methods-Disc diffusion, Agar well diffusion & broth dilution – MBC/MIC – Quality Control for antibiotics with reference to standard strains.

**UNIT III**

KOH preparation of skin / nail scrapings for fungi and scabies mites. Examination of hair infection under UV light. LPCB mount. Special stains for fungi-Gomori, PAS

and Methanamine silver stain for sections. Cultivation of fungi and their identification-Mucor, Rhizopus, Aspergillus, Penicillium, Candida, Trichophyton, Microsporum, Epidermophyton - Slide culture method - Germ tube method, Sugar assimilation /fermentation tests for yeast.

**UNIT IV**

Examination of parasites in clinical specimens - Ova/cysts in faeces -Direct and concentration: methods – Formal, Ether and Zinc sulphate methods - Saturated salt solution method. Blood smear examination for malarial parasites. Thin smear by Leishman's stain - Thick smear by J.B.stain. Wet film for Microfilariae. Identification of common arthropods of medical importance - spotters of Anopheles, Glossina, Phelbotomus, Aedes, etc. Ticks and mites.

**UNIT V**

Isolation and characterization of bacteriophage from natural sources phage titration - T4. Study of virus infected plants. Isolation of viruses - chick embryo - animal tissue culture - Spotters of viral inclusions and CPE-stained smears. Viral serology-HAI-ELISA, Western Blotting.

**MAPPING OF CO WITH PSO**

| CO / PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 | PSO6 |
|---|---|---|---|---|---|---|
| **CO 1** | S | S | M | S | M | L |
| **CO 2** | S | M | M | S | S | M |
| **CO 3** | M | M | M | S | M | S |
| **CO 4** | S | S | S | M | M | L |
| **CO 5** | S | S | M | S | M | M |

**S- Strong; M-Medium; L-Low**

**References Manuals**


1. James cappuccino, Natalie Sherman 2004. Microbiology: A Laboratory manual, 7th Edition.
2. Karen Messley 2003. Microbiology Lab manual, 2nd Edition, Berjamin cummings Publisher.
3. Collins, C.H, Lyne P.M 1985. Microbiological methods, Butterworths, London.
4. Harry W. Seeley Jr., Paul J. Vandemark2003. A Laboratory manual of Microbiology, W.H Freeman and Company Publisher.
5. John P. Harley 2007. Microbiology Lab Manual, 1st edition, McGraw-Hill Publication.
6. Ronald M. Atlas, Lawrence C. Parks, Alfred E. Brown. (1994). Laboratory Manual of Experimental Microbiology.
7. Cowan and Steel (1995). Manual for Identification of Medical Bacteria, 4th Editin. Cambridge University Press, London.
8. G Sridharan, P Abraham, AM Abraham, R Kannangai, TS Vijaykumar, M Tibbetts (2006). Practical Manual of Medical Virology.
9. Dejkstra J, Ces P. de Jager (1998). Practical Plant Virology (Protocols and exercises) Springer Lab Manual, Berlin, Heidelberg, NewYork.


**Text Books:**


1. Murray, P.R., Baron, E.J., Jorgensen, J.H., Pfaller, M.A. and Yoke, R.H. (2003) Manual of Clinical Microbiology, 8thEdition.Vol 1&2,ASM Press, Washington, D.C.
2. Balows, A., Hausler. W.J., Ohashi. M and Turano A. (Eds)(1988)Laboratory Diagnosis of Infectious Diseases: Principles and Practice, Vol1 Springer-Verlag, NewYork.
3. Finegold, S.M. (2000). Diagnostic Microbiology, 10th Edition. C.V.Mosby Company, St.Louis.
4. Lennette, E.H. (1974) Diagnostic Procedures for Viral and Rikettsial Diseases. American Public Health Association, New York.

5. Balows, A., Hausler. W.J., Ohashi.M. and Turano.A. (Eds)(1988 Laboratory Diagnosis of Infectious Diseases: Principles and Practice, Vol1 Springer-Verlag, New York.
6. Levanthal, R. and Cheadle, R.S. (1979) Medical Parasitology. S.A.Davies Co., Philadelphia.
7. WalterBeck,J and Davies ,J.E.(1976) Medical Parasitology, 2nd Edition C V.Mosby Company St.Louis.
8. Bridge, E.A. (1994) Bacterial and Bacteriophage Genetics, 3rd Edition Springer–Verlag, NewYork.
9. Miller JH. (1992). A short course in bacterial genetics. Cold Spring Harbor.
10. Gerhardt P, Murray RG, Wood WA and Kreig NR. (ed) (1994) Methods for General and Molecular Bacteriology– American Society for Microbiology, Washington D.C.
11. Dharmalingam K (1986). Experiments with M13 gene cloning and DNA sequencing. Published by Wasani for Macmillan India Limited.
12. Brown W.M.C. (1994). Microbiological Applications. 6th Edition, Publishers, a division of W.M.C. Brown Communications, Inc.

## ELECTIVE III – THEORY - INDUSTRIAL AND FERMENTATION TECHNOLOGY

**COURSE OUTCOME**

**CO-1** Imparts knowledge about fermentation, types and its importance.

**CO-2** Learn the basic knowledge in process and purification of variousfermentation products.

**CO-3** Provides perceptions about biology of industrially important microorganism.

**CO-4** Throws light on primary & secondary metabolites.

**CO-5** Gain knowledge about recent advancements in fermentations.

**UNIT I**

Isolation, preservation and improvement of industrially important microorganisms; Raw materials and media design for Fermentation processes; Sterilization; Development of inoculums for industrial fermentations; Types of fermentation: Batch, continuous, dual or multiple, surface, submerged, aerobic and anaerobic. Major types of organisms used in fermentation. Microbial growth kinetics, Batch culture, Continuous Culture, Fed – Batch – Types, applications, fermentation kinetics.

**UNIT II**

Fermentor – Design and types. Instrumentation and control-aeration and agitation. Recovery and purification of fermented products. Production of Vitamins (Riboflavin and Cyanocobalamin); Steroids; Production of enzymes (Protease, amylase and lipase); production of recombinant proteins having therapeutic and diagnostic applications: Vaccines, Insulin, Interferon, Somatotropin.

**UNIT III**

Biology of industrial microorganisms. *Streptomyces*, Yeasts (*Saccharomyes, Hansenela*) *Spirulina* and *Penicillium*. Mushroom cultivation. Biosensors and Biochips. Biofuels from microbial sources.

**UNIT IV**

Production of primary & secondary metabolites: Alcohols (Ethanol and Butanol); Beverages (Beer and Wine); Aminoacids (Glutamic acid and Lysine); Organic acids (Citric acid and acetic acid). Organic feed stocks, vitamins and antibiotics.

**UNIT V**

Enzyme and cell immobilization,microbial transformation, SCP, biosensor. Measurement of microbial growth. Computers in fermentation, modeling, software sensors, control and supervision of fermentation processes.

**MAPPING OF CO WITH PSO**

| CO / PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 | PSO6 |
|---|---|---|---|---|---|---|
| **CO 1** | S | M | S | M | M | S |
| **CO 2** | M | L | S | L | S | M |
| **CO 3** | M | S | L | S | S | S |
| **CO 4** | S | S | M | S | S | M |
| **CO 5** | M | M | M | L | M | S |

**S- Strong; M-Medium; L-Low**

**Reference Books:**


1. Prescott, L.M, Harley, J.P, Klein, D.A.; 1st Edition. Microbiology McGraw Hill. (2007).
2. Tortora, Funke, Case; Microbiology – An Introduction (Brief Edition) Benjamin Cummings Publications. (2004).
3. Arnold L. Demain & Julian E. Davis. Industrial Microbiology & Biotechnology, ASM Press (2004).
4. Coulson, J.M. and J.F. Richardson; 6th Edition, Chemical Engineering Elsevier. Mc Graw Hill Publication. (1999).
5. Mansi & CFA. Bryce. Fermentation Microbiology & Biotechnology Taylor & Francis Ltd. (2004).


**Text Books:**


1. Principles of Fermentation Technology 3rdEdition, Kindle Edition by Peter F Stanbury, Allan Whitaker, Stephen J. Hall, 2016.
2. Black, J.G. Microbiology Principles and Explorations 6th EditionJohn Wiley and Sons Inc. (2005).
3. Pelczar M. J.Jr. Chan E.C.S., Kreig. Microbiology 5th Edition Tata McGraw Hill (2006).
4. Perry, J.J., Staley, J.T., Lory, S., Microbial life Sinauer Associates Publishers (2002).
5. Emt.el-Mansi & CFA. Bryce Fermentation Microbiology & Biotechnology, Taylor & Francis Ltd. (2004).

## EXTRA DISCIPLINARY ELECTIVE I – THEORY - BIOSTATISTICS, BIOINFORMATICS AND BIOINSTRUMENTATION

**COURSE OUTCOME**

**CO-1** Evaluate and comprehend the basics statistical terminologies used in biostatistics.

**CO-2** Grab acquaintance on different type of statistical analyses and tests for scrutinizing biological data.

**CO-3** Comprehend the basic concepts and the significance of Biological data analysis. Compute Sequence submission and retrieval tools.

**CO-4** Imparts knowledge about various concepts, advanced technical tools in docking, computational drug discovery and ADME responses.

**CO-5** Critique the importance and applications of biological instrumentation for modern day research.

**UNITI**

Natureandscopeofstatisticalmethods and their limitations compilation, classification, tabulation and applications in life sciences.Graphical representation – measure of average, dispersion – stemandleafplots;boxandwhiskerplots,coplots.Introductiontoprobabilitytheoryanddistributions(conceptswithoutderivation)binomial,position andnormal(onlydefinitionand problems).

**UNIT II**

Correlation and regression – conceptsofsamplingandsamplingdistribution – tests of significance based on t-test, chi-square andF-testformeans,proportions,variationsandcorrelationefficient,theoryofattributesandtestsofindependenceofcontingencytables.

**UNIT III**

Overview of bioinformatics- applications of bioinformatics – major databases in bioinformatics - data retrieval tools – data mining of biological databases - FASTA – BLAST.

**UNIT IV**

HumanGenomeProject; DNA Microarray**;** Introduction to Drug discovery and computer aided drug design – SNPs – parameters in drug discovery - cell cycle target – identification and validation Drug design and approaches – CAMD – DOCKING programmes – ADME property prediction.

**UNIT V**

Analytical instruments: UV – VIS, FTIR, SEM, TEM, EDAX, Liquid chromatography (LPLC & HPLC), NMR, Emission Flame Photometry and GC-MS.

**MAPPING OF CO WITH PSO**

| CO / PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 | PSO6 |
|---|---|---|---|---|---|---|
| **CO 1** | M | S | L | L | S | L |
| **CO 2** | W | S | M | L | M | L |
| **CO 3** | S | W | S | S | S | M |
| **CO 4** | S | W | S | S | S | M |
| **CO 5** | S | S | S | M | S | S |

**S- Strong; M-Medium; L-Low**

**Reference Books:**


1. Marcello Pagano, Kimberlee Gauvreau. (2018). Principles of Biostatistics. (2nd Edition). CRC Press Taylor& Francis Group.
2. Uwe Flick. (2015). Introducing Research Methodology. (2nd Edition). SAGE Publications India Pvt Ltd.
3. Noor Ahmad Shaik, Khalid Rehman Hakeem, BabajanBanaganapalli, RamuElango. (2019). Essentials of Bioinformatics. Volume II. In Silico Life Sciences: Medicine. Springer; (1st Edition).

4. Stanton, A .Glantz. (2011). Primer of Bioinformatics. The McGraw Hill Inc: New York. (7th Edition).
5. Stephen, P. Hunt and Rick Liveey. (2000). Functional Genomics. A Practical Approach. Oxford University Press. (1st Edition).
6. Chung Chow Chan, Herman Lam, Xue-Ming Zhang (2011). Practical Approaches to Method Validation and Essential Instrument Qualification Wiley; (1st Edition).
7. JeyasinghEbenezar (2017). Recent Trends in Materials Science and Applications: Nanomaterials, Crystal Growth, Thin films, Quantum Dots, & Spectroscopy. Springer; (1st Edition).
8. Keith Wilson, John Walker (2010). Principles and Techniques of Biochemistry And Molecular Biology, (7th Edition), Cambridge University Press India Pvt.Ltd.

**Text Books:**

1. C.R. Kothari. (2004). Research Methodology - Methods and Techniques. (2nd Edition). New Age International Private Limited.
2. Chap T. Le, Lynn E. Eberly. (2016). Introductory Biostatistics. (2nd Edition). Wiley Interscience.
3. Teresa Attwood. (2007). Introduction to Bioinformatics. Pearson Education;
(1st Edition).
4. Arthur M. Lesk., (2008). Introduction to Bioinformatics. (3rd Edition). Oxford University Press.
5. Rastogi, NamitaMendiratta and Parag Rastogi. (2013). Bioinformatics: Methods And Applications: (Genomics, Proteomics And Drug Discovery) (4th Edition). PHI Learning.
6. Tokyo and Keiichiro Fuwa (2016) Recent Advances in Analytical Spectroscopy. Pergamon; (1st Edition).
7. Primrose, S.B. and Twyman, R.M., (2015). Basics and recent advances of two dimensional- polyacrylamide gel electrophoresis. Kindlevesion.

8. Chung Chow Chan, Herman Lam, Xue-Ming Zhang.(2010) Practical Approaches to Method Validation and Essential Instrument Qualification. (1st Edition) Wiley.
9. Douglas A. Skoog, F. James Holler, Stanley R. Crouch (2016). Principles of Instrumental Analysis. Cengage Learning (6th Edition).

## THIRD SEMESTER

## CORE IX – THEORY - MICROBIAL GENETICS

**COURSE OUTCOME**

**CO-1** Know about the principles of genetics and genetic material.

**CO-2** Familiarize on the organization of genetic material and gene regulations.

**CO-3** Learn on the types, properties of plasmids widely used in gene cloning and gene transfer.

**CO-4** Explore the impact of mutation, repair mechanism and detection of mutation.

**CO-5** Imparts knowledge on genetic recombination, transposons and gene mapping in bacteria, yeast and viruses.

**UNIT I**

Historical perspectives of microbial genetics. Nucleic acid as genetic information carriers: experimental evidence. DNA – types, structure and properties topology, super helicity, linking number.

**UNIT II**

Organization of genes and chromosomes: Definition of gene. Operon-concept and its Positive and negative regulation. Structure of chromatin and chromosomes - unique and repetitive DNA, heterochromatin, euchromatin, transposons.

**UNIT III**

Plasmids as extrachromosomal genetic elements; types and properties. Structure and replication of different plasmids: Col E1, F1 and Ti plasmids. Plasmid amplification and curing; Gene transfer mechanisms: Transformation, conjugation and transduction.

**UNIT IV**

Mutation and Mutagenesis – mechanisms, biochemical basis, mutagens. Molecular basis of spontaneous and induced mutations. Reversion and suppression.

Environmental Mutagenesis and toxicity testing; Carcinogenecity - chemical carcinogenesis and their testing. Isolation of Mutants.

**UNIT V**

Molecular recombination - Mechanism, control and models. Transposition; regulatory sequences and transacting factors. Genetic mapping in *E. coli* and Yeast. Genetics of Lambda, M13, Mu, T4 and OX174.Genetic systems of yeast.

**MAPPING OF CO WITH PSO**

| CO/ PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 | PSO 6 |
|---|---|---|---|---|---|---|
| **CO 1** | M | L | L | L | S | M |
| **CO 2** | L | L | L | L | S | M |
| **CO 3** | L | L | L | L | S | M |
| **CO 4** | L | L | M | L | S | L |
| **CO 5** | M | L | L | M | S | S |

**S- Strong; M-Medium; L-Low**

**Reference Books:**


1. Benjamin Lewin, 2000. Genes VIII, Oxford University Press, New York.
2. David Freifelder. D. 2008. Microbial Genetics, Eighteenth Edition, Narosa Publishing House, New Delhi.
3. Freifelder, D. 2000. Molecular Biology, Second Edition, Narosa Publishing house. New Delhi.
4. Jeyanthi, G.P. 2009. Molecular Biology, MJP Publishers, Chennai.
5. Kornberg, A. and Baker, A. 1992. DNA Replication, Second Edition, W.H. Freeman & Company, New York.

**Text Books:**


1. Lewin B. 2000. Gene VII, Oxford University Press Oxford.
2. Singer, M. and Paul Berg, 1991. Genes & Genomes, University Science Books, California.
3. Stanley R. Maloy, John E.C. and Freifelder, D. 2008. Microbial Genetics, Narosa Publishing House, New Delhi.
4. Stryer, L. 2010. Biochemistry, Seventh Edition, W.H. Freeman and Company, New York.
5. Turner, P.E., McLennan, A.G., Bates, A.D. and White, M.R.H. 1999. Instant Notes in Molecular Biology, Viva Books Ltd., New Delhi.

## CORE X- THEORY: GENETIC ENGINEERING

**COURSE OUTCOME**

**CO-1** Provides knowledge on the various enzymes used in genetic engineering.

**CO-2** Familiarize oncloning vectors used in genetic engineering.

**CO-3** Gain sound knowledge on the gene cloning strategies and transfer methods.

**CO-4** Acquire knowledge on various blotting techniquesand PCR.

**CO-5** Learn the techniques of protoplast fusion, DNA finger printing techniques and application of genetic engineering in various fields.

**UNIT I**

Principles and methods in genetic engineering: Host cell restriction - restriction modification. Restriction enzymes - types and applications, restriction mapping; Enzymes used in genetic engineering - Nucleases, Ribonucleases, DNA ligases, Taq DNA Polymerases, Methylases, Topoisomerases, Gyrases and Reverse transcriptase.

**UNIT II**

Vectors - Plasmid vectors: pSC101, pBR322, pUC series and Ti plasmids based vectors - Bacteriophage vectors: Lambda phage based vectors, phagemids, cosmids,

and M13 based vectors - Viral vectors: Vaccinia, Retroviral, SV40 and Baculoviral vector. Bacterial and yeast artificial chromosomes. Expression vectors.

**UNIT III**

Cloning techniques - Genomic DNA and cDNA library Construction - Screening methods. Cloning in E. coli, Streptomyces and yeast. Expression systems. Gene fusion and Reporter genes. Gene targeting. Methods of gene transfer - transformation, transfection; electroporation, microinjection and biolistics.

**UNIT IV**

Analysis of Recombinant DNA. Polymerase chain reaction. Principles and techniques of nucleic acid hybridization and cot curves –Southern blotting, Northern blotting, Western blotting, Dot and Slot blotting techniques.

**UNIT V**

DNA and protein sequencing. Protein engineering. Protoplast fusion. Hybridoma Technology. DNA finger printing - RFLP, RAPD and AFLP techniques. Applications of genetic engineering in agriculture, health and industry including gene therapy.

**MAPPING OF CO WITH PSO**

| CO / PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 | PSO 6 |
|---|---|---|---|---|---|---|
| **CO 1** | L | M | L | M | S | M |
| **CO 2** | M | L | L | M | S | M |
| **CO 3** | M | L | M | M | S | S |
| **CO 4** | M | M | L | L | S | S |
| **CO 5** | M | M | L | L | S | S |

**S- Strong; M-Medium; L-Low**

**Reference Books:**


1. Brown, T.A. 2000. Gene Cloning, Fourth Edition, Chapman and Hall Publication, USA.
2. Glick, B.K. and Pasternak, J.J. 2002. Molecular Biotechnology Principles and Applications of Recombinat DNA, ASM Press, Washington**.**
3. Hammong, J., Mc Garvey, P. and Springer, V.Y. 2000. Plant Biotechnology.
4. Lewin B. 2000. Genes VII, Oxford University Press, Oxford, UK.
5. Primrose, S.B. and Twyman, R.M. 2009. Principles of Gene manipulation and Genomics, Seventh Edition, Blackwell publishing, UK.


**Text Books:**


1. Stryer, L. 2010. Biochemistry, Seventh Edition, W.H. Freeman and Company, New York.
2. Susan, R.B. 2008. Biotechnology, Cengage Learning Pvt. Ltd., New Delhi.
3. Thieman, W.J. and Palladino, M.A. 2009. Introduction to Biotechnology, Dorling Kindersley India Pvt. Ltd., Noida.
4. Watson, J.D., Hopkins, N.H., Roberts, J.W., Steitz, J.A. and Weiner, A. M. 1998. Molecular Biology of the Gene, Fourth Edition, The Benjamin Cummings Publishing Company Inc., Tokyo.
5. Young, M.M. 1992. Plant Biotechnology, Pergmen Press, Oxford London.

## CORE XI – THEORY: MOLECULAR BIOLOGY

**COURSE OUTCOME**

**CO-1** Gain complete knowledge on biomolecules and Nucleic acids.

**CO-2** Explores the detailed processes of DNA replication, recombination, damage and repair mechanisms.

**CO-3** Learn about RNA synthesis and processing and RNA transport.

**CO-4** Understand the process of protein synthesis, inhibition factors and post translation modification of protein.

**CO-5** Get an idea on control of gene expression at transcription, translation level and gene silencing.

**UNIT I**

Composition, structure and function of biomolecules (carbohydrates, lipids, proteins and nucleic acids). Conformation of proteins (Ramachandran plot, secondary, tertiary and quaternary structure; domains; motif and folds). Conformation of nucleic acids (A-, B- and Z-forms), t-RNA, micro-RNA. Stability of protein and nucleic acid structures.

**UNIT II**

DNA replication – Different enzyme and protein involved in initiation, elongation and termination - fidelity of replication - extra-chromosomal DNA replication. DNA damage and repair mechanisms.

**UNIT III**

RNA synthesis and processing: Transcription factors and machinery - formation of initiation complex, transcription activators and repressors, RNA polymerases, capping, elongation and termination. RNA processing - RNA editing, splicing, polyadenylation, RNA transport.

**UNIT IV**

Protein synthesis - formation of initiation complex, elongation and termination – machineries and their regulation. Genetic code. Aminoacylation of tRNA, tRNA-

identity, aminoacyl tRNAsynthetase, translational proof-reading, translation inhibitors. Post-translational modification of proteins.

**UNIT V**

Control of gene expression at transcription and translation level - Regulation of phages, viruses, prokaryotic and eukaryotic gene expression - Role of chromatin in regulating gene expression and gene silencing.

**MAPPING OF CO WITH PSO**

| CO / PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 | PSO 6 |
|---|---|---|---|---|---|---|
| **CO 1** | M | M | L | L | S | M |
| **CO 2** | M | L | M | L | S | M |
| **CO 3** | M | L | M | L | S | M |
| **CO 4** | M | L | M | L | S | M |
| **CO 5** | M | M | M | M | S | M |

**S- Strong; M-Medium; L-Low**

**Reference Books:**


1. Benjamin Lewin, 2000. Genes VIII, Oxford University Press, New York.
2. David Freifelder. D. 2008. Microbial Genetics, Eighteenth Edition, Narosa Publishing House, New Delhi.
3. Freifelder, D. 2000. Molecular Biology, Second Edition, Narosa Publishing house. New Delhi.
4. Jeyanthi, G.P. 2009. Molecular Biology, MJP Publishers, Chennai.
5. Kornberg, A. and Baker, A. 1992. DNA Replication, Second Edition, W.H. Freeman &Company, New York.


**Text Books:**


1. Lewin B. 2000. Gene VII, Oxford University Press Oxford.
2. Singer, M. and Paul Berg, 1991. Genes &Genomes, University Science Books, California.

3. Stanley R. Maloy, John E.C. and Freifelder, D.2008. Microbial Genetics, Narosa Publishing House, New Delhi.
4. Stryer, L. 2010. Biochemistry, Seventh Edition, W.H. Freeman and Company, New York.
5. Turner, P.E., McLennan, A.G., Bates, A.D. and White, M.R.H. 1999. Instant Notes in Molecular Biology, Viva Books Ltd., New Delhi.

## CORE XII – PRACTICAL: MICROBIAL GENETICS, MOLECULAR BIOLOGY AND GENETIC ENGINEERING

**COURSE OUTCOME**

**CO-1** Learn the techniques for isolation of plasmid and genomic DNA, estimation of DNA by chemical and U-V method.

**CO-2** Know the techniques for isolation of RNA from yeast, estimation of RNA by chemical and U-V method and isolation of antibiotic resistant auxotrophic mutants.

**CO-3** Get hands on training on protein estimation, determination molecular weight of protein, 2D-Gel electrophoresis, Isoelectric focusing, Separation of amino acids by TLC and paper chromatography.

**CO-4** Gains experimental knowledge on separation of proteins using chromatography. Immobilization of enzymes and whole cells. Western blotting. Protoplast and spheroplast isolation. Induction of beta-galactosidase activity in *E. coli* using IPTG.

**CO-5** Acquire knowledge on the lab skills for competent cell preparation, transformation, PCR, Native PAGE and Restriction analysis.

**UNIT I**

Isolation of genomic DNA from bacteria and demonstration in agarose gel electrophoresis. Isolation of plasmid DNA by alkali lysis method. Estimation of DNA by diphenyl amine method. Determination of Tm value of DNA. Quantitation of nucleic acids by UV Spectrophotometer.

**UNIT II**

Isolation of RNA from yeast. Estimation of RNA by orcinol method. Induced mutagenesis - Isolation of antibiotic resistant auxotrophic mutants.

**UNIT III**

Estimation of proteins by Lowery et al method. SDS-PAGE. 2D-Gel electrophoresis. Isoelectric focusing. Separation of amino acids by TLC and paper chromatography.

**UNIT IV**

Separation of proteins using Gel filtration and Ion exchange chromatography. Immobilization of enzymes and whole cells. Western blotting. Protoplast and spheroplast isolation. Induction of beta-galactosidase activity in *E. coli* using IPTG.

**UNIT V**

Preparation of competent cells. Transformation and Blue-White selection for transformants. DNA amplification by PCR. Separation of PCR amplified product on PAGE and determination of product size. Restriction mapping / Restriction analysis.

**MAPPING OF CO WITH PSO**

| CO / PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 | PSO 6 |
|---|---|---|---|---|---|---|
| **CO 1** | M | L | L | M | M | M |
| **CO 2** | M | L | L | L | M | M |
| **CO 3** | M | L | L | M | M | M |
| **CO 4** | M | L | L | M | M | M |
| **CO 5** | M | L | L | M | M | M |

**S- Strong; M-Medium; L-Low**

**Reference Manuals:**


1. Ausubel, F.M., Roger, B., Robert E. Kingston, David A. Moore, Seidman J.G., John A. Smith. and Kelvin, S. 1992. Third Edition, Short Protocols in Molecular Biology, Jolm Wiley &Sons Inc., New York.
2. Berger, S.L. and Kimmel, R. 1987. Guide to Molecular Cloning Techniques, Academic Press, Inc., New York.
3. Brown, T.A. 1998. Molecular Biology Lab Fax 11 Gene Analysis, Academic Press, London. 5. Cappuccino, J.H. and Sherman, N 2007. Microbiology – A Lab Manual, seventh Edition, The Benjamin Publishing Company, Singapore.
4. Malov, S.R. 1990. Experimental Techniques in Bacterial Genetics, Jones and Bartlett Publishers, Boston.

5. Miller, J.H. 1992. A Short Course in Bacterial Genetics: A Lab Manual &Hand Book for *E. coli* and related Bacteria. Cold spring Harbor Lab press, Cold Spring Harbour.
6. Rajamanickam, C. Experimental protocols in basic molecular biology, Osho Scientific Publications, Madurai.
7. Sambrook, I., Fritsch, E.F. and Maniatis, T. 1989. Second Edition, Molecular Cloning 1, 2, 3 - A Laboratory Manual, Cold Spring Laboratory Press, USA.

## ELECTIVE IV– THEORY – SOIL AND AGRICULTURAL MICROBIOLOGY

**COURSE OUTCOME**

**CO-1** Imparts knowledge on types of soil and microbial interaction in soil.

**CO-2** Insight on biofertilizers and biopesticides.

**CO-3** Gain basic knowledge about plant diseases and defense mechanism of plants.

**CO-4** Familiarize on different plant disease and its management.

**CO-5** Throws light on biogeochemical cycles and nitrogen fixation.

**UNIT I**

Characteristics and classification of soils; Soil Microorganisms; Interactions between microorganisms - Mutalism, commensalism, ammensalism, synergism, parasitism, predation, competition. Interaction of microbes with plants - rhizosphere, phyllosphere, spermosphere and mycorrhizae. Fertility of soil.

**UNIT II**

Biogeochemical cycles – carbon, nitrogen, phosphorus, sulphur cycles; mineralization, immobilization and oxidation/reduction. Symbiotic and Asymbiotic Nitrogen fixation – mechanism and genetics of Nitrogen Fixation.

**UNIT III**

Biofertilizers: Role of biofertilizers in agriculture and forestry - Rhizobium, Azotobacter, Azospirillum, VAM, Phosphobacteria, Azolla and Cyanobacteria. Biopesticides – Viral, bacterial, Fungal, Protozoan. Interrelationships between microorganisms, plants and soil - Enzymes of microbial origin and their role in release of available plant nutrients.

**UNIT IV**

Classification of plant diseases. Host-pathogen recognition and specificity. Principles of plant infection and defense mechanisms - entry of pathogen in to host, colonization of host; role of enzymes, toxins and growth regulatory substances.

Defense mechanisms in plants - Structural and biochemical - Molecular aspects of host defense reactions - Lipoxygenase and other enzymes in the expression of disease resistance.

**UNIT V**

Plant Diseases and Management: Etiology, Symptoms, Epidemiology and Disease management of the following plant diseases: Mosaic disease of tobacco; Bunchy top of banana; Leaf roll of potato; Bacterial blight of paddy; Angular leaf spot of cotton, Late blight of potato; Damping off of tobacco, Downy mildew of bajra; Powdery mildew of cucurbits; Head smut of sorghum; Leaf rust of coffee; Blight of maize/sorghum; Leaf spot of paddy, Grassy shoot of sugar cane; Root knot of mulberry. Sanitation - physical, chemical and biological control. Plant disease forecasting. Biotechnological approaches to disease management.

**MAPPING OF CO WITH PSO**

| CO / PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 | PSO6 |
|---|---|---|---|---|---|---|
| **CO 1** | M | M | S | M | M | L |
| **CO 2** | S | L | S | L | S | M |
| **CO 3** | S | S | L | S | S | L |
| **CO 4** | M | S | L | S | S | M |
| **CO 5** | L | S | M | L | S | S |

**S-Strong; M-Medium; L-Low**

**Reference Books:**


1. Van Elsas J.D., Trevors J.T., Rosado A.S. and Nannipieri P. (Ed). 2019. Modern Soil Microbiology, 3rd Edn., CRC Press.
2. Gaur, A.C., 1999. Microbial technology for Composting of Agricultural Residues by Improved Methods, 1st print, ICAR, New Delhi.
3. Glick, B.R. AND Pasternak, J.J 1994. Molecular Biotechnology, ASM Press, Washington DC.

4. Purohit, S. S., Kothari, P. R. and Mathur 1993. Basic and Agricultural Biotechnology, Agrobotanical Publishers (India).
5. Glick B.R. 2015. Beneficial Plant Bacterial Interactions, Springer.

**Text Books:**

1. Madigan, M.T., Bender K.S. Buckley D.H., Sattley W.M. and Stahl D.A. 2019. Brock Biology of Microorganisms, 15thGlobal Edition, Pearson-Benjamin Cummings.
2. Paul E.A. 2015. Soil microbiology, Ecology and Biochemistry, 4thEdition, Elsevier Academic Press.
3. Gupta, S.K. 2014. Approaches and trends in plant disease management. Scientific publishers, Jodhpur, India.
4. Jamaluddin et al., 2013. Microbes and sustainable plant productivity. Scintific Publishers Jodhpur, India.
5. Subba Rao, N. S. 1997. Biofertilizers in Agriculture and Forestry, III Ed., Oxford & IBH Publishing Co.Pvt. Ltd. New Delhi.
6. Subba Rao, N. S. 1995. Soil microorganisms and plant growth. Oxford & IBH Publishing Co.Pvt.Ltd. New Delhi.
7. Martin Alexander 1983. Introduction to Soil Microbiology, Wiley eastern Ltd., New Delhi.
8. Newton, W.E and Orme, Johnson, W.H.1980. Nitrogen fixation vol II: Symbiotic Associations and Cyanaobacteria. University Park Press Baltimore, USA.
9. Wheeler, B. E. 1976. An Introduction to Plant Disease. ELBS and John Wiley and Sons, Ltd.
10. Sylvia D.M., Fuhrmann, J.J., Hartel P.J. and Zuberer D.A. (2005) Principles and Applications of Soil Microbiology, 2nd Edition. Pearson, Prentice Hall.
11. Subba Rao N.S. (2001) Soil Microorganisms and plant growth, Oxford and IBH Publishing Co. Pvt. Ltd.

## EXTRA DISCIPLINARY ELECTIVE II –THEORY: MICROBIAL REMEDIATION

**COURSE OUTCOME**

**CO-1** Imparts basic knowledge on bioremediation, bioaugmentation and risk associated with pollutants.

**CO-2** Insights on degradation of xenobiotics and other environmental pollutants.

**CO-3** Gain knowledge about the concepts of aerobic and anaerobic digesters, dendroremediation and biodegradation of industrial waste.

**CO-4** Throws light on enzymes from fungi and its biodegradable properties and to understand the concept of solid and liquid waste treatment.

**CO-5** Gain in-depth knowledge aboutphycoremediation of domestic wastewater.

**UNIT I**

Bioremediation - process and organisms involved; Constraints and priorities of bioremediation. Major pollutants and polluted sites. Bioaugmentation; Ex-situ and in-situ processes: Intrinsic and engineered bioremediation. Pollutants and associated risks; Water treatment- BOD, COD, dissolved gases. Advantages and disadvantages of bioremediation.

**UNIT II**

Microbiology of degradation of recalcitrant in the environment, ecological considerations,decay behaviour, biomagnifications and degredative plasmids, hydrocarbons,substituted hydrocarbons,oil pollution, surfactants and pesticides. Genetically modifiedorganismsreleasedanditsenvironmental impact assessment and ethical issues; A brief account of biodegradable plasticsandsuperbug.

**UNIT III**

Aerobic and anaerobic digesters: Design; various types of digester for bioremediation of industrial effluents; Advantages and Disadvantages of anaerobic process. Dendroremediation. Composting of solid wastes, methane production and important factors involved; sulphur, iron and nitrate reduction;dechlorination;nitroaromatic compounds degradation; bioremediation of dyes and bioremediation in paper and pulp industries.

**UNIT IV**

Fungi - Mushrooms and their enzymes – role in degradation of environmentally persistent pollutants, transform industrial and agro-industrial wastes into products. Microbial remediation of solid and liquid waste from industries.

**UNIT V**

Phycoremediation of domestic wastewater -advantages of phycoremediation. Potentials of microalgae inindustrial effluent treatment - conventional methods vs algaltechnology.

**MAPPING OF CO WITH PSO**

| CO / PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 | PSO6 |
|---|---|---|---|---|---|---|
| **CO 1** | M | M | S | L | M | S |
| **CO 2** | L | M | S | M | S | S |
| **CO 3** | M | L | S | M | S | S |
| **CO 4** | M | M | S | S | S | S |
| **CO 5** | M | M | S | M | S | S |

**S- Strong; M-Medium; L-Low**

**Reference Books:**


1. Singh SN (2014). Biological Remediation of Explosive Residues, Springer International Publishing, Switzerland.
2. Cheremisinoff NP (2013). Biotechnology for Waste and Wastewater Treatment,Elsevier, UK.
3. Dhir B (2013). Phytoremediation: Role of Aquatic Plants in Environmental Clean-Up, Springer India.
4. Khan MS, Zaidi A, Goel R, Mussarat J (2012). Biomanagement of Metal-Contaminated Soils, Springer, Dordrecht.

5. Baker K.H. And Herson D.S. 1994. Bioremediation. MacGraw Hill Inc. N.Y.

   Waste Water Engineering - Treatment, Disposal and Re-use by Metcalf and Eddy, Inc.,TataMacGrawHill,NewDelhi.

6. EcEldowney, S. Hardman D.J. Pollution: Ecology and Biotreatment and Waite S.1993. - Longman Scientific Technical.

**Text Books:**

1. Anjum NA, Pereira ME, Ahmad I, Duarte AC, Umar S and Khan NA(2013).Phytotechnologies – Remediation of Environmental Contaminants, CRCPress, Boca Raton,FL,USA.
2. Chandrappa R and Das DB (2012). Solid Waste Management Principles andPractice, Springer-Verlag, Heidelberg.
3. Tchobanoglous G and Burton F L (1991). Wastewater Engineering, Treatment,Disposal and Reuse, Metcalf and Eddy (Eds), Tata Mac Graw Hill Publishing Co.Ltd. New Delhi, 3rd Edition.
4. Sathyanarayana T, Johri BN and Prakash A (2012). Microorganisms inEnvironmental Management – Microbes and Environment, Springer, Heidelberg.
5. Gupta DK (2013). Plant-Based Remediation Processes, Springer-Verlag, Berlin Heildelberg.
6. Gupta DK and Sandalio LM (2013). Metal Toxicity in Plants: Perception,Signaling and Remediation Springer, Berlin Heidelberg.
7. Des. W. Connell, G.J. Miller. Waste Water Microbiology 2nd Edition by Bitton. Chemistry and Ecotoxicology of pollution. Edited by Des. W. Connell, G.J. Miller. Wiley Inter science Publications.
8. C. F. Forster and D.A., John Wase. Ellis, Environmental Biotechnology. Edited by C. F. Forster and D.A., John Wase. EllisHorwoodLtd.Publication.
9. Lawrence P. Wacekett, C. Douglas Hershberger, Biocatalysis and Biodegradation: Microbial transformation of organic compounds.2000, ASM Publications.
10. San Diego, Biodegradation and Bioremediation, Academic Press.

11. A. D. Agate, Basic Principles of Geomicrobiology Pune. Christon J. Hurst A Manual of Environmental Microbiology. 2nd Edition. 2001, ASM Publications

## FOURTH SEMESTER

## CORE XIII -THEORY - FOOD, DAIRY AND ENVIRONMENTAL MICROBIOLOGY

**COURSE OUTCOME**

**CO-1** Gain knowledge about different principles involved infood preservation, microbiological quality control and prevention of food-borne diseases.

**CO-2** Throws light on the role of microorganisms in milk, fermented foods and in food processing, different types of fermented food products.

**CO-3** Familiarize the diversity of microorganisms in air, exemplify the air quality, explore the impact of air borne diseases.

**CO-4** Learn the role of indicator microorganisms in water quality.

**CO-5** Gain in-depth knowledge about the degradation of xenobiotics in the environment.

**UNIT I**

Food Microbiology: Occurrence of microorganisms in food - Factors influencing microbial growth - extrinsic and intrinsic. Principles and methods of food preservation - high Temperature, low Temperature, drying, irradiation and chemical preservatives. Food borne diseases - Bacteria, Fungi, Viruses, Algae and Protozoa. Spoilage of fruits, vegetables, meat, poultry, fish and sea foods.

**UNIT II**

Dairy Microbiology: Microflora of milk - sources of contamination. Spoilage and preservation of milk and milk products. Fermented foods - Sauerkraut, Pickles, Buttermilk, Yogurt and Cheese. Probiotics and Prebiotics. Milk borne diseases. Food sanitation - food control agencies and their regulations.

**UNIT III**

Microbiology of air: Occurrence - number and kinds of microbes in air. Distribution and sources of air borne organisms - aerosol and droplet nuclei. Assessment of air quality -Air Sanitation - Airborne diseases. Microbiology of water: Aquatic habitats

- their microflora and fauna - lake, ponds, river, estuary and sea. Biology and ecology of reservoirs and influence of environmental factors on the aquatic biota.

**UNIT IV**

Environmental Microbiology: Waste treatment - Wastes - types and characterization. Treatment of solid wastes - composting, vermiform composting, silage, pyrolysis and saccharifications. Treatment of liquid wastes - primary, secondary (anaerobic and aerobic) – trickling activated sludge, oxidation pond, and oxidation ditch-tertiary - disinfection.

**UNIT V**

Degradation of Xenobiotic compounds: Simple aromatics, chlorinated polyaromatic petroleum products, pesticides and surfactants. Biodeterioration of materials - paper, leather, wood, textiles and paint. Metal corrosion - Bioaccumulation of heavy metals. Biofouling and Bioleaching.

**MAPPING OF CO WITHPSO**

| CO / PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 | PSO 6 |
|---|---|---|---|---|---|---|
| **CO 1** | S | M | S | S | S | S |
| **CO 2** | S | S | S | S | S | S |
| **CO 3** | S | S | M | W | S | S |
| **CO 4** | S | M | S | S | W | S |
| **CO 5** | S | S | S | M | S | S |

**S- Strong; M-Medium; L-Low**

**Reference Books:**


1. Kimberly B. Morland, (2015), Local Food Environments - Food Access on America 1st Edition, CRC Press, New York, USA.
2. Y. H. Hui, E. Özgul Evranuz, (2015), Handbook of Plant-Based Handbook of Fermented Food and Beverage Technology, 2nd Edition, CRC Press, New York, USA.

3. BrijeshK.Tiwari, Tomas Norton, Nicholas M. Holden, (2014), Sustainable Food Processing, 1st Edition, John Wiley & Sons, Ltd, West Sussex, UK.
4. Mitchel, R., (1992). Environmental Microbiology. Wiley – John Wiley and Sons. Inc. Publications: New York.
5. Gabriel Bitton,(2011). Wastewater Microbiology, Wiley-Blackwell publications.
6. Charles Gerday, Nicolas Glandsdorff. (2011). Physiology and Biochemistry of extremophiles. Wiley-Blackwell publications.

**Text Books:**

1. Frazier WC and Westhoff DC. (2014) *Food microbiology*, TATA McGraw Hill Publishing Company Ltd. 5th edition, New Delhi.
2. Patel, AH. (2011). *Industrial Microbiology*, Macmillan India Ltd, 2ndEdition.
3. Adams, Martin R., Moss, Maurice O., (2017) *Food Microbiology*, 3rd Edition, Royal Society of Chemistry, Washington DC, USA.
4. Yasmine Motarjemi, HuubLelieveld, (2014), Food Safety Management - A Practical Guide for the Food Industry, 1st Edition, Academic Press, London, UK.
5. Barton, L. L. and Northop, E.D. (2011). Microbial Ecology (1st Edition). Wiley-Blackwell publications.
6. Atlas Ronald, M., Bartha, and Richard. (1987). *Microbial Ecology*, (2nd Edition). Benjamin/Cummings Publishing Company: California.
7. Forster, C.F. and John Wase. D.A. (2010). *Environmental Biotechnology*. Ellis Horwood: England.

## CORE XIV – PRACTICAL - SOIL, AGRICULTURAL, FOOD AND ENVIRONMENTAL MICROBIOLOGY

**COURSE OUTCOME**

**CO-1** Imparts basic knowledge about soil inhabitingmicrobes and its impact in soil.

**CO-2** Gain knowledge about plant diseases.

**CO-3** Throws light on food spoilage, enumeration and quality assessment.

**CO-4** Learn about extracellular enzyme activity & quantification of microbes in air.

**CO-5** Gain knowledge of about the microbiological analysis of water.

**UNIT I**

Isolation and enumeration of soil microorganisms (fungi, bacteria and actinomycetes). Isolation of phosphate solubilizer from soil. Isolation of Nitrogen fixers - Rhizobium from root nodule and - Azotobacter from rhizosphere. Screening of antagonistic bacteria in soil by agar overlay method. Qualitative examination of soil microflora by the buried Slide Method. Sulfate reducing microorganism in soil.

**UNIT II**

Estimation of foliar infection by Stoyer's method. Cultivation of oyster mushroom. Study of the following diseases: Tobacco mosaic; Bacterial blight of paddy; Downy mildew of bajra; Powdery mildow of cucurbits; Head smut of sorghum, Leaf rust of coffee; Leaf spot of mulberry, Red rot of sugarcane, Root knot of mulberry.

**UNIT III**

Detection of number of bacteria in milk by breed count. Determination of quality of milk sample - methylene blue reduction test and Resorzurin method. Detection of number of bacteria in milk - standard plant count. Isolation of yeast and molds from spoiled nuts, fruits, and vegetables. Bacteriological examination of specific foods –

curd, raw meat, fish, Ice cream. Maltodextrin detection test: Enzymatic method. Formalin test.

**UNIT IV**

Extracellular enzyme activities - phosphatase. Quantification of microorganisms in air-solid and liquid impingement techniques.

**UNIT V**

Physical, chemical and microbial assessment of water and potability test for water. Physical and chemical - colour, alkalinity, acidity, COD, BOD, anions and cations. Microbiological - MPN index - presumptive, completed and confirmatory tests. Total dissolved solid and Total suspended solid in water.

**MAPPING OF CO WITH PSO**

| CO / PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 | PSO 6 |
|---|---|---|---|---|---|---|
| **CO 1** | M | S | S | M | M | S |
| **CO 2** | M | L | S | L | S | L |
| **CO 3** | M | S | L | S | S | S |
| **CO 4** | S | S | M | S | S | M |
| **CO 5** | S | M | M | L | S | S |

**S- Strong; M-Medium; L-Low**

**Reference Manuals:**


1. Cappuccimo, J and Sherman, N (2002) Microbiology: A Laboratory manual, 6th Edition. Pearson Education Publication. New Delhi.
2. Basanta Kumar Rai and Dil Kumar Subba (2016) Basic Practical Manual on Industrial Microbiology, Dharan Multiple Campus, Nepal.
3. Kulandaivel and Janarthanan, S. (2012) Practical Manual on Fermentation Technology.

4. Mathur, N. and Singh, A. (2007) Industrial Microbiology: A Laboratory Manual, Pointer publishers.
5. Arnold L. Demain, Julian E. Davies, Ronald M. Atlas, Gerald Cohen, Charles L. Hershberger, Wei-Shou Hu, David H. Sherman, Richard C. Willson and David Wu, J.H. (1999) Manual of Industrial Microbiology and Biotechnology, 2nd Edition.
6. Lorian, V. (1991) Antibiotics in Laboratory Medicine. Williams and Wilkins.
7. Sadasivam, S. and Manickam, A. (1996) Biochemical Methods. New Age International (P) Limited, Publishers.

## ELECTIVE V– THEORY - RESEARCH METHODOLOGY

**COURSE OUTCOME**

**CO-1** Understand the objectives of research, design of research and analysis of data.

**CO-2** Gain basic knowledge about dissertation and publication ethics.

**CO-3** Provides perceptions about funded projects.

**CO-4** Learn about research metrics & ethics.

**CO-5** Throws light on statistical tools in biological science, software for plagiarism and reference.

**UNIT I**

Research Methodology - Objectives and types of research. Research approaches - research Process. Defining the research problem - research design. Data Analysis: Data Preparation – Univariate analysis, Bivariate analysis, testing hypothesis of association. Sampling: Concepts of Statistical Population, Sample, Sampling Frame, Sampling Error, Sample Size and Non Response.

**UNIT II**

Writing the Research Report (Thesis and publications): Components of research report - Title, Authors, Addresses, Abstract, Keywords, Introduction, Materials and Methods, Results, Discussion, Summary, Acknowledgements and Bibliography. Writing a Scientific Paper, Communicating to a Journal,Impact factor of Journals, false impact factors and predatory journals.

**UNIT III**

Steps involved in research, Inter disciplinary research. Characteristics of research, Writing a Grant for funding, Preparation of Research Presentation, Types of report – Mechanics of writing a research report – Precautions for writing a research report – Conclusion.

**UNIT IV**

Concept and design of research paper, citation and acknowledgement, Research Metrics (i-10 index, h-index, G index and altmetrics) ethical issues, ethical committees (human & animal); IPR- intellectual property rights and patent law, copy right, royalty. Indexing databases, Citation databases: Web of Science, Scopus.

**UNIT V**

Use of statistical softwares (Sigma STAT, SPSS for student t-test, ANOVA). Use of Encyclopedias, Research Guide& Handbooks.Reference Management Software (Endnote, Mendeley, Zotero).Plagiarism software.

**MAPPING OF CO WITH PSO**

| CO / PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 | PSO 6 |
|---|---|---|---|---|---|---|
| **CO 1** | S | S | S | M | M | S |
| **CO 2** | M | L | S | L | S | S |
| **CO 3** | M | S | L | S | S | M |
| **CO 4** | S | S | M | S | S | M |
| **CO 5** | M | S | M | L | L | S |

**S- Strong; M-Medium; L-Low**

**Reference Books:**


1. Snedecar, G.W. and Cochram, W.G. (1967) Statistical Methods. Oxford Press,London.
2. Robert A. Day (1998), How To Write & Publish a Scientific Paper. Oryx Press; 5th Edition.
3. Suresh C. Sinha and Anil K. Dhiman, (2002), Research Methodology (2 Vols-Set) Vedams Books (P) Ltd.
4. Sharma, K.R. (2002). Research methodology. National Publishing House, Jaipur and New Delhi.
5. Kothari, C.R. (2004). Research Methodology: Methods and Techniques, New Age International Publishers, New Delhi.
6. Skoog: Principles of Instrumental Analysis (Saunders College Publishing Philadelphia).


**Text Books:**


1. Sundar Rao, P.S.S. and Richard, J. (2006) Introduction to Biostatistics & Research methods. Prentice-Hall of India (P) Ltd, New Delhi.
2. Sharma, K.R. (2002) Research methodology. National Publishing House, Jaipur and New Delhi.
3. Sundar Rao, P.S.S. and Richard, J. (2006) Introduction to Biostatistics & Research methods. Prentice-Hall of India (P) Ltd, New Delhi.
4. Kothari, C.R. Research Methodology (Methods and Techniques), New Age Publisher, 2020.
5. LokeshKoul, Methodology of Educational Research 5th Edition.
6. Fred N KerlingerFoundations of Behavioral Research (2017).
7. Arya P.P. and Pal, Y. (2001), Research Methodology in Management: Theory and Case Studies, Deep and Deep Publishers Pvt. Ltd., New Delhi.

## CORE XV PROJECT VIVA VOCE

**OBJECTIVE OF THE COURSE**

To impart advanced practical knowledge in conducting a research project.To plan and design statistically, retrieve relevant literature, organize and conduct, process the data, photograph relevant observations, evaluate by statistical programmes. Present the project in any regional/national conference/seminar during the Second year of the course and submit for final semester Examinations. The work has to be conducted in department under the guidance of the project supervisor. Interdisciplinary collaborations from external departments / institutions can be organized only for essential areas of the project.Industrial Visit has been included along with the Project work as a report (minimum of 10 pages) possibly with geo-tagged photographs. The method of valuation of the project and Industrial visit report submitted by the candidate is outlined as follows:

| | | |
|---|---|---|
| Internal(2 out of 3 presentations) | - | 10 Marks |
| Industrial Visit Report | - | 10 Marks |
| Viva | - | 20 Marks |
| Project Report | - | 60 Marks |

## PSO - CO Matrix

| Course Component | Name of the Subject | Course Outcome | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 | PSO6 |
|---|---|---|---|---|---|---|---|---|
| CoreI-Theory | Microbial Diversityand Taxonomy | CO 1 | S | L | L | L | M | M |
| | | CO 1 | S | M | L | M | M | M |
| | | CO 3 | S | L | L | L | M | M |
| | | CO 4 | S | L | M | L | M | M |
| | | CO 5 | S | L | L | M | M | M |
| CoreII-Theory | General Microbiology and Laboratory Animal Science | CO 1 | S | L | L | S | S | M |
| | | CO 1 | S | M | M | L | L | M |
| | | CO 3 | L | S | S | S | S | M |
| | | CO 4 | L | L | M | M | S | S |
| | | CO 5 | L | M | L | S | S | S |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CoreIII-Theory | Immunology | CO 1 | L | S | L | S | M | M |
| | | CO 1 | L | S | L | S | M | M |
| | | CO 3 | L | M | L | S | S | S |
| | | CO 4 | M | S | M | M | M | M |
| | | CO 5 | M | S | L | S | S | S |
| CoreIV–Practical | General Microbiology and Immunology | CO 1 | S | S | S | S | M | M |
| | | CO 1 | S | S | M | M | L | S |
| | | CO 3 | M | S | M | M | M | L |
| | | CO 4 | L | M | S | S | S | S |
| | | CO 5 | L | S | L | S | M | M |
| ElectiveI-Theory | Microbial Metabolic Pathways | CO 1 | S | M | M | M | S | S |
| | | CO 1 | S | S | M | M | S | S |
| | | CO 3 | M | S | M | M | M | S |
| | | CO 4 | L | M | S | S | M | M |
| | | CO 5 | L | S | L | S | L | L |
| ElectiveII-Theory | Pharmaceutical Microbiology | CO 1 | S | L | M | S | M | S |
| | | CO 1 | M | L | S | M | M | L |
| | | CO 3 | M | L | L | M | S | M |
| | | CO 4 | L | L | L | M | M | M |
| | | CO 5 | M | L | M | S | M | S |
| CoreV-Theory | Virology | CO 1 | S | M | L | L | M | M |
| | | CO 1 | S | M | L | L | M | M |
| | | CO 3 | S | M | M | L | M | M |
| | | CO 4 | S | S | M | L | M | M |
| | | CO 5 | M | M | M | L | M | M |
| CoreVI-Theory | Medical Bacteriology | CO 1 | M | S | L | L | L | M |
| | | CO 1 | S | S | M | S | M | M |
| | | CO 3 | L | S | M | L | S | M |
| | | CO 4 | M | S | M | L | M | L |
| | | CO 5 | S | S | M | L | M | M |
| CoreVII-Theory | Medical Mycology and Parasitology | CO 1 | S | M | S | M | W | M |
| | | CO 1 | S | M | M | M | S | L |
| | | CO 3 | M | M | M | S | S | L |
| | | CO 4 | S | S | M | M | L | L |
| | | CO 5 | S | S | M | M | L | L |
| CoreVIII-Practical | Medical Bacteriology, Medical Mycology | CO 1 | S | S | M | S | M | L |
| | | CO 1 | S | M | M | S | S | M |
| | | CO 3 | M | M | M | S | M | S |
| | | CO 4 | S | S | S | M | M | L |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | & Parasitology and Virology | CO 5 | S | S | M | S | M | M |
| Elective III-Theory | Industrial and Fermentation Technology | CO 1 | S | M | S | M | M | S |
| | | CO 1 | M | L | S | L | S | M |
| | | CO 3 | M | S | L | S | S | S |
| | | CO 4 | S | S | M | S | S | M |
| | | CO 5 | M | M | M | L | M | S |
| Extra disciplinary ElectiveI-Theory | Biostatistics, Bioinformatics and Bioinstrumentation | CO 1 | M | S | L | L | S | L |
| | | CO 1 | W | S | M | L | M | L |
| | | CO 3 | S | W | S | S | S | M |
| | | CO 4 | S | W | S | S | S | M |
| | | CO 5 | S | S | S | M | S | S |
| CoreIX-Theory | Microbial Genetics | CO 1 | M | L | L | L | S | M |
| | | CO 1 | L | L | L | L | S | M |
| | | CO 3 | L | L | L | L | S | M |
| | | CO 4 | L | L | M | L | S | L |
| | | CO 5 | M | L | L | M | S | S |
| CoreX-Theory | Genetic Engineering | CO 1 | L | M | L | M | S | M |
| | | CO 1 | M | L | L | M | S | M |
| | | CO 3 | M | L | M | M | S | S |
| | | CO 4 | M | M | L | L | S | S |
| | | CO 5 | M | M | L | L | S | S |
| Core XI-Theory | Molecular Biology | CO 1 | M | M | L | L | S | M |
| | | CO 1 | M | L | M | L | S | M |
| | | CO 3 | M | L | M | L | S | M |
| | | CO 4 | M | L | M | L | S | M |
| | | CO 5 | M | M | M | M | S | M |
| Core XII-Practical | Microbial Genetics, Molecular Biology & Genetic Engineering | CO 1 | M | L | L | M | M | M |
| | | CO 1 | M | L | L | L | M | M |
| | | CO 3 | M | L | L | M | M | M |
| | | CO 4 | M | L | L | M | M | M |
| | | CO 5 | M | L | L | M | M | M |
| Elective IV-Theory | Soil and Agricultural Microbiology | CO 1 | M | M | S | M | M | L |
| | | CO 1 | S | L | S | L | S | M |
| | | CO 3 | S | S | L | S | S | L |
| | | CO 4 | M | S | L | S | S | M |
| | | CO 5 | L | S | M | L | S | S |
| Extra disciplinary | Microbial Remediation | CO 1 | M | M | S | L | M | S |
| | | CO 1 | L | M | S | M | S | S |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Elective II-Theory | | CO 3 | M | L | S | M | S | S |
| | | CO 4 | M | M | S | S | S | S |
| | | CO 5 | M | M | S | M | S | S |
| Core XIII-Theory | Food, Dairy and Environmental Microbiology | CO 1 | S | M | S | S | S | S |
| | | CO 1 | S | S | S | S | S | S |
| | | CO 3 | S | S | M | W | S | S |
| | | CO 4 | S | M | S | S | W | S |
| | | CO 5 | S | S | S | M | S | S |
| Core XIV-Practical | Soil, Agricultural, Food and Environmental Microbiology | CO 1 | M | S | S | M | M | S |
| | | CO 1 | M | L | S | L | S | L |
| | | CO 3 | M | S | L | S | S | S |
| | | CO 4 | S | S | M | S | S | M |
| | | CO 5 | S | M | M | L | S | S |
| Elective V-Theory | Research Methodology | CO 1 | S | S | S | M | M | S |
| | | CO 1 | M | L | S | L | S | S |
| | | CO 3 | M | S | L | S | S | M |
| | | CO 4 | S | S | M | S | S | M |
| | | CO 5 | M | S | M | L | L | S |

**S- Strong; M-Medium; L-Low**

**S.A.C. SEPT'2022**

**APPENDIX – (i)14(R)**
**UNIVERSITY OF MADRAS**
**MASTER OF COMMERCE (M.Com.)**
**(w.e.f.2022 – 2023 onwards)**

**Program Outcomes for M.Com (General Commerce )**

**PO1. Critical Thinking**: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.

**PO2. Problem Solving**: Solve problems from the disciplines of concern using the knowledge, skills and attitudes acquired from humanities/ sciences/ mathematics/ social sciences.

**PO3. Effective Communication**: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology.

**PO4. Individual and Team Work**: Function effectively as an individual, and as a member or leader in diverse teams, and in wide variety of settings.

**PO5. Ethics**: Understand multiple value systems including your own, the moral dimensions of your decisions, and accept responsibility for them.

**PO6. Environment and sustainability**: Understand the impact of technology and business practices in societal and environmental contexts, and sustainable development.

**PO7. Self-directed and life-long learning**: Demonstrate the ability to engage in independent and life-long learning in the broadest context socio-technological changes.

**PO8. Computational Thinking**: Understand data-based reasoning through translation of data into abstract concepts using computing technology-based tools.

## SCHEME OF EXAMINATIONS:

### First Semester

| Course Components | Code | Subjects | Instructional Hours | Credits | Exam. Hours | Max. Marks | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | CIA | Ext | Total |
| Core Paper - I | Com 201 | Advanced Corporate Accounting & Accounting Standards# | 6 | 4 | 3 | 25 | 75 | 100 |
| Core Paper – II | Com 203 | Financial Management # | 6 | 4 | 3 | 25 | 75 | 100 |
| Core Paper – III | Com 205 | Organizational Behaviour | 6 | 4 | 3 | 25 | 75 | 100 |
| Core Paper – IV | Com 207 | Managerial Economics * | 6 | 4 | 3 | 25 | 75 | 100 |
| Elective | | Accounting for Specialized Institutions **OR** Strategic Human Resource Management & Development | 4 | 3 | 3 | 25 | 75 | 100 |
| Soft Skill - I | | | 2 | 2 | - | 40 | 60 | 100 |

# ***Composition of marks: 80 % problems and 20 % theory***

****Composition of Marks: 40% problems and 60% theory***

✓ ***One paper is chosen (Organisational Behaviour)and a component on Industrial exposure is included***

**Industry Component**

- Internship have to be carried out at the end of the First semester in any aspect of the units of organizational Behaviour (HR Department)
- 20 hours of practicals in the mentioned area to be completed and attendance certificate to be submitted
- The report of the same with a maximum of 3000 words shall be submitted by the students within a period of one month after the completion of the Internship which can be considered as the assignment of the particular subject.

**Second Semester**

| Course Components | Code | Subjects | Instructional Hours | Credits | Exam. Hours | Max. Marks | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | CIA | Ext | Total |
| Core Paper – V | Com 202 | Advanced Cost and Management Accounting# | 6 | 4 | 3 | 25 | 75 | 100 |
| Core Paper – VI | Com 204 | Quantitative Techniques for Business Decisions # | 6 | 4 | 3 | 25 | 75 | 100 |
| Core Paper – VII | Com 206 | Corporate Laws | 6 | 4 | 3 | 25 | 75 | 100 |
| Elective | | Industrial Relations & Labour Welfare **OR** Customer Relationship Management* | 4 | 3 | 3 | 25 | 75 | 100 |
| Extra Disciplinary Elective $ | | Total Quality Management | 5 | 3 | 3 | 25 | 75 | 100 |
| Internship | | | 1 | 2 | - | - | - | 100 |
| Soft Skill – II | | | 2 | 2 | - | 40 | 60 | 100 |

***# Composition of marks: 80 % problems and 20 % theory***

**$ To be offered to other Departments**

Internship will have to be carried out at the end of the Second Semester and the report of the same shall be submitted by the students within a period of one month after the completion of the Internship. The Internship report shall be evaluated by the two examiners within the Department of the College. The marks shall be sent to the University by the College and the same will be included in the Third Semester Statement of Marks

**Third Semester**

| Course Components | Code | Subjects | Instructional Hours | Credits | Exam. Hours | Max. Marks | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | CIA | Ext | Total |
| Core Paper – VIII | Com 209 | Research Methodology | 5 | 4 | 3 | 25 | 75 | 100 |
| Core Paper – IX | Com 211 | Information Technology for Business | 5 | 4 | 3 | 25 | 75 | 100 |
| Core Paper – X | Com 213 | Income Tax Law & Practice | 5 | 4 | 3 | 25 | 75 | 100 |
| Elective | | Marketing of Services **OR** Managerial Behaviour and effectiveness | 4 | 3 | 3 | 25 | 75 | 100 |
| Elective | | Consumer Behaviour **OR** Change Management | 4 | 3 | 3 | 25 | 75 | 100 |
| Extra Disciplinary Elective $ | | Corporate Governance & Social Responsibility | 5 | 3 | 3 | 25 | 75 | 100 |
| Soft Skill - III | | | 2 | 2 | - | 40 | 60 | 100 |

✓ ***One paper is chosen (Income Tax Law and Practice) and a component on Industrial exposure is included***

- Internship have to be carried out at the end of the **Third Semester** in CA firm **(Income Tax Law and Tax Planning)**
- 20 hours of practicals in the mentioned area to be completed and attendance certificate to be submitted
- The report of the same with a maximum of 3000 words shall be submitted by the students within a period of one month after the completion of the Internship which can be considered as the assignment of the particular subject.

**Fourth Semester**

| Course Components | Code | Subjects | Instructional Hours | Credits | Exam. Hours | Max. Marks | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | CIA | Ext | Total |
| Core Paper – XI | Com 208 | Management Information Systems | 6 | 4 | 3 | 25 | 75 | 100 |
| Core Paper – XII | Com 210 | Investment Analysis and Portfolio Management | 6 | 4 | 3 | 25 | 75 | 100 |
| Core Paper – XIII | Com 212 | Indirect Taxes | 6 | 4 | 3 | 25 | 75 | 100 |
| Core Paper – XIV & XV | Com 214 | Project | 6 | 8 | - | 40 | 160@ | 200 |
| Elective | | Financial Markets & Institutions **OR** Digital Banking | 4 | 3 | 3 | 25 | 75 | 100 |
| Soft Skill – IV | | | 2 | 2 | - | 40 | 60 | 100 |

@ Viva-voce examination carries 40 Marks and Project Report carries 160 Marks

**S.SENATE.SEPT.'2022**

# APPENDIX – (i)14(S)
# UNIVERSITY OF MADRAS
# MASTER OF COMMERCE (M.Com.)
# (w.e.f.2022 – 2023 onwards)

**Advanced Corporate Accounting and Accounting Standards**
**SEMESTER I – CORE PAPER - 1**

**COURSE CODE: Com 201** **CREDITS: 4**
**L:P:T:S** **CIA MARKS: 25**
**EXAM HOURS: 3** **ESE MARKS: 75**

**COURSE OBJECTIVE :**
To impart knowledge on corporate accounting methods and procedures and to develop skills in the preparation of accounting statements and in their analysis.

**COURSE OUTCOMES:**
At the end of the course the students will be able to

| | |
|---|---|
| **CO1** | Explain the accounting treatment adopted for raising funds and redeeming the funds. (U |
| **CO2** | Illustrate the Acquisition, amalgamation, and reconstruction (internal & external) schemes of companies (U) |
| **CO3** | Construct final accounts of Joint Stock Companies. (P) |
| **CO4** | Explain the methods of preparing statements for liquidation of companies. (U) |
| **CO5** | Outline the accounting standards prescribed by Generally Accepted Accounting Principles and Practices (GAAP) recommended by the ICAI - Mandatory Accounting Standards (AS) issued by the ICAI (U) |

**MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES**

| | **PSO 1** | **PSO 2** | **PSO 3** |
|---|---|---|---|
| **CO 1** | 3 | - | 2 |
| **CO 2** | 3 | - | - |
| **CO 3** | 3 | - | 2 |
| **CO 4** | 3 | - | - |
| **CO5** | 3 | - | 2 |

**3-Strong Correlation, 2- Medium Correlation, 1-Low correlation**

| Unit | Contents of Module | Hrs | CO |
|---|---|---|---|
| **1** | Advanced problems in share capital and debenture transactions including underwriting - Valuation of goodwill and shares | **15** | **1** |
| **2** | Acquisition, Amalgamation, absorption and reconstruction (internal and external) schemes | **15** | **2** |
| **3** | Consolidated final statement of Holding companies and subsidiary companies –intercompany holdings and Owings -treatment of dividends | **15** | **3** |
| **4** | Statements for liquidation of companies | **15** | **4** |
| **5** | Basic postulates of accounting theory and generally accepted accounting principles and practices recommended by the ICAI -Mandatory Accounting Standards (AS) issued by the Ministry of Corporate Affairs (MCA) | **15** | **5** |

Note: The proportion between theory oriented and problem oriented questions in the University examination shall be 20:80

**QUESTION PAPER PATTERN:**

PART A - 10 OUT OF 12 = 10 X 1 = 10 marks
PART B - 5 OUT OF 7 = 5 X 5 = 25 marks
PART C - 4 OUT OF 6 = 4 X 10 = 40 marks

**RECOMMENDED TEXT BOOKS:**


1. M.C. Shukla and T. S. Grewal, Advanced Accounts, New Delhi, S. Chand and Co.
2. R.L. Gupta and M. Radhaswamy, Advanced Accounts, New Delhi, Sultan Chand
3. S.P. Jain and K.L. Narang, Advanced Accounts, Ludhiana, Kalyani Publishers
4. T S Reddy, et.al., Corporate Accounting, Chennai, Margam Publications


**WEB REFERENCES:**

www.indiacorporateadvisor.com
www.iimcal.sc.in
www.futureaccountant.com

**Financial Management**
**SEMESTER I – CORE PAPER – 2**

**COURSE CODE: Com 203** **CREDITS: 4**
**L:P:T:S** **CIA MARKS: 25**
**EXAM HOURS: 3** **ESE MARKS: 75**

**COURSE OBJECTIVE :**
To impart knowledge on the fundamentals of finance function in business and to develop skills in financial analysis and decision making

**COURSE OUTCOMES:**
At the end of the course the students will be able to

| | |
|---|---|
| **CO1** | Develop the scope of financial management in functional areas of business and corporate (P) |
| **CO2** | Solve problems relating to the capital structure and types of leverages to take financial decisions. (P) |
| **CO3** | Determine the cost of capital and Choose appropriate dividend theories to cope with market conditions (P) |
| **CO4** | Analyze various investment options to make investment decisions. (A) |
| **CO5** | Analyze the elements of working capital management for efficient management of short term finance. (A) |

**MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES**

| | **PSO 1** | **PSO 2** | **PSO 3** |
|---|---|---|---|
| **CO 1** | 3 | - | 3 |
| **CO 2** | 3 | - | 3 |
| **CO 3** | 3 | - | 3 |
| **CO 4** | 3 | - | 3 |
| **CO5** | 3 | - | 3 |

**3- Strong Correlation 2- Medium Correlation 1- Low Correlation**

| Unit | Contents of Module | Hrs | CO |
|---|---|---|---|
| 1 | Functions of manager – methods and sources of raising finance – sources of short term and long term finance – critical appraisal of different securities and bonds as source of finance – equity shares – convertible and non-convertible debentures – preferred stock - Objectives / goals of finance function -financing decisions -investment decision -importance of financial planning -problems in financial forecasting. | 15 | 1 |
| 2 | Capital Structure decisions -Traditional and MM approaches -current views -determinants - capital structure- overtrading-over and under capitalization -leverage analysis EBIT -EPS analysis. | 15 | 2 |
| 3 | Cost of capital measurement WACC-MCC and value of the firm -factors influencing dividend policy of firm -dividend relevancy -company law provisions on dividend payment. | 15 | 3 |
| 4 | Capital Budgeting -risk -required rate of return -estimating cash flows - present value of cash flows -evaluation of alternative investment proposals -sensitivity analysis -simulation -decision making under conditions of risk and uncertainty -inflation and investment decisions. | 15 | 4 |
| 5 | Working capital management -working capital c.ycle -forecasting of working capital requirement - factors influencing working capital- different components -inventory -cash - receivables -credit policies – collection policies. | 15 | 5 |

Note: The proportion between theory oriented and problem oriented questions in the University Examination shall be 60:40

**QUESTION PAPER PATTERN:**

PART A - 10 OUT OF 12 = 10 X 1 = 10 marks
PART B - 5 OUT OF 7 = 5 X 5 = 25 marks
PART C - 4 OUT OF 6 = 4 X 10 = 40 marks

**RECOMMENDED TEXT BOOKS:**

1. Van Horne J. Financial Management & Policy Pearson Education, Delhi
2. Brealey and Myers, Principles of Corporate Finance, New York, McGraw Hill
3. West on and Brigham, Managerial Finance, New York, Holt Rinehart
4. Pandey I M, Financial Management, New Delhi, Vikas
5. Babatosh Banerjee, Financial Policy and Management Accounting, Calcutta, The World Press
6. Prasanna Chandra, Financial Management Theory and Practice, New Delhi, TMH
7. Periyasamy P, Financial Management, Vijay Nicole Imprints

**WEB REFERENCES:**

www.accountingstudyguide.com
www.managementparadise.com

**Organizational Behaviour**
**SEMESTER I – CORE PAPER - 3**

**COURSE CODE: Com 205** **CREDITS: 4**
**L:P:T:S** **CIA MARKS: 25**
**EXAM HOURS: 3** **ESE MARKS: 75**

**COURSE OBJECTIVES:**
To provide knowledge on employees' behaviour and their managerial implications and to impart knowledge on organizational dynamics

**COURSE OUTCOMES:**
At the end of the course the students will be able to

| | |
|---|---|
| **CO1** | Infer the organizational behaviour needs and approaches in global scenario (U) |
| **CO2** | Identify the progress and challenges in organizational change management and the role of politics( P) |
| **CO3** | Explain the organizational communication and types of stress management (U) |
| **CO4** | Compare the organizational culture and its effectiveness (U) |
| **CO5** | Illustrate the Systems approach to change, intervention strategy model, total project management model organize the organizational change in management (U) |

**MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES**

| | **PSO 1** | **PSO 2** | **PSO 3** |
|---|---|---|---|
| **CO 1** | 3 | - | 3 |
| **CO 2** | 3 | - | 3 |
| **CO 3** | 3 | - | 3 |
| **CO 4** | 3 | - | 3 |
| **CO5** | 3 | - | 3 |

**3- Strong Correlation 2- Medium Correlation 1- Low Correlation**

| Unit | Contents of Module | Hrs | CO |
|---|---|---|---|
| **1** | Introduction to Organizational Behaviour - Meaning - Elements - Need - Approaches - Models -Global Scenario. | **15** | **1** |
| **2** | Individual Behaviour - Personality - Learning - Attitudes - Perception - Motivation - Relevance to Organizational Behaviour - Group behaviour - Group Dynamics - Group Norms - Group Cohesiveness - Their relevance to Organizational Behaviour | **15** | **2** |
| **3** | Organizational communication - Meaning, Importance, Process, Barriers - Methods to reduce barriers - Principles of effective communication - Stress - Meaning - Types - Stress management | **15** | **3** |
| **4** | Organizational Dynamics - Organizational Effectiveness - Meaning, Approaches - Organizational Culture - Meaning, Significance - Organizational Climate - Implications on Organizational Behaviour | **15** | **4** |
| **5** | Organizational change - Meaning - Resistance to change - Management of change | **15** | **5** |

**QUESTION PAPER PATTERN:**

PART A - 10 OUT OF 12 = 10 X 1 = 10 marks
PART B - 5 OUT OF 7 = 5 X 5 = 25 marks
PART C - 4 OUT OF 6 = 4 X 10 = 40 marks

**RECOMMENDED TEXT BOOKS:**


1. Mishra - Organizational Behaviour - Vikas Publishing House Pvt. Ltd
2. Chandran - Organizational Behaviour - Vikas Publishing House Pvt Ltd
3. L.M. Prasad, - Organizational Behaviour - 3rd Edition Reprint - Sultan Chand & Sons
4. Gupta.Shahi.K & Joshi Rosy Wahia, 2004 - Organizational Behaviour - 1st Edition - Kalyani Publishers
5. Gregory Moorhead, Ricky W. Griffin - Organizational Behaviour - Published by Bixtantra
6. Chauhan R.K. - Organisational Behaviour - Tamilnadu Book House.


**WEB REFERENCES:**

www.journals.elsevier.com
www.unesco.org
www.onlinelibrary.wiley.com

**Managerial Economics**
**SEMESTER I – CORE PAPER - 4**

**COURSE CODE: Com 207** **CREDITS: 4**
**L:P:T:S** **CIA MARKS: 25**
**EXAM HOURS: 3** **ESE MARKS: 75**

**COURSE OBJECTIVES:**
To offer expertise and knowledge on the application of economic theories and concepts to business decisions

**COURSE OUTCOMES:**
At the end of the course the students will be able to

| | |
|---|---|
| **CO1** | Illustrate the applications of managerial economics in business decision-making. |
| **CO2** | Outline the economic principles and best practices in business. (U) |
| **CO3** | Demonstrate how to estimate demand on the basis of available data. (U) |
| **CO4** | Explain how to make price and quantity competition decisions in various market structures. (U) |

**MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES**

**Managerial Economics**

| | **PSO 1** | **PSO 2** | **PSO 3** |
|---|---|---|---|
| **CO 1** | 3 | - | - |
| **CO 2** | 3 | - | - |
| **CO 3** | 3 | - | - |
| **CO 4** | 3 | - | - |
| **CO5** | 3 | - | - |

**3- Strong Correlation 2- Medium Correlation 1- Low Correlation**

| Unit | Contents of Module | Hrs | CO |
|---|---|---|---|
| **1** | The Scope and Methods of Managerial Economics -Risk -uncertainty and probability analysis - Approach to managerial decision making and the theory of firm. | **15** | **1** |
| **2** | Demand analysis, basic concepts and tools of analysis for demand forecasting, use of business indicators; demand forecasting for consumer goods, Consumer durable and capital goods. | **15** | **2** |
| **3** | Concepts in resource allocation, cost analysis; breakeven analysis, short run and long run cost functions; production function: cost -price -output relations -Capital investment analysis - Economics of size and capacity utilization input -output –analysis. | **15** | **3** |
| **4** | Market structure, Pricing and output; general equilibrium. Product policy, rates, promotion and market strategy -Advertising rates model-Advertisement budgeting. | **15** | **4** |
| **5** | Pricing objectives -pricing methods and approaches -Product line pricing -Differential pricing - Monopoly policy restrictive agreements -Price discrimination -Measurement of economic concentration -Policy against monopoly and restrictive trade practices. | **15** | **5** |

**QUESTION PAPER PATTERN:**

PART A - 10 OUT OF 12 = 10 X 1 = 10 marks
PART B - 5 OUT OF 7 = 5 X 5 = 25 marks
PART C - 4 OUT OF 6 = 4 X 10 = 40 marks

**RECOMMENDED TEXT BOOKS:**

1. Peterson, Managerial Economics 4th Ed. Pearson Education, New Delhi,
2. Spencer, M.H. : Managerial Economics, Text Problems and Short Cases
3 Mote and Paul: Managerial Economics TMH, New Delhi
4 Sampat Mokherjee, Business and Managerial Economics Calcutta New Central Book Agency
5 Dwivedi D N Managerial Economics, New Delhi Vikas

Note: The proportion between theory oriented and problem oriented questions in the University examination shall be 60:40.

**Accounting for Specialized Institutions**
**SEMESTER I – ELECTIVE PAPER -1**

**COURSE CODE:** **CREDITS: 3**
**L:P:T:S** **CIA MARKS: 25**
**EXAM HOURS: 3** **ESE MARKS: 75**

**COURSE OBJECTIVES:**
To provide in-depth understanding about the accounting practices to be followed to maintain the accounts of various specialized institutions and to update the knowledge of accounting standards for specified nature of accounts

**COURSE OUTCOMES:**
At the end of the course the students will be able to

| | |
|---|---|
| **CO1** | Infer the balance sheet preparation procedure for banking companies. (U) |
| **CO2** | Identify the accounting treatment for insurance companies. (P) |
| **CO3** | Summarize the details relating to the Double Account system. (U) |
| **CO4** | Construct the final accounts of electricity companies, educational institutions and voyage. (P) |
| **CO5** | Interpret the concepts of price level changes, social responsibility and human resource accounting. (U) |

**MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES**

| | **PSO 1** | **PSO 2** | **PSO 3** |
|---|---|---|---|
| **CO 1** | 3 | - | 3 |
| **CO 2** | 3 | - | 3 |
| **CO 3** | 3 | - | 3 |
| **CO 4** | 3 | - | 3 |
| **CO5** | 3 | - | 3 |

**3- Strong Correlation 2- Medium Correlation 1- Low Correlation**

| Unit | Contents of Module | Hrs | CO |
|---|---|---|---|
| **1** | Accounting for banking companies | **15** | **1** |
| **2** | Accounting for insurance companies (both life and non-life) | **15** | **2** |
| **3** | Double account system – meaning - differences between single and double account system, advantages and disadvantages of double account system – preparation of final accounts of electricity companies | **15** | **3** |
| **4** | Accounting for price level changes -Social responsibility accounting - Human resources accounting | **15** | **4** |
| **5** | Accounting for Educational Institutions - Voyage Accounts - Accounting for Investments AS 13 | **15** | **5** |

Note: The proportion between theory oriented and problem oriented questions in the University examination shall be 20:80

**QUESTION PAPER PATTERN:**

PART A - 10 OUT OF 12 = 10 X 1 = 10 marks
PART B - 5 OUT OF 7 = 5 X 5 = 25 marks
PART C - 4 OUT OF 6 = 4 X 10 = 40 marks

**RECOMMENDED TEXT BOOKS:**


1. Maheshwari S N, Advanced Accounting, Vol.II, Vikas Delhi
2. Shukla and Grewal, Advanced Accounting, Vol.II, S. Chand and Sons,New Delhi
3. Gupta R L and Radhaswamy, Advanced Accounting, Vol.II, Sultan Chandand Sons, New Delhi
4. Jain and Narang, Advanced Accounting, Vol.II, Kalyani, New Delhi
5. Horngren C T, Introduction to Financial Accounting, PHI, New Delhi
6. Mark, E., Harkins, International Financial Reporting and Analysis, TMH,New Delhi
7. Thomas, P. Edmonds, Fundamentals of Financial Accounting Concepts, TMH,New Delhi


**WEB REFERENCES:**

www.accountingcoach.com
www.accountingstudyguide.com
www.cimaglobal.com
www.futureaccountant.com

**Strategic Human Resource Management and Development**
**SEMESTER I – ELECTIVE PAPER - 1**

**COURSE CODE:** **CREDITS: 3**
**L:P:T:S** **CIA MARKS: 25**
**EXAM HOURS: 3** **ESE MARKS: 75**

**COURSE OBJECTIVES:**
To provide knowledge on understanding managing human resources in the organizations, and to offer exposure on human resources practices in organizations

**COURSE OUTCOMES:**
At the end of the course the students will be able to

| | |
|---|---|
| **CO1** | Explain the strategic framework human resource management and Human resource development (U) |
| **CO2** | Explain the HR policies and procedures of E - Employee profile, E- selection and recruitment (U) |
| **CO3** | Outline the cultural aspects of domestic and international HRM. (U) |
| **CO4** | Interpret career management concepts and build career development models. (U) |
| **CO5** | Outline the role of HR in coaching and counselling employees. (U) |

**MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES**

| | **PSO 1** | **PSO 2** | **PSO 3** |
|---|---|---|---|
| **CO 1** | 3 | - | 3 |
| **CO 2** | 3 | - | 3 |
| **CO 3** | 3 | - | 3 |
| **CO 4** | 3 | - | 3 |
| **CO5** | 3 | - | 3 |

**3- Strong Correlation 2- Medium Correlation 1- Low Correlation**

| Unit | Contents of Module | Hrs | CO |
|---|---|---|---|
| **1** | Meaning- Strategic framework for HRM and HRD –Vision, Mission and Value-Importance – Challenges to organisations –HRD functions –Roles of HRD professionals –HRD needs assessment – HRD practices – Measures of HRD performance – Links to HR, Strategy and business goals –HRD program implementation and evaluation – Recent trends – strategic capability, bench marking and HRD audit | **15** | **1** |
| **2** | E - Employee profile – E- selection and recruitment – Virtual learning and orientation – E-training and development – E- performance management and compensation design –Development and implementation of HRIS- Designing HR portals –Issues in employee privacy –Employee surveys online | **15** | **2** |
| **3** | Domestic Vs International HRM – Cultural dynamics – Culture assessment - Cross cultural education and training programs – Leadership and strategic HR issues in international assignments – Current challenges in outsourcing, cross border M and A-Repatriation etc. – Building multicultural organizations- international compensation | **15** | **3** |
| **4** | Career concepts – Roles – Career stages – Career planning and process – Career development models- Career motivation and enrichment – Managing career plateaus –Designing effective career development systems- Competencies and career management- Competency mapping models- Equity and competency based compensation | **15** | **4** |
| **5** | Need for coaching – Role of HR in coaching – Coaching and performance- Skills for effective coaching – Coaching effectiveness – Need for counselling – Role of HR in counselling – Components of counselling programs –Counselling effectiveness –Employee health and welfare programs – Work stress- Sources – Consequences – Stress management techniques – Eastern and Western practices-Self management and Emotional intelligence | **15** | **5** |

**QUESTION PAPER PATTERN:**

PART A - 10 OUT OF 12 = 10 X 1 = 10 marks
PART B - 5 OUT OF 7 = 5 X 5 = 25 marks
PART C - 4 OUT OF 6 = 4 X 10 = 40 marks

**RECOMMENDED TEXT BOOKS:**

1. Jeffrey A Mello, 'Strategic Human Resource Management', Thomson, Singapore, southwestern
2. Randy L.Desimone, Jon M. Werner – David M. Marris, 'Human Resource Development', Thomson Southwestern, Singapore
3. Robert L.Mathis and John H.Jackson, 'Human Resource Management', Thomson Southwestern, Singapore
4. Rosemary Harrison, 'Employee Development' –University Press, India ltd, New Delhi
5. Srinivas Kandula, 'Human Resource management in Practice', Prentice Hall of India, 2005, New Delhi

**WEB REFERENCES:**

www.springer.com
www.emeraldinsight.com
www.tatamcgrawhill.com
www.onlinelibrary.wiley.com

**Advanced Cost and Management Accounting**
**SEMESTER II – CORE PAPER- 5**

**COURSE CODE: Com202** **CREDITS: 4**
**L:P:T:S** **CIA MARKS: 25**
**EXAM HOURS: 3** **ESE MARKS: 75**

**COURSE OBJECTIVES:**
To impart knowledge on cost and management accounting techniques and to develop the skills of students in the preparation of cost and management accounting statements

**COURSE OUTCOMES:**
At the end of the course the students will be able to

| | |
|---|---|
| **CO1** | Outline the concepts of cost accounting principles and cost control techniques. (U) |
| **CO2** | Apply the accounting procedure of product costing and process costing to prepare the accounts of the manufacturing industries. (P) |
| **CO3** | Apply the techniques of marginal costing & Cost volume profit analysis in Business decision making (P) |
| **CO4** | Analyse the standard cost and variance in cost estimation and control (A) |
| **CO5** | Apply costing techniques and interpret financial statements for making financial decisions(P) |

**MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES**

| | **PSO 1** | **PSO 2** | **PSO 3** |
|---|---|---|---|
| **CO 1** | 3 | - | - |
| **CO 2** | 3 | - | 3 |
| **CO 3** | 3 | - | - |
| **CO 4** | 3 | - | - |
| **CO5** | 3 | - | 3 |

**3- Strong Correlation 2- Medium Correlation 1- Low Correlation**

| Unit | Contents of Module | Hrs | CO |
|---|---|---|---|
| 1 | Installation of costing system -records required to be maintained under the Companies Act - management control and information system -cost reduction and cost control techniques -control over wastages, scrap, spoilage and defectives - | 15 | 1 |
| 2 | Costing methods -product costing -process costing -treatment of equivalent units -inter - process profit- JIT costing -Activity based costing | 15 | 2 |
| 3 | Cost Volume Profit Analysis -decision making -make or buy, own or lease, repair or renovate, changes V s. Status quo, sell or scrap, export V s. local sales, shut down or continue. Responsibility Accounting and Transfer Pricing -Measurement of Segment Performance | 15 | 3 |
| 4 | Standard Costing & Variance Analysis | 15 | 4 |
| 5 | Financial Statement analysis -Ratio analysis -Funds / Cash flow statement. | 15 | 5 |

Note: The proportion between theory and problems shall be 20:80

**QUESTION PAPER PATTERN:**

PART A - 10 OUT OF 12 = 10 X 1 = 10 marks
PART B - 5 OUT OF 7 = 5 X 5 = 25 marks
PART C - 4 OUT OF 6 = 4 X 10 = 40 marks

**RECOMMENDED TEXT BOOKS:**


1. Murthy and Gurusamy, Cost Accounting, Vijay Nicole Imprints and Tata McGraw Hill
2. Murthy and Gurusamy, Management Accounting, Vijay Nicole Imprints and Tata McGraw Hill
3. Horngren C. T. Cost Accounting -A Managerial Emphasis, New Delhi, Pearson Education
4. Kaplan, Advanced Management Accounting, 3rd Ed. Pearson Education, New Delhi
5. Polimeni, et. at. Cost Accounting: Concepts and Applications for Managerial Decision Ma king, New York, McGrawHill Choudhary Anu Prasad Roy & Amitava Bhattac.harya, Cost and Management Accountancy: Methods and Techniques, Calcutta, New Central Book Agency
6. Reddy T S and Y.H. Reddy, Cost and Management Accounting, Margam Publications, Chennai


**WEB REFERENCES:**

www.futureaccountant.com
www.ce.cmu.edu
www.computerizedaccount.tripod.com

**Quantitative Techniques for Business Decisions**
**SEMESTER II – CORE PAPER-6**

**COURSE CODE:Com204** **CREDITS: 4**
**L:P:T:S** **CIA MARKS: 25**
**EXAM HOURS: 3** **ESE MARKS: 75**

**COURSE OBJECTIVES:**
To provide knowledge in quantitative methods and applications and to offer expertise in quantitative analysis

**COURSE OUTCOMES:**
At the end of the course the students will be able to

| | |
|---|---|
| **CO1** | Illustrate quantitative methods and statistical tools for business problems. (U) |
| **CO2** | Explain the application of statistics in business Decision making. (U) |
| **CO3** | Choose appropriate Statistical methods for data analysis. (P) |
| **CO4** | Analyse the data using Descriptive and Inferential statistics. (P) |
| **CO5** | Interpret the statistical results to make meaningful decisions. (U) |

**MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES**

| | **PSO 1** | **PSO2** | **PSO3** |
|---|---|---|---|
| **CO1** | 3 | - | - |
| **CO2** | 2 | 3 | - |
| **CO3** | 2 | 3 | - |
| **CO4** | 2 | 3 | - |
| **CO5** | 2 | 3 | - |

**3- Strong Correlation 2- Medium Correlation 1- Low Correlation**

| Unit | Contents of Module | Hrs | CO |
|---|---|---|---|
| **1** | Theory of probability -probability rules -Baye's theorem -Probability distribution -Binomial, Poisson and Normal. Statistical decision theory - Decision environment -decision making under certainty and uncertainty and risk conditions -EMV, EOL and marginal analysis -value of perfect information - decision tree analysis | **15** | **1** |
| **2** | Sampling-Meaning of random sample -sampling methods -sampling error and standard error relationship between sample size and standard error Sampling distribution -characteristics- central limit theorem -estimating population parameters - point and interval estimates -estimating proportion, percentage and mean of population from large sample and small sample | **15** | **2** |
| **3** | Testing hypothesis -testing of proportions and means -large samples - small samples -one tailed and two tailed tests -testing differences between mean and proportions -errors in hypothesis testing -chi square distribution -characteristics -applications -test of independence and tests of goodness of fit - inferences -F distribution- testing of population variance- analysis of variance -one way and two way - **using SPSS** | **15** | **3** |
| **4** | Correlation and regression -Simple, partial and multiple correlation - simple, partial and multiple regressions -estimation using regression line - standard error of estimate -testing significance of correlation and regression coefficients -interpreting correlation -explained variation and unexplained variation - coefficient of determination- multivariate analysis -factor, cluster and discriminant analysis | **15** | **4** |
| **5** | Linear programming graphic and simplex models -maximization and minimization - transportation –Assignment | **15** | **5** |

Note: The proportion between theory and problems shall 20:80

**QUESTION PAPER PATTERN:**

PART A - 10 OUT OF 12 = 10 X 1 = 10 marks
PART B - 5 OUT OF 7 = 5 X 5 = 25 marks
PART C - 4 OUT OF 6 = 4 X 10 = 40 marks

**RECOMMENDED TEXT BOOKS:**

1 Richard I. Levin and David S Rubin, Statistics for Management, 7th Ed. Pearson Education New Delhi
2 Gupta, Statistical Methods, Sultan Chand
3 Johnson, Applied Multivariate Statistical Analysis, 5th Ed, Pearson Education

**WEB REFERENCES:**

http://fe.ugm.ac.id/iup/material/syllabi_quantitative.pdf
www.aiu.edu
http://www.duxbury.com/sme6/index.html

**Corporate Laws**
**SEMESTER II – CORE PAPER- 7**

**COURSE CODE:Com206** **CREDITS: 4**
**L:P:T:S** **CIA MARKS: 25**
**EXAM HOURS: 3** **ESE MARKS: 75**

**COURSE OBJECTIVES:**
To provide an overview on legal knowledge on corporate laws and to understand key concepts in corporate law

**COURSE OUTCOMES:**
At the end of the course the students will be able to

| | |
|---|---|
| **CO1** | Explain the concepts of corporate governance, CSR and its implications. |
| **CO2** | Compare and contrast the principles of governance in various sector. |
| **CO3** | Identify the functional procedures of companies with SEBI regulations |
| **CO4** | Examine the legal frameworks of The Competition Act 2002, Foreign Exchange Management Act 1999. |
| **CO5** | Infer the legal frameworks of Information Technology Act 2000. |

**MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES**

| | **PSO 1** | **PSO 2** | **PSO 3** |
|---|---|---|---|
| **CO 1** | 3 | - | - |
| **CO 2** | 3 | - | - |
| **CO 3** | 3 | - | - |
| **CO 4** | 3 | - | - |
| **CO5** | 3 | - | - |

**3- Strong Correlation 2- Medium Correlation 1- Low Correlation**

| Unit | Contents of Module | Hrs | CO |
|---|---|---|---|
| 1 | Corporate Governance: Principle-agent relationship in the context of governance -issues connected with separation of ownership and control over organisation activity - stakeholder analysis (power & interest) using Mendelow matrix and applying it to strategy & governance - CSR and organisation as a corporate citizen in the context of governance. | 15 | 1 |
| 2 | Governance approaches & scope: Role of institutional investors in governance systems - rules v/s principles approach to governance - Compare & contract the principles of governance in private sector, public sector, charitable trusts and NGOs | 15 | 2 |
| 3 | SEBI Act 1992 (As amended by the Securities Laws Amendment Act, 2014) - Definitions - Establishment of the Securities and Exchange Board of India-Transfer of Assets and Liabilities etc.,- Powers and functions of the Board-Registration Certificate - Prohibition-Finance, Accounts and Audit Penalties and Adjudication - Establishment, Jurisdiction, Authority and Procedure of Appellate Tribunal –Miscellaneous | 15 | 3 |
| 4 | The Competition Act 2002- The Competition (Amendment) Act, 2007 Definition - Prohibition of certain agreements - Abuse of dominant position - Competition Commission of India - Duties, powers and functions of Commission - Duties of Director General - Penalties Competition Advocacy -Miscellaneous - Foreign Exchange Management Act 1999-Definition-Regulation and Management of Foreign Exchange - Authorised Person - Contravention and Penalties - Adjudication and Appeal-Directorate of Enforcement-Miscellaneous | 15 | 4 |
| 5 | Information Technology Act 2000- Definition - Authentication of Electronic Records - Electronic Governance-Secure Electronic Records and Secure Digital Signature-Regulation of Certifying Authorities - Penalties-Adjudication-Miscellaneous. - Intellectual Property Rights- Copyright Act 1957-Meaning - Copyright Authorities - Infringement of Copyright. | 15 | 5 |

**QUESTION PAPER PATTERN:**

PART A - 10 OUT OF 12 = 10 X 1 = 10 marks
PART B - 5 OUT OF 7 = 5 X 5 = 25 marks
PART C - 4 OUT OF 6 = 4 X 10 = 40 marks

**RECOMMENDED TEXT BOOKS:**


1. Dr. J. Jayasankar, Corporate Laws Margham Publications, Chennai
2. Bare Acts
3. Corporate Laws, Taxman,(latest)
4. S. Santhakumar's-Introduction to Environmental Law, - Lexis Nexis
5. Sharma, J.P., Corporate Governance, Business Ethics and CSR, Anne Books Pvt. Ltd, New Delhi
6. Sharma, J.P Corporate Governance and Social Responsibility of Business, Anne Books Pvt. Ltd., New Delhi.
7. Mallian, Christine A, Corporate Governance (Indian Edition), Oxford University Press, New Delhi
8. Blowfield, Michael and Alam Morray, Corporate Responsibility,Oxford University Press, New Delhi
9. Francesco perrimi, Stefano, and Antonio Tencati, Developing Corporate Social Responsibility - An European Perspective, Edward Elgar

**Industrial Relations & Labour Welfare**
**SEMESTER II – ELECTIVE PAPER - I**

**COURSE CODE:** **CREDITS: 3**
**L:P:T:S** **CIA MARKS: 25**
**EXAM HOURS: 3** **ESE MARKS: 75**

**COURSE OBJECTIVES:**

To offer knowledge on managing industrial relations and the processes, regulations and the authorities regarding industrial relations

**COURSE OUTCOMES:**

At the end of the course the students will be able to

| | |
|---|---|
| **CO1** | Explain the role of management and unions in the promotion of industrial relations (U) |
| **CO2** | Outline the important causes & impact of industrial disputes and settlement procedures. (U) |
| **CO3** | Demonstrate the judicial setup of Labour Laws, the features of welfare and wage Legislations. (U) |
| **CO4** | Inspect the social security measures and labour welfare under Labour Laws (A) |
| **CO5** | Interpret the different categories of labour, Economic assistance, and social protection. (U) |

**MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES**

| | **PSO 1** | **PSO 2** | **PSO 3** |
|---|---|---|---|
| **CO 1** | 3 | - | - |
| **CO 2** | 3 | - | - |
| **CO 3** | 3 | - | - |
| **CO 4** | 3 | - | - |
| **CO5** | 3 | - | - |

**3- Strong Correlation 2- Medium Correlation 1- Low Correlation**

| Unit | Contents of Module | Hrs | CO |
|---|---|---|---|
| 1 | Concepts – Importance - Industrial Relations Problems in the Public Sector- Growth of Trade Unions- Codes of conduct | 15 | 1 |
| 2 | Disputes – Impact – Causes – Strikes - Prevention – Industrial Peace –Government Machinery- Conciliation – Arbitration – Adjudication | 15 | 2 |
| 3 | Concept –Objectives – Scope – Need- Voluntary Welfare Measures – Statutory Welfare Measures- Labour- Welfare Funds- Education and Training Schemes | 15 | 3 |
| 4 | Causes of Accidents – Prevention –Safety – Provisions – Industrial Health and Hygiene-Importance – Problems-Occupational Hazards-Diseases – Psychological problems- counseling-statutory provisions | 15 | 4 |
| 5 | Child Labour – Female Labour- Contact Labour – Construction Labour –Agricultural labour – Disabled – Welfare of knowledge – Social Assistance – Social Security- Implications | 15 | 5 |

**QUESTION PAPER PATTERN:**

PART A - 10 OUT OF 12 = 10 X 1 = 10 marks
PART B - 5 OUT OF 7 = 5 X 5 = 25 marks
PART C - 4 OUT OF 6 = 4 X 10 = 40 marks

**RECOMMENDED TEXT BOOKS:**

**1.** Mamoria C.B. and Sathish Mamoria , 'Dynamics of Industrial Relations', Himalaya Publishing House, New Delhi 1998
**2.** Dwivedi. R.S. 'Human Relations & Organisational Behaviour', Macmillan India Ltd., New Delhi, 1997
**3.** Ratna Sen, 'Industrial Relations in India', Shifting Paradigms, Macmillan India Ltd., New Delhi, 2003
**4.** Srivastava, 'Industrial Relations and Labour laws', Vikas 4 th edition, 2000
**5.** Venkata Ratnam C S, 'Globalisation and Labour Management Relations', Response Books, 2001

**WEB REFERENCES:**

www.springer.com
www.emeraldinsight.com
www.tatamcgrawhill.com
www.onlinelibrary.wiley.com

**CUSTOMER RELATIONSHIP MANAGEMENT**
**SEMESTER II – ELECTIVE PAPER - I**

**COURSE CODE:** **CREDITS: 3**
**L:P:T:S** **CIA MARKS: 25**
**EXAM HOURS: 3** **ESE MARKS: 75**

**COURSE OBJECTIVES:**
The paper will provide skill based knowledge of Customer Relationship Management. The Syllabus describes the entire aspects of CRM. The objective of the syllabus is to make the students aware of the concepts and practices of CRM in modern businesses.

**COURSE OUTCOMES:**
At the end of the course the students will be able to

| | |
|---|---|
| **CO1** | Infer about the concept of CRM and its types (U) |
| **CO2** | Summarize the CRM concepts with respect to Marketing and sales (U) |
| **CO3** | Demonstrate the CRM and customer service concepts for customer satisfaction (U) |
| **CO4** | Identify the sales process management tools and E-CRM techniques (P) |
| **CO5** | Utilize the CRM practices adopted in the diversified industry (P). |

**MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES**

| | **PSO 1** | **PSO 2** | **PSO 3** |
|---|---|---|---|
| **CO 1** | 3 | - | - |
| **CO 2** | 3 | - | 3 |
| **CO 3** | 3 | - | 3 |
| **CO 4** | 3 | - | 3 |
| **CO5** | 3 | - | 3 |

**3- Strong Correlation 2- Medium Correlation 1- Low Correlation**

| Unit | Contents of Module | Hrs | CO |
|---|---|---|---|
| **1** | Introduction, Meaning and definitions of CRM- Objective of CRM - benefits of CRM - CRM concept; Acquiring customers, customer Retention, loyalty, and optimizing the customer experience. Types of CRM. | **15** | **1** |
| **2** | CRM in Marketing: One-to-One and Relationship Marketing,, Cross Selling & Up Selling, Behaviour Predicting, customer Profitability & Value Modeling, Channel Optimization, Event-based Marketing. | **15** | **2** |
| **3** | CRM and Customer Service: The Call Centre and customer care, call routing, Call Scripting, Customer Satisfaction – meaning, definition and significance- Customer Satisfaction Measurement. | **15** | **3** |
| **4** | Sales Force Automation – Sales Process Management, Contact Management, Lead Management and Knowledge management. Field Force Automation. SFA and mobile CRM - E- CRM in business, Analytical CRM: Data warehousing and Data Mining concepts; Data analysis. | **15** | **4** |
| **5** | Customer relationship management practice in retails industry, hospitality industry, banking industry, Insurance industry, telecom industry, aviation industry and in education. | **15** | **5** |

**QUESTION PAPER PATTERN:**

PART A - 10 OUT OF 12 = 10 X 1 = 10 marks
PART B - 5 OUT OF 7 = 5 X 5 = 25 marks
PART C - 4 OUT OF 6 = 4 X 10 = 40 marks

**RECOMMENDED TEXT BOOKS:**

1. Stanley A. Brown: Customer relationship management, John Wiley & Sons Canada, ltd.
2. Jagdish Seth, Et al: Customer relationship management
3. Paul Greenberg: CRM at the speed of light: capturing and keeping customer in internet real time
4. Jill Dyche: The CRM handbook: a business guide to customer relationship management, Addison Wesley Information Technology Series
5. Patrica 13. Ramaswamy, et al: Harvard business review on customer relationship management
6. Bernd H Schmitt: customer experience management: a revolutionary approach to connecting with your customer

**Total Quality Management**
**SEMESTER II – Extra-Disciplinary Elective- I**

**COURSE CODE:** **CREDITS: 3**
**L:P:T:S** **CIA MARKS: 25**
**EXAM HOURS: 3** **ESE MARKS: 75**

**COURSE OBJECTIVES:**
To provide expert knowledge in the emerging Total Management techniques and to build conceptual clarity and skill of concept applications

**COURSE OUTCOMES:**
At the end of the course the students will be able to

| | |
|---|---|
| **CO1** | Explain the quality control applications with cost benefits (U) |
| **CO2** | Classify the inspection methods and value engineering concepts (U) |
| **CO3** | Relate the theory of sampling inspection (U) |
| **CO4** | Interpret the quality improvement techniques and control system (U) |
| **CO5** | Illustrate the ISO model, implementation of ISO 9000, HRM and Quality circles, Environment Management System and Total quality control (P) |

**MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES**

| | **PSO 1** | **PSO 2** | **PSO 3** |
|---|---|---|---|
| **CO 1** | 3 | - | - |
| **CO 2** | 3 | - | |
| **CO 3** | 3 | - | - |
| **CO 4** | 3 | - | - |
| **CO5** | 3 | - | 3 |

**3- Strong Correlation 2- Medium Correlation 1- Low Correlation**

| Unit | Contents of Module | Hrs | CO |
|---|---|---|---|
| **1** | Introduction to Quality Control - Quality and Cost Considerations - Statistics and its Applications in Quality Control | **15** | **1** |
| **2** | 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 | **15** | **2** |
| **3** | Theory of Sampling Inspection - Standard Tolerancing - ABC Analysis - Defect Diagnosis and Prevention | **15** | **3** |
| **4** | Recent Technique for Quality Improvement - Zero Defect - Quality Motivation Techniques - Quality Management System and Total Quality Control | **15** | **4** |
| **5** | Selection of ISO Model ad Implementation of ISO 9000 - Human Resource Development and Quality Circles - Environmental Management System and Total Quality Control | **15** | **5** |

**QUESTION PAPER PATTERN:**

PART A - 10 OUT OF 12 = 10 X 1 = 10 marks
PART B - 5 OUT OF 7 = 5 X 5 = 25 marks
PART C - 4 OUT OF 6 = 4 X 10 = 40 marks

**RECOMMENDED TEXT BOOKS:**

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

**WEB REFERENCES:**

www.managementhelp.org
www.tqmschool.com
www.bpir.com

**Research Methodology**
**SEMESTER III – CORE PAPER-8**

**COURSE CODE:Com209** **CREDITS: 4**
**L:P:T:S** **CIA MARKS: 25**
**EXAM HOURS: 3** **ESE MARKS: 75**

**COURSE OBJECTIVES:**
To provide knowledge on research methods, techniques and the process and to develop skills in the application of research methods for business problem solving

**COURSE OUTCOMES:**
At the end of the course the students will be able to

| | |
|---|---|
| **CO1** | Outline the basic concept of Research, the Steps involved in the Research, and the research problem. (U) |
| **CO2** | Demonstrate the formulation of hypothesis, sampling techniques, and sample size determination. (U) |
| **CO3** | Infer the methods of data collection, construction of questionnaire, tools for data collection, testing validity, and reliability. (U) |
| **CO4** | Analyse and interpret data, through statistical applications (A) |
| **CO5** | Apply the methods of report writing in preparing the report. (P) |

**MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES**

| | **PSO 1** | **PSO2** | **PSO3** |
|---|---|---|---|
| **CO1** | 2 | 3 | 3 |
| **CO2** | 2 | 3 | 3 |
| **CO3** | 2 | 3 | 3 |
| **CO4** | 2 | 3 | 3 |
| **CO5** | 2 | 3 | 3 |

**3- Strong Correlation 2- Medium Correlation 1- Low Correlation**

| Unit | Contents of Module | Hrs | CO |
|---|---|---|---|
| **1** | Research -Meaning and purpose -types of research -Pure and applied, survey, case study experimental, exploratory -Research Design -Steps in selection and formulation of research problem - steps in research -review of literature | **15** | **1** |
| **2** | Formulation of Hypothesis- Types, sources -Testing -sampling techniques- sampling error and sample size | **15** | **2** |
| **3** | Methods of data collection -Primary and secondary data -observation - interview - questionnaire -construction of tools for data collection -testing validity and reliability -pilot study and pre-testing | **15** | **3** |
| **4** | Processing and analysis of data -editing -coding -transcription- tabulation -outline of statistical analysis -descriptive statistics -elements of processing through computers -packages for analysis (SPSS) | **15** | **4** |
| **5** | Report writing -target audience -types of reports -contents of reports - styles and conventions in reporting -steps in drafting a report | **15** | **5** |

**QUESTION PAPER PATTERN:**

PART A - 10 OUT OF 12 = 10 X 1 = 10 marks
PART B - 5 OUT OF 7 = 5 X 5 = 25 marks
PART C - 4 OUT OF 6 = 4 X 10 = 40 marks

**RECOMMENDED TEXT BOOKS:**

1. William C Emory, Business Research Methods, Richard D Irwin, NJ
2. Donald R Cooper, Business Research Methods 7th Ed, McGraw Hill
3. Krishnaswami OR, Methodology of Research for Social Science, Himalaya, Mumbai
4. Anderson J. et.al, Thesis and Assignment writing, Wiley Eastern

**WEB REFERENCES:**

www.tutorsindia.com
www.springer.com
www.authorstream.com
www.socialpsychology.org

**Information Technology for Business**
**SEMESTER III – CORE PAPER- 9**

**COURSE CODE:Com11** **CREDITS: 4**
**L:P:T:S** **CIA MARKS: 25**
**EXAM HOURS: 3** **ESE MARKS: 75**

**COURSE OBJECTIVES:**
To offer basic skills in computer applications and to develop working knowledge on business related software

**COURSE OUTCOMES:**
At the end of the course the students will be able to

| | |
|---|---|
| **CO1** | Define the fundamentals of computer (R) |
| **CO2** | Explain the computerizations in Banks (U) |
| **CO3** | Apply the methods in electronic funds transfer and document handling systems (P) |
| **CO4** | Examine the use of computer in additional banking applications (A) |
| **CO5** | Apply the software applications like WordStar, Lotus 123, dbase III+, Graphics in Real time Project (P). |

**MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES**

| | **PSO 1** | **PSO 2** | **PSO 3** |
|---|---|---|---|
| **CO 1** | - | 2 | 3 |
| **CO 2** | 1 | 3 | 3 |
| **CO 3** | 3 | 3 | 3 |
| **CO 4** | 1 | 3 | 3 |
| **CO5** | - | 3 | 3 |

**3- Strong Correlation 2- Medium Correlation 1- Low Correlation**

| Unit | Contents of Module | Hrs | CO |
|---|---|---|---|
| 1 | Introduction to Computer -Classification of Digital Computer System- Computer Architecture - Number -Compliments -Logic Gates -Truth Table -Boolean Algebra -Table Simplification of Boolean Function | 15 | 1 |
| 2 | Introduction to Computer Software -'C', DBMS, RDBMS -Implementing Number Sorting, Matrix Addition, Multiplication, Palindrome Checking, Searching an Element an Array | 15 | 2 |
| 3 | MS- WORD -Creating Word Document -Editing Text -Adding and Formatting Numbers - Symbols -.Getting into Print -MS-EXCEL - Creating Tables Using EXCEL -Using Tables and Creating Graphs -MS-ACCESS -Planning and Creating Tables -forms -Modifying Tables - Creating relational Database- Form Design- Reports -MS-POWERPOINT -Preparing Power Point Presentation for Marketing Products such as CREDIT CARD, Newly Introduced Cosmetic item etc. | 15 | 3 |
| 4 | Introduction to Internet -Resources of Internet -Hardware and Software Requirement of Internet -Internet Service Providers -Creating an E-Mail Account-Sending and Receiving Messages with Attachments to our friends account -Multimedia and its Applications | 15 | 4 |
| 5 | Application software -Accounting packages- Statistical packages - Preparation of financial statements and statistical analysis (SPSS) | 15 | 5 |

Note: The practical examination will be conducted by an internal examiner and an external examiner jointly.

The theory paper (3 hours and, 75 marks) will be scaled to 60 marks. The practical paper (3 hours and 100 marks) will be scaled to 40 marks. The candidate has to secure 50% in each of the practical and theory papers to secure a pass. Failure to secure the minimum either in the theory or the practical will entail the reappearance only in that paper. Twenty marks out of hundred for the practical paper is reserved for the record.

**QUESTION PAPER PATTERN:**

PART A - 10 OUT OF 12 = 10 X 1 = 10 marks
PART B - 5 OUT OF 7 = 5 X 5 = 25 marks
PART C - 4 OUT OF 6 = 4 X 10 = 40 marks

**RECOMMENDED TEXT BOOKS:**

1. James A. Senn, Information Technology in Business Principles; Practices and opportunities, International Edition, Prentice Hall
2. Corey Sandler, Tom Badget, Jan Wein Garten, Ms-Office for Windows
3. Alexis Leon & Mathew Leon, Fundamental of information Technology, Vikas Publishing Home Pvt.,Ltd

**WEB REFERENCES:**

www.gurukpo.com/admin/bookpdf/66.pdf
www.springer.com
*www.emeraldinsight.com*

**FUNDAMENTALS OF INFORMATION TECHNOLOGY LIST OF PRACTICAL EXPERIMENTS**

- Creating Mail merged documents in MS WORD for example, Interview call letters
- Typing tables in Ms Word, for example schedule of debtors
- Creating a Cash budget in MS-EXCEL
- Draw a break even analysis graph in EXCEL
- Draw a graph to compare prices across year of multiple products
- Calculate the NPV of projects using EXCEL
- Computing regression and estimating the dependent variable using EXCEL
- Preparing Flexible budget using EXCEL
- Creating a file debtors and a file of Invoices along with the debtors details (relationship)
- Creating forms of data entry and data editing for a given data file (Include validation)
    - Using the query generator to extract data
    - Creating a Power Point presentation to promote a product.
    - Creating a PP Slide show with clip art and image files
    - Spelling checking, formatting and printing in WORD
    - Update files in MS-Access
    - Use reports to generate summaries in Ms-Access
    - Use PP Facilities to create and automate slide show ( including transition)
    - Computing variance analysis using EXCEL
    - Using data from Ms-Access to mail, merge a document in MS-WORD
    - Drawing various types of graphs in EXCEL
    - Preparation of Ledger Accounts through Tally
    - Preparation of Trial balance though Tally
    - Computation of Means and Standard deviation through SPSS package
    - Computing Correlation and Regression through SPSS Package
    - Preparation of Charts and Diagrams through SPSS Package

**Web references**

www.gurukpo.com/admin/bookpdf/66.pdf
www.springer.com
*www.emeraldinsight.com*

**Income Tax Law And Practice**
**SEMESTER III – CORE PAPER**

**COURSE CODE:Com213** **CREDITS: 4**
**L:P:T:S** **CIA MARKS: 25**
**EXAM HOURS: 3** **ESE MARKS: 75**

**COURSE OBJECTIVES:**
To test whether the students have acquired working knowledge of the Income Tax Act 1961 and basic concepts of different Tax Concepts

**COURSE OUTCOMES:**
At the end of the course the students will be able to

| | |
|---|---|
| **CO1** | Construct the computation of income from on different sources. (P) |
| **CO2** | Apply the gains earned or loss occurred from the transfer of capital assets. (U) |
| **CO3** | Identify the permissible inter-source and inter-head adjustments and provisions to arrive at the total income of an assessee. (P) |
| **CO4** | Construct the Gross Total Income, Total Income and the tax liability of an individual. (U) |
| **CO5** | Outline the domestic and international transfer pricing under Income Tax Law 1961. (U) |

**MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES**

| | **PSO 1** | **PSO 2** | **PSO 3** |
|---|---|---|---|
| **CO 1** | 3 | - | 3 |
| **CO 2** | 3 | - | 3 |
| **CO 3** | 3 | - | 3 |
| **CO 4** | 3 | - | 3 |
| **CO5** | 3 | - | 3 |

**3- Strong Correlation 2- Medium Correlation 1- Low Correlation**

| Unit | Contents of Module | Hrs | CO |
|---|---|---|---|
| **1** | Heads of Income – computation of income from salary – income from house property – profits and gain from business or profession | **15** | **1** |
| **2** | Computation of capital gains – income from other sources - set-off and carry forward of losses – deduction from gross total income | **15** | **2** |
| **3** | Assessment of individuals taking into account under all five Heads of Income and deductions from Gross Total Income. | **15** | **3** |
| **4** | Clubbing of Income – Aggregation of Income Tax planning application with respect to clubbing of income and Aggregation of Income | **15** | **4** |
| **5** | Transfer pricing – concept – methods – domestic and international under the Income Tax of 1961 | **15** | **5** |

Note: The proportion between theory oriented and problem oriented questions in the University examination shall be 20:80

**QUESTION PAPER PATTERN:**

PART A - 10 OUT OF 12 = 10 X 1 = 10 marks
PART B - 5 OUT OF 7 = 5 X 5 = 25 marks
PART C - 4 OUT OF 6 = 4 X 10 = 40 marks

**RECOMMENDED TEXT BOOKS:**

1. Hariharan N, Income Tax Law and Practice, Vijay Nicole Imprints
2. Bhagawath Prasad Direct Taxes Law and Practice
3. DinakarPagre - Direct Taxes
4. V.K. Singharia Direct Taxes Law & Practice
5. S. Bhattacharya Indian income Tax Law & Practice

**WEB REFERENCES:**

www.incometaxindia.gov.in
www.taxsmile.com
www.law.incometaxindia.gov.in
www.taxmanagementindia.com

**Marketing of Services**
**SEMESTER III – ELECTIVE PAPER - I**

**COURSE CODE:** **CREDITS: 3**
**L:P:T:S** **CIA MARKS: 25**
**EXAM HOURS: 3** **ESE MARKS: 75**

**COURSE OBJECTIVES:**
To provide specialized knowledge on marketing skills for service sector and to expose students to marketing practices in service sector

**COURSE OUTCOMES:**
At the end of the course the students will be able to

| | |
|---|---|
| **CO1** | Demonstrate the similarities and differences between service-based and physical-based product activities. (U) |
| **CO2** | Illustrate the challenges and marketing issues in a changing technological landscape. (U) |
| **CO3** | Interpret the extended marketing mix for services. (U) |
| **CO4** | Explain the overall marketing environment of financial services. (U) |
| **CO5** | Relate the technological and human issues relating to the implementation of CRM in the organization. (U) |

**MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES**

| | **PSO 1** | **PSO 2** | **PSO 3** |
|---|---|---|---|
| **CO 1** | 3 | - | - |
| **CO 2** | 3 | - | - |
| **CO 3** | 3 | - | - |
| **CO 4** | 3 | - | 3 |
| **CO5** | 3 | - | 3 |

**3- Strong Correlation 2- Medium Correlation 1- Low Correlation**

| Unit | Contents of Module | Hrs | CO |
|---|---|---|---|
| 1 | Nature and classification of services -Characteristics of services and their marketing implications | 15 | 1 |
| 2 | Marketing strategies for service firms -with special reference to information, communication, consultancy, advertising, professional services, after -sales service, recruitment, training and tourism | 15 | 2 |
| 3 | Product support services -pricing of services -problems of quality - innovations in services | 15 | 3 |
| 4 | Marketing of financial services -nature- types -marketing of insurance - mutual fund - marketing for non-profit firms. | 15 | 4 |
| 5 | CRM & Relationship Marketing -Customer Satisfaction - Technological Mediation in Service Marketing | 15 | 5 |

**QUESTION PAPER PATTERN:**

PART A - 10 OUT OF 12 = 10 X 1 = 10 marks
PART B - 5 OUT OF 7 = 5 X 5 = 25 marks
PART C - 4 OUT OF 6 = 4 X 10 = 40 marks

**RECOMMENDED TEXT BOOKS:**

1. Christopher Lovelock, Services Marketing, 4th Ed, Pearson Education
2. EG Bateson, Mal1agil1g Services Marketing -Text and Readings, Dryden Press, Hinsdale Ill
3. Philip Kotler and Paul N Bloom, Marketing Professional Services, Prentice Hall, New Jersey
4. Payne, The Essencl' of ServIces Marketing, New Delhi, Prentice Hall
5. Helen Wood Ruffe, Services Marketing, Macmillan India, New Delhi
6. Mary Anrn Pezzallo, Marketing Financial Services, Macrnillan

**WEB REFERENCES:**

www.managementstudyguide.com
www.tutor2u.ne
www.learnmarketing.net

**Managerial Behaviour and Effectiveness**
**SEMESTER III – ELECTIVE PAPER - 3**

**COURSE CODE:** **CREDITS: 3**
**L:P:T:S** **CIA MARKS: 25**
**EXAM HOURS: 3** **ESE MARKS: 75**

**COURSE OBJECTIVES:**
To develop an understanding of managerial behavior in organization and to sensitize students in managing human relations and on developing managerial effectiveness

**COURSE OUTCOMES:**
At the end of the course the students will be able to

| | |
|---|---|
| **CO1** | Demonstrate the dimensions of managerial job behaviour. (U) |
| **CO2** | Identify the managerial talent and methods of career development. (P) |
| **CO3** | Outline the Industrial and Government practices in the management of managerial effectiveness. (U) |
| **CO4** | Compare the components of the organizational process. (A) |
| **CO5** | Demonstrate the aspects of managing human relations.(U) |

**MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES**

| | **PSO 1** | **PSO 2** | **PSO 3** |
|---|---|---|---|
| **CO 1** | 3 | - | - |
| **CO 2** | 3 | - | - |
| **CO 3** | 3 | - | - |
| **CO 4** | 3 | - | - |
| **CO5** | 3 | - | - |

**3- Strong Correlation 2- Medium Correlation 1- Low Correlation**

| Unit | Contents of Module | Hrs | CO |
|---|---|---|---|
| 1 | Defining dimensions of managerial jobs –methods –Model –Time dimensions in managerial jobs –Effective and ineffective job behaviour –Functional and level difference in managerial job behaviour | 15 | 1 |
| 2 | Identifying managerial talent – Selection and recruitment –Managerial skills development-pay and rewards –Managerial motivation –Effective management criteria –performance appraisal measures –balanced scoreboard –Feedback –Career management –current Practices | 15 | 2 |
| 3 | Definition –The person, process, product approaches –Bridging the Gap-Measuring Managerial Effectiveness –Current Industrial and Government practices in the Management of managerial effectiveness-the effective manager as an optimizer | 15 | 3 |
| 4 | Organizational processes-Organizational climate-Leader-Group influences –Job challenge – Competition –Managerial styles | 15 | 4 |
| 5 | Organizational and managerial efforts –Self-development –Negotiation skills –Development of the competitive spirit -Knowledge management-Forecasting creativity | 15 | 5 |

**QUESTION PAPER PATTERN:**

PART A - 10 OUT OF 12 = 10 X 1 = 10 marks
PART B - 5 OUT OF 7 = 5 X 5 = 25 marks
PART C - 4 OUT OF 6 = 4 X 10 = 40 marks

**RECOMMENDED TEXT BOOKS:**


1. Peter Drucker,'Management', Harper Row
2. Milkovich and Newman,'compenstion', McGraw-Hill international
3. Blanchard and Thacker, 'effective Training Systems, Strategies and practices' Pearson
4. Dubin, Leadership,' Research Findings, Practices & skills', Biztantra
5. Mathis Jackson Human Resource Management', Thomson Southwestern


**WEB REFERENCES:**

www.springer.com
www.emeraldinsight.com
www.tatamcgrawhill.com
www.onlinelibrary.wiley.com

**Consumer Behaviour**
**SEMESTER III – ELECTIVE PAPER - 3**

**COURSE CODE:** **CREDITS: 3**
**L:P:T:S** **CIA MARKS: 25**
**EXAM HOURS: 3** **ESE MARKS: 75**

**COURSE OBJECTIVES:**
To develop knowledge and skill in the application of marketing research tools and techniques and to develop an understanding of consumer behaviour

**COURSE OUTCOMES:**
At the end of the course the students will be able to

| | |
|---|---|
| **CO1** | Identify Consumer Behaviour models (P) |
| **CO2** | Examine the impact of psychological variables, including perception, learning, motivation, personality and attitudes on Consumer's behaviour. (A) |
| **CO3** | Demonstrate the impact of various social variables, such as culture, subcultures, family/household and reference groups, on consumer's purchasing patterns. (U) |
| **CO4** | Interpret the consumer decision-making process. (U) |
| **CO5** | Explain family and household decision-making process (U) |

**MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES**

| | **PSO 1** | **PSO 2** | **PSO 3** |
|---|---|---|---|
| **CO 1** | 3 | - | 3 |
| **CO 2** | 3 | - | 3 |
| **CO 3** | 3 | - | 3 |
| **CO 4** | 3 | - | 3 |
| **CO5** | 3 | - | 3 |

**3- Strong Correlation 2- Medium Correlation 1- Low Correlation**

| Unit | Contents of Module | Hrs | CO |
|---|---|---|---|
| **1** | The consumer behavior - Meeting Changes and Challenges – Perspectives towards the study of consumer behavior – Understanding about the dark side of the consumer – various consumer behavior models - Consumer behavior and marketing strategy | **15** | **1** |
| **2** | Internal influences on Consumer behavior – Personality – self image and Life style – Consumer motivation – Consumer involvement – Consumer perception – Consumer Learning and knowledge – Consumer attitude and change | **15** | **2** |
| **3** | External Influences on consumer behaviour – The influences of culture on Consumer Behaviour - Subcultures and Consumer Behaviour- Social Class and Consumer Behaviour- Reference Groups and Family- Consumer Influence and the Diffusion of Innovations | **15** | **3** |
| **4** | The consumer decision process, prospect theory, heuristics, persuasion- – Consumer decision making processes – Need recognition – Information search – Consumer Evaluation process – Purchase decision – Post purchase decision – Marketing strategies involved in each stage of the process | **15** | **4** |
| **5** | Family and Household Decision making - The role of Reference group in purchase decisions – Word of Mouth (WOM) – Demographics and psychographics in consumer purchase decision of the Consumer- Global consumer and diffusion and innovations – Consumer behavior and social marketing - Consumer and public policy | **15** | **5** |

**QUESTION PAPER PATTERN:**

PART A - 10 OUT OF 12 = 10 X 1 = 10 marks
PART B - 5 OUT OF 7 = 5 X 5 = 25 marks
PART C - 4 OUT OF 6 = 4 X 10 = 40 marks

**RECOMMENDED TEXT BOOKS:**


1. Leon G.Schiffman, Leslie Lazar Kanuk, "Consumer Behaviour ", Pearson Education, New Delhi
2. David L.Loudon, Albert J Della Bitta, "Consumer Behaviour ", McGraw Hill, New Delhi
3. Jay D.Lindquist and M.Joseph sirgy, "Shopper, buyer & consumer Behaviour, Theory and Marketing application", Biztantra Publication, New Delhi
4. Sheth Mittal, " Consumer Behaviour A Managerial Perspective", Thomson Asia (P) Ltd., Singapore
5. Srivastava K K, " Consumer Behaviour an Indian Context", Goal Gotia Publishing Co, New Delhi
6. Gupta S L & Sumitra Pal,"Consumer Behaviour an Indian Perspectives", Sultan Chand, New Delhi
7. Raju, Dominique Xavedel, "Consumer behaviour, Concepts Applications and cases" vikas publiching house (P) Ltd., New Delhi
8. Henry Assael, Consumer behaviour strategic approach Biztantra, New Delhi

**WEB REFERENCES:**
www.marketingpower.com
www.tutor2u.net
www.marketingprofs.com

**Change Management**
**SEMESTER III – ELECTIVE PAPER - 3**

**COURSE CODE:** **CREDITS: 3**
**L:P:T:S** **CIA MARKS: 25**
**EXAM HOURS: 3** **ESE MARKS: 75**

**COURSE OBJECTIVES:**
To enable students to analyze strategic change and how change impacts managerial issues

**COURSE OUTCOMES:**
At the end of the course the students will be able to

| | |
|---|---|
| **CO1** | Explain the Concepts and models of Organizational change (U) |
| **CO2** | Outline the Challenges in change management and Learning organization (U) |
| **CO3** | Demonstrate the ways of managing major changes, and how to motivate and enable the changes in an organization (U) |
| **CO4** | Identify Mapping of change, cultural web, Cultural attributes and resistance of change (P) |
| **CO5** | Develop Systems approach to change, intervention strategy model, total project management model in an organization. (P) |

**MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES**

| | **PSO 1** | **PSO 2** | **PSO 3** |
|---|---|---|---|
| **CO 1** | 3 | - | 3 |
| **CO 2** | 3 | - | 3 |
| **CO 3** | 3 | - | 3 |
| **CO 4** | 3 | - | 3 |
| **CO5** | 3 | - | 3 |

**3- Strong Correlation 2- Medium Correlation 1- Low Correlation**

| Unit | Contents of Module | Hrs | CO |
|---|---|---|---|
| 1 | Nature, forces, types and models of organizational change - impact of change, transition management | 15 | 1 |
| 2 | Progress and challenges in organizational change management - learning organization, role of politics | 15 | 2 |
| 3 | Motivating and enabling change, managing complex major changes Effective change leader –Mapping change – the cultural web – cultural attributes to change – resistance to change | 15 | 3 |
| 4 | Mapping change – the cultural web – cultural attributes to change – resistance to change | 15 | 4 |
| 5 | Systems approach to change, intervention strategy model, total project management model | 15 | 5 |

**QUESTION PAPER PATTERN:**

PART A - 10 OUT OF 12 = 10 X 1 = 10 marks
PART B - 5 OUT OF 7 = 5 X 5 = 25 marks
PART C - 4 OUT OF 6 = 4 X 10 = 40 marks

**RECOMMENDED TEXT BOOKS:**

1. Harigopal K, Management of Organizational change – Leveraging transformation, Sage Publications Pvt. Ltd., New Delhi
2. Paton A.R, Mc Calman J, Change Management – A guide to effective implementation, Sage Publications Pvt. Ltd., New Delhi
3. Carr K.D, Hard J.K.Tralant W.J, Managing the change process, Mc GrawHill, NewYork

**WEB REFERENCES:**

www.springer.com
www.emeraldinsight.com
www.tatamcgrawhill.com
www.onlinelibrary.wiley.com

**Corporate Governance & Social Responsibility**
**SEMESTER III – Extra-disciplinary Paper**

**COURSE CODE:** **CREDITS: 3**
**L:P:T:S** **CIA MARKS: 25**
**EXAM HOURS: 3** **ESE MARKS: 75**

**COURSE OBJECTIVES:**
To develop an understanding among students on ethical issues in business and good governance practices and to impart skills of analysis and capability of making business decisions

**COURSE OUTCOMES:**
At the end of the course the students will be able to

| | |
|---|---|
| **CO1** | Explain the fundamentals of ethics and its implications in business (U) |
| **CO2** | Interpret the concepts of ethics in advertisement and environmental. (U) |
| **CO3** | Demonstrate the corporate social responsibility and promoting corporate responsiveness. (U) |
| **CO4** | Interpret the concepts of corporate governance and identify the board mechanism. (U) |
| **CO5** | To outline the formation of the Birla Committee Report and its recommendations. (U) |

**MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES**

| | **PSO 1** | **PSO 2** | **PSO 3** |
|---|---|---|---|
| **CO 1** | 3 | - | - |
| **CO 2** | 3 | - | - |
| **CO 3** | 3 | - | 3 |
| **CO 4** | 3 | - | - |
| **CO5** | 3 | - | - |

**3- Strong Correlation 2- Medium Correlation 1- Low Correlation**

| Unit | Contents of Module | Hrs | CO |
|---|---|---|---|
| 1 | Concept of ethics - sources -- values - codes of conduct - what is an ethical issue? - Ethical theory and its applications to business/morality and ethical theory – Ethical management - love and reverence in work and life - strengthening personal and organizational integrity - the spiritual core of leadership | 15 | 1 |
| 2 | Advertising and information disclosures - environmental responsibility - ethics and ecology - employee rights - conflict of interests - work ethics - professional ethics and responsibility | 15 | 2 |
| 3 | Corporate Social Responsibility (CSR) - meaning - promoting corporate responsiveness - managing socially responsible business | 15 | 3 |
| 4 | Corporate Governance – Meaning and scope -– Origin- Practices – Shareholders Vs. Stakeholders approach –Board mechanism, Role and duties of the directors-Chairman-Governance committees | 15 | 4 |
| 5 | Codes of governance –Birla committee report | 15 | 5 |

**QUESTION PAPER PATTERN:**

PART A - 10 OUT OF 12 = 10 X 1 = 10 marks
PART B - 5 OUT OF 7 = 5 X 5 = 25 marks
PART C - 4 OUT OF 6 = 4 X 10 = 40 marks

**RECOMMENDED TEXT BOOKS:**


1. A M A, “Corporate Governance And Business Ethics”, Excel Books
2. Cannon Tom, “Corporate responsibility. A textbook on business ethics, governance, environment: role and responsibilities”, Pitman, London
3. Hoffman, W. Michael, et, “Corporate Governance and Institutionalizing Ethics”, Lexington Books
4. Sutton, Brenda, editor, “The Legitimate Corporation; Essential Readings in Business Ethics & Corporate Governance”, Blackwell Publishers
5. Manual Vela Squez, “Business Ethics Concepts and Cases”, Prentice Hall, New Jersey
6. Kenneth Blanchard and Norman Vincent Peale, “The Power of Ethical Management”, New York, William Morrow & Co.,
7. Sekhar R C, “Ethical Choices in Business”, Response Books
8. Kendall, Nigel, “Corporate Governance”, London, Financial Times Pitman Publishing


**WEB REFERENCES:**

www.business-ethics.com
www.cgi.com
www.businessethics.ca
www.societyforbusinessethics.org
e-businessethics.com

**Management Information Systems**
**SEMESTER IV– CORE PAPER-11**

**COURSE CODE:Com208** **CREDITS: 4**
**L:P:T:S** **CIA MARKS: 25**
**EXAM HOURS: 3** **ESE MARKS: 75**

**COURSE OBJECTIVES:**
To offer in depth knowledge on information systems in business and their management

**COURSE OUTCOMES:**
At the end of the course the students will be able to

| | |
|---|---|
| **CO1** | Management Information System – Concept, Need, Strategic role – Evolution of Management Information System – Components of Management Information System – Information flow |
| **CO2** | Data base management systems – Objectives and Components – Database design – Creation and control – Recent trends in database |
| **CO3** | Developing information system – Planning, Designing and redesigning – Approaches for system development – System analysis and Design – system Implementation and Maintenance |
| **CO4** | Transaction processing and Support system – Transaction processing system – Office automation systems – Decision support systems – Executive information systems – Artificial intelligence and Expert systems |
| **CO5** | Functional Information systems – Production, Finance, Human resource and Marketing – Managing information resources – Information Security – Control & Audit of Information Systems |

**MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES**

| | **PSO 1** | **PSO 2** | **PSO 3** |
|---|---|---|---|
| **CO 1** | 3 | - | - |
| **CO 2** | 3 | - | - |
| **CO 3** | 3 | - | - |
| **CO 4** | 3 | - | - |
| **CO5** | 3 | - | - |

**3- Strong Correlation 2- Medium Correlation 1- Low Correlation**

| Unit | Contents of Module | Hrs | CO |
|---|---|---|---|
| 1 | Management Information System – Concept, Need, Strategic role – Evolution of Management Information System – Components of Management Information System – Information flow | 15 | 1 |
| 2 | Data base management systems – Objectives and Components – Database design – Creation and control – Recent trends in database | 15 | 2 |
| 3 | Developing information system – Planning, Designing and redesigning – Approaches for system development – System analysis and Design – system Implementation and Maintenance | 15 | 3 |
| 4 | Transaction processing and Support system – Transaction processing system – Office automation systems – Decision support systems – Executive information systems – Artificial intelligence and Expert systems | 15 | 4 |
| 5 | Functional Information systems – Production, Finance, Human resource and Marketing – Managing information resources – Information Security – Control & Audit of Information Systems | 15 | 5 |

**QUESTION PAPER PATTERN:**

PART A - 10 OUT OF 12 = 10 X 1 = 10 marks
PART B - 5 OUT OF 7 = 5 X 5 = 25 marks
PART C - 4 OUT OF 6 = 4 X 10 = 40 marks

**RECOMMENDED TEXT BOOKS:**


1. Azam M, **Management Information Systems, Vijay Nicole Imprints**
2. James A O' Brain, Management Information Systems', Tata Mc Graw Hill
3. King R William, 'Management Information Systems'
4. Davis, 'Management Information Systems',Mc Graw Hill
5. Wetherbe, Turban, 'Information Technology for Management', John willey publisher
6. Prasad L M, Usha Prasad, 'Management Information Systems', Sultan chand & Sons
7. Goyal D P, 'Management Information Systems – Managerial Perspectives', Mac Millan India Ltd
8. Sadagopan S, 'Management Information System', Prentice Hall
9. Eff Oz, 'Management Information Systems', Vikas Publishing house Pvt. Ltd
10. Muneesh Kumar, 'Business Information Systems', Vikas Publishing house Pvt. Ltd
11. Kenneth C.Loudan & Jane P.Loudan, "Essentials of MIS", Prentice Hall India


**WEB REFERENCES:**

www.dbatra.com
www.itworld.com
www.icisa.cag.gov.in

**Investment Analysis and Portfolio Management**
**SEMESTER IV– CORE PAPER - 12**

**COURSE CODE:Com210** **CREDITS: 4**
**L:P:T:S** **CIA MARKS: 25**
**EXAM HOURS: 3** **ESE MARKS: 75**

**COURSE OBJECTIVES:**
To provide knowledge on basics of investment management and to develop skill for investment analysis and portfolio building

**COURSE OUTCOMES:**
At the end of the course the students will be able to

| | |
|---|---|
| **CO1** | Describe the overview of investments and identify the various financial instruments.(U) |
| **CO2** | Apply the relationship between risk and return, to solve problems related to time value of money.(P) |
| **CO3** | Categorize the securities and their valuation to interpret the fundamental and technical analysis of derivatives.(A) |
| **CO4** | Illustrate the theories of portfolio management and SEBI regulations. (A) |
| **CO5** | Apply the theories relating to portfolio management & portfolio risk & return.(U) |

**MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES**

| | **PSO 1** | **PSO 2** | **PSO 3** |
|---|---|---|---|
| **CO 1** | 3 | - | 3 |
| **CO 2** | 3 | - | 3 |
| **CO 3** | 3 | - | 3 |
| **CO 4** | 3 | - | 3 |
| **CO5** | 3 | - | 3 |

**3- Strong Correlation 2- Medium Correlation 1- Low Correlation**

| Unit | Contents of Module | Hrs | CO |
|---|---|---|---|
| 1 | Nature and scope of investment management -investment objectives, constraints -factors – investment process -investment management and portfolio management -factors for investment analysis -impact of economic analysis -impact of industrial analysis role of capital markets. Understanding the investment environment -sources of investment information | 15 | 1 |
| 2 | Approaches to security analysis- market indicators -security price movements -fundamental analysis -technical-analysis -Dow theory - Random walk theory -efficient market hypothesis -various forms of market efficiency and their implications to security analysis-technical analysis Vs. efficient markets hypothesis -common stock analysis - economic analysis -economic indicators -industry analysis | 15 | 2 |
| 3 | Company analysis components -non financial aspects -financial analysis -financial statement - analysis of prospectus -ratio analysis -EPS, dividend yield -payout ratio -ROI, ROCI -Risk return - market risk - interest rat~ risk -purchasing power risk -business risk -financial risk - measurement of risk | 15 | 3 |
| 4 | Portfolio -portfolio management -portfolio theory -meaning and objectives, traditional and modem portfolio theory. Diversification-Markowitz's approach -portfolio management process-portfolio planning-portfolio analysis-portfolio selection -portfolio evaluation -portfolio revision-various steps involved in the development of portfolio | 15 | 4 |
| 5 | Capital market theory -assumptions -risk, investors preference -capital asset pricing model (CAPM) -estimating Betas -significance of betas in portfolio theory -securities market line arbitrage pricing theory- options pricing model-put and call- valuation of various options -futures trading - hedging and forward contracts -Indian stock market and the institutional investors | 15 | 5 |

**QUESTION PAPER PATTERN:**

PART A - 10 OUT OF 12 = 10 X 1 = 10 marks
PART B - 5 OUT OF 7 = 5 X 5 = 25 marks
PART C - 4 OUT OF 6 = 4 X 10 = 40 marks

Note: The proportion between theory and problems shall be 60: 40

**RECOMMENDED TEXT BOOKS:**

1. Prasanna Chandra, Managing Investments, New Delhi, Tata Mcgraw Hill
2. Elton, Edwin J & Gruber Martin J, Modem Portfolio Theory & Investment Analysis, Wiley & Sons
3. Sidney CottIe, Graham & Dood's, Security Analysis, Tata Mcgraw Hill
4. Fisher D & RJ Jordan, Security Analysis & Portfolio Management, Prentice Hall of India
5 Francis J C and S H Arclean, Portfolio Analysis, Prentice Hall of India
6 Russell Fuller et.al, Modern Investments and Security Analysis, McGraw Hill

**WEB REFERENCES:**

www.amazon.com
www.bcci.bg
www.asrm.edu.pk

**Indirect Taxes**
**SEMESTER IV– CORE PAPER- 13**

**COURSE CODE:Com212** **CREDITS: 4**
**L:P:T:S** **CIA MARKS: 25**
**EXAM HOURS: 3** **ESE MARKS: 75**

**COURSE OBJECTIVES:**

- To teach the features, and benefits of GST
- To enable students to learn important definitions on GST
- To learn the registration procedure relating to GST
- To teach the various aspects of assessment of GST
- To learn the important provisions of GST

**COURSE OUTCOMES:**
At the end of the course the students will be able to

| | |
|---|---|
| **CO1** | Explain the features, and benefits of GST (U) |
| **CO2** | Describe the important definitions on GST(U) |
| **CO3** | Outline the registration procedure relating to GST(U) |
| **CO4** | Explain the various aspects of assessment of GST(U) |
| **CO5** | Outline the important provisions of Customs Duty(U) |

**MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES**

| | **PSO 1** | **PSO 2** | **PSO 3** |
|---|---|---|---|
| **CO 1** | 3 | - | 3 |
| **CO 2** | 3 | - | 3 |
| **CO 3** | 3 | - | 3 |
| **CO 4** | 3 | - | 3 |
| **CO5** | 3 | - | 3 |

**3- Strong Correlation 2- Medium Correlation 1- Low Correlation**

| Unit | Contents of Module | Hrs | CO |
|---|---|---|---|
| **1** | Introduction - Features - Objectives of Taxation- Types of taxes- Direct and Indirect taxes - Indirect Tax structure-Merits and Demerits of Indirect Taxes- Recent Developments in Indirect Taxes- Goods and Services Tax Act 2016 - Introduction – Features – Benefits of GST Act. | **15** | **1** |
| **2** | Important Definitions - Taxable persons – Time of supply of goods and services – Administrative set up – Classes of officers under Central and State goods and services Tax Act - Appointment of Officers – Powers of officers – Levy and collection of GST – Powers to grant exemption from tax. | **15** | **2** |
| **3** | Procedure for registration under Schedule III – Special provisions relating to casual taxable person and non-resident taxable person – Amendment of registration – Cancellation of registration – Revocation of cancellation of registration. | **15** | **3** |
| **4** | Self-assessment – Provisional assessment – Scrutiny of returns – Assessment of non-filers of returns – Assessment of unregistered persons – Assessment in certain special cases – Tax Invoice – Credit and Debit Notes – Payment of Tax – Tax Deducted at Source – Electronic Commerce – Definitions - Collection of Tax at source. | **15** | **4** |
| **5** | Important Definitions – Basics – Importance of Customs Duty – Constitutional authority for levy of Customs Duty – Types of Customs Duty – Prohibition of Importation and Exportation of goods – Valuation of goods for Customs Duty – Transaction Value – Assessable Value – Computation of Assessable Value and Customs Duty. | **15** | **5** |

**QUESTION PAPER PATTERN:**

PART A - 10 OUT OF 12 = 10 X 1 = 10 marks
PART B - 5 OUT OF 7 = 5 X 5 = 25 marks
PART C - 4 OUT OF 6 = 4 X 10 = 40 marks

**RECOMMENDED TEXT BOOKS:**


1. Balachandran, (2014), Indirect Taxation", Sultan Chand & Sons and Kalyani Publishers
2. Mehrotra&Goyal (2015), Indirect Taxes, SahityaBhavan Publications, Agra
3. Parameswaran and Viswanatha, Indirect Taxes - GST and Customs Law, (2018), Kavin Publications, Coimbatore
4. Radhakrishnan, (2013), Indirect Taxation, Kalyani Publishers
5. Background Material for Goods and Service Tax. July, 2016. National Academy Of Customs Excise and Narcotics.

**Financial Markets and Institutions**
**SEMESTER IV– ELECTIVE PAPER- 4**

**COURSE CODE:** **CREDITS: 3**
**L:P:T:S** **CIA MARKS: 25**
**EXAM HOURS: 3** **ESE MARKS: 75**

**COURSE OBJECTIVES:**
To provide knowledge on financial markets and institutions and to impart knowledge on financial markets and institutions

**COURSE OUTCOMES:**
At the end of the course the students will be able to

| | |
|---|---|
| **CO1** | Outline the Money market and Capital market in the Indian financial system. (U) |
| **CO2** | Explain the profile of the Indian money market which includes the commercial paper market, Bill market (U) |
| **CO3** | Describe the role of certificate of deposits, Treasury bills, REPO Accounting in Indian money markets. (U) |
| **CO4** | Classify the Indian money and Capital market and analyse the new financial instruments in the capital market (U) |
| **CO5** | Demonstrate the functions of financial service institutions in India like CRISIL, DFHIL, ICRA, OTCEI, NSDL, STCI (U) |

**MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES**

| | **PSO 1** | **PSO 2** | **PSO 3** |
|---|---|---|---|
| **CO 1** | 3 | - | 3 |
| **CO 2** | 3 | - | - |
| **CO 3** | 3 | - | - |
| **CO 4** | 3 | - | 3 |
| **CO5** | 3 | - | 3 |

**3- Strong Correlation 2- Medium Correlation 1- Low Correlation**

| Unit | Contents of Module | Hrs | CO |
|---|---|---|---|
| 1 | Meaning, role, functions and constituents of financial markets – Financial instruments – Indian Money and Capital Markets – Money Market: Meaning, characteristics, objectives, importance, general functions and segments of money market – Characteristics of a developed money market – Money market Vs Capital market – Global money markets. | 15 | 1 |
| 2 | Profile of Indian money market – nature of dealings – participants – mode of operation – call money rates – Commercial Paper Market: meaning and features – Satellite Dealers – Commercial Bill Market: Meaning and importance – Developed Bill Market – shortcomings of Indian Bill Market – growth of Indian Bill Market – Bill Market Schemes – Failure of Bill Market Scheme Blues of bill discounting – RBI directives | 15 | 2 |
| 3 | Certificate of Deposit Market: Meaning, features – time deposit Vs certificate of deposit –Role of DFHI and banks – Treasury Bills Market: Meaning and features – features of Indian treasury bills – Gilt-edged securities market: meaning and features – REPOS – Repo Accounting – Government bonds – important of gilt-edged market – criticisms | 15 | 3 |
| 4 | Capital market: meaning – Indian money market – Indian capital market – evaluation and growth – new financial instruments recent initiatives in the Indian capital market – major issues of Indian capital market – Capital market instruments – New Issues Market – meaning and features – NIM Vs secondary market – intermediaries in NIM | 15 | 4 |
| 5 | Financial Service Institutions: Clearing Corporation of India – Credit Rating and Information Services of India Limited (CRISIL) – Discount and Finance House of India Limited (DFHIL) – Investment Information and Credit Rating Agency of India Limited (ICRA) – Moody's Investor Service – S & P – Fitch ratings – OTCEI – NSDL – STCI – Financial Institutions: NHB – EXIM Bank – NABARD – Stock Exchange – functions and working | 15 | 5 |

**QUESTION PAPER PATTERN:**

PART A - 10 OUT OF 12 = 10 X 1 = 10 marks
PART B - 5 OUT OF 7 = 5 X 5 = 25 marks
PART C - 4 OUT OF 6 = 4 X 10 = 40 marks

**RECOMMENDED TEXT BOOKS:**


1. Gurusamy S, Financial Markets and Institutions, Vijay Nicole and Tata McGraw Hill Company
2. Bhole L M, Financial Institutions and Markets, Tata McGraw Hill Company
3. Varshney P N and Mittal D K, Indian Financial System, Sultan Chand & Sons
4. Kohmn Meir, Financial Institutions and Markets, Tata McGraw Hill Company
5. Apte P G, International Financial Management, Tata McGraw Hill Company
6. Avadhani V A, Capital Market Management, Himalaya Publishing Company
7. Khan M Y, Indian Financial System, Tata McGraw Hill Company

**WEB REFERENCES:**

www.indiacorporateadvisor.com
www.nse-india.com
www.nsdl.co.in

**Digital Banking**
**SEMESTER IV– ELECTIVE PAPER - 4**

**COURSE CODE:** **CREDITS: 3**
**L:P:T:S** **CIA MARKS: 25**
**EXAM HOURS: 3** **ESE MARKS: 75**

**COURSE OBJECTIVES:**

- To make the students understand the concept of application of Technology in Banking Sector.
- To expose the students to learn the role of Technology in the Banking Sector.

**COURSE OUTCOMES:**
At the end of the course the students will be able to

| | |
|---|---|
| **CO1** | Critically compare, contrast evaluate the different machine learning techniques in terms of their applicability to solving problems in banking sector (A) |
| **CO2** | To explain present major economic and technical changes are undergoing in industrial and financial revolution through the new information-processing Technology(U) |

**MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES**

| | **PSO 1** | **PSO 2** | **PSO 3** |
|---|---|---|---|
| **CO 1** | 3 | - | 3 |
| **CO 2** | 3 | - | 3 |

**3- Strong Correlation** **2- Medium Correlation** **1- Low Correlation**

| Unit | Contents of Module | Hrs | CO |
|---|---|---|---|
| **1** | Networking of computers – Types – LAN – WAN – Internet and Intranet – E-mail – rise of on-line – banking technology in banking services. | **15** | **1** |
| **2** | Electronic payment system : Automatic teller machine merits and demerits – installation and security aspects of ATM, MICR equipment - precautions in handling MICR instrument – benefits and limitations. | **15** | **2** |
| **3** | e-cash : features – benefits of e-cash – limitations of electronic data interchange – electronicfund transfer credit card – debit card – payment through bank network –payment by smart card – electronic pass book – home banking. | **15** | **3** |
| **4** | Electronic clearing services – SWIFT – types of message in SWIFT (society for worldwide interbank financial telecommunication) – message format in SWIFT – bank information code – message flow in SWIFT system – advantages and structure of SWIFT. | **15** | **4** |
| **5** | E-Banking challenges and opportunities – services offered through e-banking – strengths of e-banking – weakness of e-banking – opportunities – theories of e-banking. | **15** | **5** |

**QUESTION PAPER PATTERN:**

PART A - 10 OUT OF 12 = 10 X 1 = 10 marks
PART B - 5 OUT OF 7 = 5 X 5 = 25 marks
PART C - 4 OUT OF 6 = 4 X 10 = 40 marks

**RECOMMENDED TEXT BOOKS:**

1. Knowledge based system in banking sector – R.V. Kulkarni
2. Computer Application in Business and, Commerce and Banking – R.S.Viramani.
3. Computer Application in Business – R.Parameswaran.