# Tumkur University

## Department of Studies and Research in Computer Science

**Syllabus for**

**Master of Science in Computer Science – M. Sc. (CS) Programme**

**Choice Based Credit System (CBCS Scheme)**

**2023 - 24 onwards**

**Eligibility for M.Sc. Computer Science:**

A pass in B.Sc. Computer Science or its equivalents / BCA or its equivalents/Bachelor of Vocational course in computer science or related

- Candidates must have studied Computer Science as Optional Subjects at the Bachelor's Degree.
- A Bachelor's Degree with an aggregate of 45% in the Cognate Subject and a minimum of 40% in all subjects.
- In case of SC / ST and Category-I, a minimum aggregate of 40% in the Cognate Subject and a minimum of 40% in all the subjects

## SEMESTER –I

| Sl.No | Paper | Title of the paper | Instruction Hrs. per week | No. of Credits | Duration of the Exam. | Marks | | |
|-------|-------|--------------------|---------------------------|----------------|----------------------|-------|--|--|
| | | | | | | Internal Assessment | Semester End Exam. | Total |
| 1 | CPT 1.1 | Advanced Data Structure Using C | 4 | 4 | 3 Hrs. | 30 | 70 | 100 |
| 2 | CPT 1.2 | Operating Systems | 4 | 4 | 3 Hrs. | 30 | 70 | 100 |
| 3 | CPT 1.3 | Advanced Database Management Systems | 4 | 4 | 3 Hrs. | 30 | 70 | 100 |
| 4 | SPT 1.4 A | Computer Networks | 4 | 4 | 3 Hrs. | 30 | 70 | 100 |
| | SPT1.4 B | Design and Analysis of Algorithms | 4 | 4 | 3 Hrs. | 30 | 70 | 100 |
| 5 | CPP 1.5 | Advanced Data Structure Lab | 4 | 2 | 3Hrs. | 15 | 35 | 50 |
| 6 | CPP1.6 | Linux Lab | 4 | 2 | 3Hrs. | 15 | 35 | 50 |
| 7 | CPP 1.7 | Advanced Data Base Management Systems Lab | 4 | 2 | 3Hrs. | 15 | 35 | 50 |
| 8 | SPP1.8 A | Computer Networks Lab | 4 | 2 | 3Hrs. | 15 | 35 | 50 |
| | SPP1.8 B | Design and Analysis of Algorithms Lab | 4 | 2 | 3Hrs. | 15 | 35 | 50 |
| | TOTAL | | 32 | 24 | | | | 600 |

**NOTE: Theory: 1 Hr. = 1 Credit; Practical: 2 Hrs. = 1 Credit**

**CPT**: Core Paper Theory          **SPT**: Special Paper Theory

**CPP**: Core Paper Practical        **SPP**: Special Paper Practical

## SEMESTER –II

| Sl. No | Paper | Title of the paper | Instruction Hrs. per week | No. of Credits | Duration of the Exam. | Internal Assessment | Semester End Exam. | Total |
|---|---|---|---|---|---|---|---|---|
| 1 | CPT 2.1 | Artificial Intelligence | 4 | 4 | 3 Hrs. | 30 | 70 | 100 |
| 2 | CPT 2.2 | Python Programming | 4 | 4 | 3 Hrs. | 30 | 70 | 100 |
| 3 | SPT 2.3 A | Computer Architecture | 4 | 4 | 3 Hrs. | 30 | 70 | 100 |
| | SPT 2.3 B | Cyber Security and Cyber Law | 4 | 4 | 3 Hrs. | 30 | 70 | 100 |
| 4 | OET 2.4 | Information and Communication Technology | 4 | 4 | 3 Hrs. | 30 | 70 | 100 |
| 5 | CPP 2.5 | Artificial Intelligence Lab | 4 | 2 | 3 Hrs. | 10 | 40 | 50 |
| 6 | CPP 2.6 | Python Programming Lab | 4 | 2 | Hrs. | 15 | 35 | 50 |
| 7 | SPP 2.7 A | Preparing for Industry | 4 | 2 | 3 Hrs. | 15 | 35 | 50 |
| | SPP 2.7 B | Social Networking and Soft Skill Enhancement Course | 4 | 2 | 3 Hrs. | 15 | 35 | 50 |
| 8 | OEP 2.8 | Information and Communication Technology Lab | 4 | 2 | 3 Hrs. | 15 | 35 | 50 |
| | | TOTAL | 32 | 24 | | | | 600 |

**NOTE: Theory: 1 Hr. =1Credit; Practical: 2 Hrs. =1Credit**

**CPT**: Core Paper Theory          **SPP**: Special Paper Practical

**CPP**: Core Paper Practical          **OET**: Open Elective Paper

**SPT**: Special Paper Theory          **OEP**: Open Elective practical

## SEMESTER –III

| Sl.No | Paper | Title of the paper | Instruction Hrs. per week | No. of Credits | Duration of the Exam. | Marks | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Internal Assessment | Semester End Exam. | Total |
| 1 | CPT 3.1 | Advanced Software Engineering | 4 | 4 | 3 Hrs. | 30 | 70 | 100 |
| 2 | CPT 3.2 | Statistics Using R Programming | 4 | 4 | 3 Hrs. | 30 | 70 | 100 |
| 3 | SPT 3.3 A | Cloud Computing | 4 | 4 | 3 Hrs. | 30 | 70 | 100 |
| | SPT 3.3 B | Advanced Java Programming | 4 | 4 | 3 Hrs. | 30 | 70 | 100 |
| 4 | OET 3.4 | Web Programming | 4 | 4 | 3 Hrs. | 30 | 70 | 100 |
| 5 | CPP 3.5 | Minor Project | 4 | 2 | 3Hrs. | 15 | 35 | 50 |
| 6 | CPP 3.6 | Statistics Using R Programming Lab | 4 | 2 | 3Hrs. | 15 | 35 | 50 |
| 7 | SPP 3.7 A | Cloud Computing Lab | 4 | 2 | 3Hrs. | 15 | 35 | 50 |
| | SPP 3.7 B | Advanced Java Programming Lab | 4 | 2 | 3Hrs. | 15 | 35 | 50 |
| 8 | OEP 3.8 | Web Programming Lab | 4 | 2 | 3Hrs. | 15 | 35 | 50 |
| | TOTAL | | 32 | 24 | | | | 600 |

**NOTE: Theory: 1 Hr. =1Credit; Practical: 2Hrs=1Credit**

**CPT**: Core Paper Theory

**CPP**: Core Paper Practical

**SPT**: Special Paper Theory

**SPP**: Special Paper Practical

**OET**: Open Elective Paper

**OEP**: Open Elective practical

## SEMESTER –IV

| Sl.No | Paper | Title of the paper | Instruction Hrs. per Week | No. of Credits | Duration of the Exam. | Internal Assessment | Semester End Exam. | Total |
|-------|-------|--------------------|--------------------------|----------------|----------------------|---------------------|--------------------|-------|
| | | | | | | Marks | | |
| 1 | CPT 4.1 | Research Methodology | 4 | 4 | 3 Hrs. | 30 | 70 | 100 |
| 2 | CPT 4.2 | Machine Learning | 4 | 4 | 3 Hrs. | 30 | 70 | 100 |
| 3 | SPT 4.3 A | Digital Image Processing | 4 | 4 | 3 Hrs. | 30 | 70 | 100 |
| | SPT 4.3 B | Internet of Things | 4 | 4 | 3 Hrs. | 30 | 70 | 100 |
| 4 | CPP 4.4 | Mobile App Development Lab | 4 | 2 | 3 Hrs. | 10 | 40 | 50 |
| 5 | CPP 4.5 | Machine Learning Lab | 4 | 2 | 3 Hrs. | 15 | 35 | 50 |
| 6 | SPP 4.6 A | Digital Image Processing Lab | 4 | 2 | 3 Hrs. | 15 | 35 | 50 |
| | SPP 4.6 B | Internet of Things Lab | 4 | 2 | 3 Hrs. | 15 | 35 | 50 |
| 7 | PROJECT 4.7 | Major Project | 8(4+4) | 6 | 3 Hrs. | 15+30 | Viva –Voce 35 Dissertation 70 | 150 |
| | **TOTAL** | | **32** | **24** | | | | **600** |

**NOTE: Theory: 1 Hr. = 1 Credit; Practical: 2 Hrs. = 1 Credit**

**CPT**: Core Paper Theory        **SPT**: Special Paper Theory

**CPP**: Core Paper Practical        **SPP**: Special Paper Practical

## Internal Assessment Marks Allotment for Theory:

| | |
|---:|:---|
| **Internal Test:** | 10 Marks |
| **Seminar:** | 5 Marks |
| **Assignment:** | 5 Marks |
| **Attendance:** | 5 Marks |
| **Class room exercise:** | 5 Marks |
| **TOTAL:** | **30 Marks** |

## Internal Assessment Marks Allotment for Practical:

| | |
|---:|:---|
| **Internal Test:** | 10 Marks |
| **Records and Attendance:** | 5 Marks |
| **TOTAL:** | **15 Marks** |

| First Semester | | | |
|---|---|---|---|
| Title of the Paper: Advanced Data Structure Using C | | | |
| Paper | CPT 1.1 | CIE Marks | 30 |
| No of Hours/Week: | 4 | SEE Marks | 70 |
| Total Hours: | 48 | Credits | 04 |

**Course Outcomes:**

- Differentiate primitive and non-primitive structures
- Design and apply appropriate data structures for solving computing problems.
- Apply sorting and searching algorithms to the small and large data sets.

**UNIT I**                                                                                          **8 Hours**

Introduction and Overview: Definition, Elementary data organization, Data Structures, data structures operations, Abstract data types, algorithms complexity, time-space trade off. Preliminaries: Mathematical notations and functions, Algorithmic notations, control structures, Complexity of algorithms, asymptotic notations for complexity of algorithms. String Processing: Definition, Storing, Strings, String as ADT, String operations, word/text processing, Pattern Matching algorithms.

**UNIT II**                                                                                          **10 Hours**

Arrays: Definition, Linear arrays, arrays as ADT, Representation of Linear Arrays in Memory, Traversing Linear arrays, Inserting and deleting, Multi-dimensional arrays, Matrices and Sparse matrices Linked list: Searching in a Singly linked list, Memory allocation, Garbage collection, Insertion into a singly linked list, Deletion from a singly linked list, Doubly linked list, Header linked list, Circular linked list.

**UNIT III**                                                                                          **10 Hours**

Stacks: Definition, Array representation of stacks, Linked representation of stacks, Stacks as ADT, Arithmetic Expressions: Polish Notation, Conversion of infix expression to postfix expression, Evaluation of post fix expression, Application of stack, Queues: Definition, Array representation of queue, Linked list representation of queues. Types of queue: Simple queue, Circular queue, Double-ended queue, Priority queue, Operations on Queue, Applications of queue.

**UNIT IV**                                                                                    **10 Hours**

Binary Tree: Definitions, Tree Search, Traversal of Binary Tree, Tree Sort, Building a Binary Search Tree, Height Balance: AVL Trees, Contiguous Representation of Binary Trees: Heaps, Lexicographic Search Tree; Tries, External Searching:  m-array tree, B- Trees, B+ Tree, B*Tree, Applications of Trees, Graphs: Mathematical Back ground, Computer Representation, Graph Traversal, Topological Sorting, Greedy Algorithm, Graphs as Data Structure.

**UNIT V**                                                                                    **10 Hours**

Searching: Introduction and Notation, Sequential Search, Binary Search, Comparison of Methods. Sorting: Introduction and Notation, Insertion Sort, Selection Sort, Shell Sort, Divide and Conquer, Merge sort for Linked List, Quick sort for Contiguous List. Hashing: Sparse Tables, Choosing a Hash function, Collision Resolution with Open Addressing, Collision Resolution by Chaining.

**Text Books:**

1. Seymour Lipschutz,"Data Structures with C", Schaum's out Lines, Tata Mc Graw Hill, 2011.

2. Robert Kruse, C.L.Tondo, Bruce Leung, Shashi Mogalla, "Fta Structures and Program Design using C", Person Education, 2009.


**Reference Books:**

1. Marks Allen Weiss, "Data Structures and Algorithm Analysis in C", Second Edition, Pearson Education, 2013.

| First Semester | | | |
|---|---|---|---|
| Title of the Paper: Operating Systems | | | |
| Paper | CPT 1.2 | CIE Marks | 30 |
| No of Hours/Week: | 4 | SEE Marks | 70 |
| Total Hours: | 48 | Credits | 04 |

**Course Outcomes:**

- Recognize the importance of the operating systems.
- Recognize how the applications interact with the operating system as the later working as intermediary program between the machine and the application.
- Know how the operating systems transport the application requests to the hardware.
- Understand how operating systems managing resources such as processors, memory and I/O

**UNIT I**          **8 Hours**

**Introduction:** Batch Systems, Concepts of Multiprogramming and Time Sharing, Parallel, Distributed and real time Systems, Operating System Structures, Components & Services, System calls, System programs, Virtual machines. Process Management: Process Concept, Process Scheduling, Co Operating process, Threads, Inter process communication, CPU Scheduling Criteria, Scheduling algorithm, Multiple Processor Scheduling, Real time Scheduling, Algorithm evolution.

**UNIT II**          **10 Hours**

**Process Synchronization and deadlocks:** The Critical Section Problem, Synchronization hardware, Semaphores, Classical problems of synchronization, Critical regions, monitors, Dead locks - system model, Characterization, Dead lock prevention, avoidance and detection, Recovery from dead lock, Combined approach to deadlock handling.

**UNIT III**          **10 Hours**

**Memory Management:** Logical and Physical address space, Swapping, Contiguous allocation, Paging, Segmentation, Segmentation with paging in Mastics and Intel 386, Virtual

memory, Demand paging and its performance, Page replacement algorithms, Allocation of frames, thrashing, page size and other considerations. Demand Segmentation.

**UNIT IV**                                                                                      **10 Hours**

**File management (Systems, Secondary Storage Structure):** File Concepts, Access methods, Directory Structure, Protection and consistency, File system structure, Allocation methods, Free space management, Directory Implementation, Efficiency and Performance, Recovery. Disk Management (Structure, Disk Scheduling Methods): Disk Structure & Scheduling methods, Disk management, Swap - Space management

**Protection and Security:** Goals of protection, Domain Protection, Access matrix, Security Problem, Authentication, One time password, program threats, System threats. Virtual Machines: Building Blocks, Types of VMs and their implementations.

**UNIT V**                                                                                        **10 Hours**

**Introduction to Linux:** Linux distributions, Overview of Linux operating system, Linux architecture, Features of Linux, Accessing Linux system, Starting and shutting down system, Logging in and Logging out, Comparison of Linux with other operating systems.

**Commands in Linux:** General-Purpose commands, File oriented commands, directory oriented commands, Communication-oriented commands, process oriented commands, etc. Regular expressions & Filters in Linux: Simple filters viz. more, wc, diff, sort, uniq, grep; Introducing regular expressions. Linux file system, Shell Programming, creating & executing shell scripts in linux.

**Text Books:**

1. Abraham Silberschatz and Peter Baer Galvin, "Operating System Concepts", 7th Edition, Pearson Education, 2002.
2. Unix and shell Programming Behrouz A. Forouzan, Richard F. Gilberg.Thomson
3. Linux System Programming, Robert Love, O'Reilly, SPD.

**Reference Books:**

1. H.M.Deitel, "Operating Systems", Pearson Learning Solutions, 3rd Edition, 2003.

2. William Stallings, "Operating Systems", 6th Edition, Pearson Education, 2010.

3. Stuart, "Operating systems: Principles, Design and Implementation", Cengage Learning India, 1st Edition 2008

4. UNIX Network Programming, W.R. Stevens, PHI.

| First Semester | | | |
|---|---|---|---|
| Title of the Paper: Advanced Database Management Systems | | | |
| **Paper** | **CPT 1.3** | CIE Marks | 30 |
| No of Hours/Week: | 4 | SEE Marks | 70 |
| Total Hours: | 48 | Credits | 04 |

**Course Outcomes:**

- To teach the basic database concepts, applications, data models, schemas and instances.
- To familiarize entity relationship model for a database.
- To demonstrate the use of constraints and relational algebra operations.
- To demonstrate the basic concepts of transaction processing and concurrency control.
- To emphasize the importance of normalization in databases.

**UNIT I**      **10 Hours**

Introduction to Database Management Systems, Purpose of Database Systems, View of Data, Database Languages, Database System Structure, Data Models, Database Design and ER Model: Entity, Attributes, Relationships, Constraints, Keys.

**UNIT II**      **10 Hours**

Structured Query Language Basics SQL Overview: Data Types and Literals, DDL, DML, DCL, TCL. Data Definitions, Basic Structure Operations, Additional Operations, Set Operations, Null Values, Aggregate Functions, Nested Sub-Queries. Modifications of Database: Deletion, Insertion and Updates.

**UNIT III**      **8 Hours**

Intermediate Structured Query Language Joins Expressions, Views, Transactions. Relational Integrity: Domain, Referential Integrities, Enterprise Constraints. Data Types and Schemas, Authorizations, Functions and Procedures, Triggers.

### UNIT IV                                                    10 Hours

Relational Query Languages & Database Design, Relational Algebra, Tuple relational Calculus, Design Process, Entity Relationship Model, ER Diagram, Design Issues, Extended E-R Features, converting E-R & EER diagram into tables.

### UNIT V                                                     10 Hours

Relational Model Normalization Relational Database Design Relational Model: Basic concepts, Attributes and Domains, CODD's Rules, Database Design: Features of Good Relational Designs, Normalization, Atomic Domains and First Normal Form, Decomposition using Functional Dependencies, Algorithms for Decomposition, 2NF, 3NF, BCNF.

**Text Books:**

1. Abraham Silberchatz, Henry K.Forth, Sudharshan, Database System Concepts, 7th edition, McGraw Hill, 2020

**Reference Books:**

1. R. Elmasri, S.B. Navathe, Fundamentals of Database Systems, Seventh Edition, Pearson Education, 2016.

2. Bipin C Desai, "An introduction to Database Systems", Galgotia Publications, 2015.

| First Semester | | | |
|---|---|---|---|
| Title of the Paper: Computer Networks | | | |
| **Paper** | **SPT 1.4 A** | CIE Marks | 30 |
| No of Hours/Week: | 4 | SEE Marks | 70 |
| Total Hours: | 48 | Credits | 04 |

**Course Outcomes:**

- Gain the knowledge of the basic computer network technology.
- Gain the knowledge of the functions of each layer in the OSI and TCP/IP reference model.
- Obtain the skills of sub netting and routing mechanisms.
- Familiarity with the essential protocols of computer networks, and how they can be applied in network design and implementation.

## UNIT I                                                                8 Hours

Basic Concepts: Application, requirements, perspectives, scalable connectivity, cost-effective resource sharing, support for common services, manageability, protocol layering, performance, bandwidth and latency, delay X bandwidth product, perspectives on connecting, classes of links, Rings(802.5, FDDI) –Token Ring Media Access Control, Token Ring Maintenance, FDDI.

## UNIT II                                                              10 Hours

Networking: Datagram's, virtual circuit switching, source routing, bridges and LAN switches, Internetwork, service model, global addresses, datagram forwarding in IP, sub netting and classless addressing, Address Translation (ARP), Host Configuration (DHCP), Error Reporting (ICMP), virtual networks and Tunnels, Distance Vector (RIP), Link State (OSPF), routing areas, inter domain routing (BGP), IPv6, challenges for mobile networking and routing to mobile hosts (mobile IP).

## UNIT III                                                            10 Hours

End to end protocols: Simple Demultiplexer (UDP), Reliable Byte Stream (TCP)-End-to-end issues, segment format, connection Establishment and Termination, sliding window revisited, triggering transmission, adaptive retransmission, record boundaries, TCP extensions, Transport for Real-Time Applications-requirements, RTP details, control protocol.

## UNIT IV                                                    10 Hours

**Congestion Control and Resource Allocation:** Issues in resource allocation – network model, taxonomy, evaluation criteria; Queuing discipline – FIFO, Fair Queuing; TCP congestion control–additive increase/multiplicative decrease, slow start, fast retransmit and fast Recovery, Congestion avoidance mechanisms – DECbit, Random Early Detection (RED), Source-based congestion control.

## UNIT V                                                    10 Hours

**Network Security:** Cryptographic Building Blocks-Principles of Ciphers, Symmetric-Key Ciphers, Public-Key Ciphers. Key Pre-distribution: Pre-distribution of Public Keys, Predistribution of Symmetric Keys. Authentication Protocols-Originality and Timeliness Techniques, Public-Key Authentication Protocols, Symmetric-Key Authentication Protocols. Example Systems-Pretty Good Privacy (PGP), Secure Shell (SSH), Transport Layer Security, IP Security, Wireless Security. Firewalls.

**Text Books:**

1. Larry Peterson and Bruce S Davis "Computer Networks: A System Approach" 5th Edition, Elsevier -2014.

2. Douglas E Comer, "Internetworking with TCP/IP, Principles, Protocols and Architecture" 6th Edition, PHI – 2014.

| First Semester | | | |
|---|---|---|---|
| Title of the Paper: Design and Analysis of Algorithms | | | |
| **Paper** | **SPT 1.4 B** | CIE Marks | 30 |
| No of Hours/Week: | 4 | SEE Marks | 70 |
| Total Hours: | 48 | Credits | 04 |

**Course Outcome:**

- Analyze the asymptotic performance of algorithms.
- Derive and solve recurrences describing the performance of divide-and-conquer algorithms.
- Find optimal solution by applying various methods.
- Apply pattern matching algorithms to find particular pattern.
- Differentiate polynomial and non-polynomial problems.
- Explain the major graph algorithms and their analyses. Employ graphs to model engineering problems, when appropriate.

**UNIT I**                                                                          **8 Hours**

**Basics of Algorithms and Mathematics:** What is an algorithm?, Mathematics for Algorithmic Sets, Functions and Relations, Vectors and Matrices, Linear Inequalities and Linear Equations.

**Analysis of Algorithm:** The efficient algorithm, Average, Best and worst case analysis, Amortized analysis , Asymptotic Notations, Analyzing control statement, Loop invariant and the correctness of the algorithm, Sorting Algorithms and analysis: Bubble sort, Selection sort, Insertion sort, Shell sort Heap sort, Sorting in linear time : Bucket sort, Radix sort and Counting sort

**UNIT II**                                                                        **8 Hours**

**Divide and Conquer Algorithm:** Introduction, Recurrence and different methods to solve recurrence, multiplying large Integers Problem, Problem Solving using divide and conquer algorithm - Binary Search, Max-Min problem, Sorting (Merge Sort, Quick Sort), Matrix Multiplication, Exponential.

**UNIT III**                                                                      **10 Hours**

**Dynamic Programming:** Introduction, The Principle of Optimality, Problem Solving using Dynamic Programming – Calculating the Binomial Coefficient, Making Change Problem,

Assembly Line-Scheduling, Knapsack problem, All Points Shortest path, Matrix chain multiplication, Longest Common Subsequence.

## UNIT IV                                                          11 Hours

**Greedy Algorithm**: General Characteristics of greedy algorithms, Problem solving using Greedy Algorithm - Activity selection problem, Elements of Greedy Strategy, Minimum Spanning trees (Kruskal's algorithm, Prim's algorithm), Graphs: Shortest paths, The Knapsack Problem, Job Scheduling Problem, Huffman code.

**Exploring Graphs:** An introduction using graphs and games, Undirected Graph, Directed Graph, Traversing Graphs, Depth First Search, Breath First Search, Topological sort, Connected components.

## UNIT V                                                           11 Hours

**Backtracking and Branch and Bound:** Introduction, The Eight queens problem , Knapsack problem, Travelling Salesman problem, Minimax principle 03 5 8 String Matching: Introduction, The naive string matching algorithm, The Rabin-Karp algorithm, String Matching with finite automata, The Knuth-Morris-Pratt algorithm.

**Introduction to NP-Completeness:** The class P and NP, Polynomial reduction, NP-Completeness Problem, NP-Hard Problems. Travelling Salesman problem, Hamiltonian problem, Approximation algorithms.


**Reference Books:**

1. Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, PHI.

2. Fundamental of Algorithms by Gills Brassard, Paul Bratley, PHI.

3. Introduction to Design and Analysis of Algorithms, Anany Levitin, Pearson.

4. Foundations of Algorithms, Shailesh R Sathe, Penram

5. Design and Analysis of Algorithms, Dave and Dave, Pearson.

| First Semester | | | |
|---|---|---|---|
| **Title of the Paper: Advanced Data Structure Lab** | | | |
| **Paper** | **CPP 1.5** | CIE Marks | 15 |
| No of Hours/Week: | 4 | SEE Marks | 35 |
| Total Hours: | 48 | Credits | 02 |

### List of Practical Programs:

1.   Write a program to convert a prefix notation to postfix notation.

2.   Write a program to Evaluate a given postfix expression and its values for the variables

3.   Write a program to simulate the working of circular queue providing the following operations–Insert, Delete and Display.

4.   Write a program to Demonstrate recursion, Generate Fibonacci sequence, Solve Towers of Hanoi Problem.

5.   Write a program to simulate the working of a linked list providing the following operations: Insert at the beginning/end; Insert at the position; Display list

6.   Write a program to simulate the working of a circular linked list providing the following operations Delete from the beginning/end; Delete a given element; Display list

7.   Write a program to simulate the working of a Dequeue

8.   Write a program to simulate the working of a double linked list to implement stack.

9.   Write a program to create a binary tree and implement the tree traversal techniques of in order, preorder and post order.

10. Write a program to implement quick sort

11. Write a program to implement the search techniques of Linear Search; Binary Search

12. Write a program to create a class called STACK using an array of integers. Implement the following operations by overloading the operators '+' and '--': s1 = s1 + element; where s1 is an object of the class STACK and element is an integer to be pushed on the top of the stack s1 = --s1; where s1 is an object of the class STACK. '- 22 'operator pops the element.

13. Handle the STACK empty and full conditions. Also display the contents of the stack after each operation, by overloading the << operator.

14. Write a program to create a class called QUEUE with member functions to add an element and to delete an element from the queue. Using the member functions, implement a queue of integers. Demonstrate the operations by displaying the contents of the queue after every operation.

| First Semester | | | |
|---|---|---|---|
| **Title of the Paper: Linux Lab** | | | |
| **Paper** | **CPP 1.6** | CIE Marks | 15 |
| No of Hours/Week: | 4 | SEE Marks | 35 |
| Total Hours: | 48 | Credits | 02 |

### List of Practical Programs:

1. Write a shell script that accept a file name starting and ending line numbers as arguments and display all the lines between given line no:

2. Write a shell script that delete all lines containing a specified word.

3. Write a shell script that displays a list of all the files in the current directory.

4. Write a shell script that receives any number of file names as arguments checks if every argument supplied is a file or a directory and reports accordingly. Whenever the argument is a file or directory.

5. Write a shell script that accept a list of file names as arguments count and report the occurrence of each word.

6. Write a shell script to find the factorial of given integer

7. Write a shell script to compute GCD & LCM of two numbers.

8. Write a shell script to print end of a Glossary file in reverse order using array

9. Write a shell script to find whether a given number is prime

10. Write a shell script that list the all files in a directory.

11. Write awk script to find the number of characters, words and lines in a file? Linked list respectively.

12. Write a C Program that makes a copy of a file using standard I/O and system calls?

13. Implement in C the following Unix commands using system calls
    i) cat            ii) mv

14. Write a C program to emulate the Unix ls-l command?

15. Write a C program to list for every file in a directory, its inode number and file name.

| First Semester | | | |
|---|---|---|---|
| **Title of the Paper: Advanced Database Management Systems Lab** | | | |
| **Paper** | **CPP 1.7** | CIE Marks | 15 |
| No of Hours/Week: | 4 | SEE Marks | 35 |
| Total Hours: | 48 | Credits | 02 |

### List of Practical Programs:

1. Creation of database for the following details:
   a. Employee details      b. Student details      c. Hospital management
   d. Railway reservation      e. Hostel management

2. BOOK(Book_id, Title, Publisher_Name, Pub_Year) BOOK_AUTHORS(Book_id, Author_Name) PUBLISHER(Name, Address, Phone) BOOK_COPIES(Book_id, Branch_id, No-of_Copies) BOOK_LENDING(Book_id, Branch_id, Card_No, Date_Out, Due_Date) LIBRARY_BRANCH(Branch_id, Branch_Name, Address)

   Write the queries to

   a. Retrieve details of all books in the library – id, title, name of publisher, authors, number of copies in each branch, etc.
   b. Get the particulars of borrowers who have borrowed more than 3 books, but from Jan 2017 to Jun 2017.
   c. Delete a book in BOOK table. Update the contents of other tables to reflect this data manipulation operation.
   d. Partition the BOOK table based on year of publication. Demonstrate its working with a simple query.
   e. Create a view of all books and its number of copies that are currently available in the Library.

3. Consider the schema for Movie Database: ACTOR(Act_id, Act_Name, Act_Gender) DIRECTOR(Dir_id, Dir_Name, Dir_Phone) MOVIES(Mov_id, Mov_Title, Mov_Year, Mov_Lang, Dir_id) MOVIE_CAST(Act_id, Mov_id, Role) RATING(Mov_id, Rev_Stars)

   Write the queries to

   a. List the titles of all movies directed by 'Hitchcock'.
   b. Find the movie names where one or more actors acted in two or more movies.

    c. List all actors who acted in a movie before 2000 and also in a movie after 2015 (use JOIN operation).

    d. Find the title of movies and number of stars for each movie that has at least one rating and find the highest number of stars that movie received. Sort the result by movie title.

    e. Update rating of all movies directed by 'Steven Spielberg' to 5.

4.    Consider the schema for Company Database: EMPLOYEE(SSN, Name, Address, Sex, Salary, SuperSSN, DNo) DEPARTMENT(DNo, DName, MgrSSN, MgrStartDate) DLOCATION(DNo,DLoc) PROJECT(PNo, PName, PLocation, DNo) WORKS_ON(SSN, PNo, Hours)

    Write the queries to

    a. Make a list of all project numbers for projects that involve an employee whose last name is 'Scott', either as a worker or as a manager of the department that controls the project.

    b. Show the resulting salaries if every employee working on the 'IoT' project is given a 10 percent raise. C.

    c. Find the sum of the salaries of all employees of the 'Accounts' department, as well as the maximum salary, the minimum salary, and the average salary in this department

    d. Retrieve the name of each employee who works on all the projects controlledby department number 5 (use NOT EXISTS operator).

    e. For each department that has more than five employees, retrieve the department number and the number of its employees who are making more than Rs. 6,00,000.

5.    Perform the following:
Viewing all databases, viewing all Tables in a Database, Creating Tables (With and Without Constraints), Inserting/Updating/Deleting Records in a Table, Saving (Commit) and Undoing (rollback).

6.    Perform the following:
Altering a Table, Dropping/Truncating/Renaming Tables, backing up / Restoring a Database.

7.    For a given set of relation schemes, create tables and perform the following Simple Queries, Simple Queries with Aggregate functions, Queries with Aggregate functions (group by and having clause), Queries involving- Date Functions, String Functions, Math Functions Join Queries- Inner Join, Outer Join Subqueries- With IN clause, With EXISTS clause

8. For a given set of relation tables perform the following a. Creating Views (with and without check option), Dropping views, Selecting from a view

9. Write a PL/SQL program using FOR loop to insert ten rows into a database table.

10. Given the table EMPLOYEE (EmpNo, Name, Salary, Designation, DeptID) write a cursor to select the five highest paid employees from the table.

11. Illustrate on usage of procedures and functions.

12. Illustrate on usage of triggers.

13. Given an integer i, write a PL/SQL procedure to insert the tuple (i, 'xxx') into a given relation.

14. Write a PL/SQL block to satisfy some conditions by accepting input from the user.

15. Write a PL/SQL block that handles all types of exceptions.

| First Semester | | | |
|---|---|---|---|
| Title of the Paper: Computer Networks Lab | | | |
| **Paper** | **SPP 1.8A** | CIE Marks | 15 |
| No of Hours/Week: | 4 | SEE Marks | 35 |
| Total Hours: | 48 | Credits | 02 |

### List of Practical Programs:

1. Study of different types of Network cables and practically implement the cross-wired cable and straight through cable using clamping tool

2. Connect the computers in Local Area Network.

3. Study of basic network command and Network configuration commands.

4. Performing an Initial Switch Configuration and Initial Router Configuration

5. Configuring and Troubleshooting a Switched Network

6. Implementing an IP Addressing Scheme

7. Examining WAN Connections

8. Planning Network-based Firewalls

9. Implementation of Error Detection / Error Correction Techniques

10. Implementation of Stop and Wait Protocol and sliding window

11. Implementation and study of Go back-N and selective repeat protocols

12. Implementation of High-Level Data Link Control

13. Write a socket Program for Echo/Ping/Talk commands.

14. Network Topology - Star, Bus, Ring

15. Implementation of distance vector routing algorithm

16. Implementation of Link state routing algorithm

| First Semester | | | |
|---|---|---|---|
| Title of the Paper: Design and Analysis of Algorithms Lab | | | |
| **Paper** | **SPP 1.8B** | CIE Marks | 15 |
| No of Hours/Week: | 4 | SEE Marks | 35 |
| Total Hours: | 48 | Credits | 02 |

**List of Practical Programs:**

1. Implementation and Time analysis of sorting algorithms. Bubble sort, Selection sort, Insertion sort, Merge sort and Quicksort

2. Implementation and Time analysis of linear and binary search algorithm.

3. Implementation of max-heap sort algorithm

4. Implementation and Time analysis of factorial program using iterative and recursive method

5. Implementation of a knapsack problem using dynamic programming.

6. Implementation of chain matrix multiplication using dynamic programming.

7. Implementation of making a change problem using dynamic programming

8. Implementation of a knapsack problem using greedy algorithm

9. Implementation of Graph and Searching (DFS and BFS).

10. Implement prim's algorithm

11. Implement kruskal's algorithm.

12. Implement LCS problem.

| Second Semester | | | |
|---|---|---|---|
| Title of the Paper: Artificial Intelligence | | | |
| Paper | CPT 2.1 | CIE Marks | 30 |
| No of Hours/Week: | 4 | SEE Marks | 70 |
| Total Hours: | 48 | Credits | 04 |

**Course Outcomes:**

- Explain what constitutes "Artificial" Intelligence and how to identify systems with Artificial Intelligence.
- Explain how Artificial Intelligence enables capabilities that are beyond conventional technology,
- Use classical Artificial Intelligence techniques, such as search algorithms, minimax algorithm, neural networks, tracking, and robot localization.
- Ability to apply Artificial Intelligence techniques for problem-solving.
- Explain the limitations of current Artificial Intelligence techniques.

**UNIT I**                                                                 **8 Hours**

**PROBLEM SOLVING:** Introduction to AI- Foundations of AI – Risks and benefits of AI - Agents and Environments – Structure of Agents - Uninformed Search Strategies- Informed Search Strategies- Heuristic functions - Local Search Algorithm.

**UNIT II**                                                              **10 Hours**

**SEARCH IN COMPLEX ENVIRONMENT, GAMES AND KNOWLEDGE REPRESENTATION:**

Introduction to Game Playing-Alpha Beta Pruning- Constraint Satisfaction Problems - Knowledge Representation using First order logic- Knowledge Engineering in First Order Logic Proportional vs First Order Logic.

**UNIT III**                                                             **10 Hours**

**KNOWLEDGE REASONING AND PLANNING:**

Inference- Forward and Backward Chaining-Unification-Uncertainty-Inference in Bayesian Network – Inference in Temporal models – Hidden Markov Models – Kalman Filters – Dynamic Bayesian Networks – Combining Beliefs and desires under uncertainty – Decision Networks.

**UNIT IV** 10 Hours

**PRODUCTION SYSTEM AND PLANNING**

Introduction to Production system-control strategies-Rete Algorithm-Planning-STRIPS-Planning with state space search-Partial Order Planning-Planning Graphs-Planning, acting in the real world.

**UNIT V** 10 Hours

**EXPERT SYSTEM**

Expert System- Architecture and Roles of Expert System-Typical Expert System-MYCINXOON-DART Case Study-Construction of simple reflex agent with sensor and actuator using Arduino.

**Text Books:**

1. Stuart Russell, Peter Norvig, "Artificial Intelligence – A Modern Approach", 3rd Edition, Pearson Education / Prentice Hall of India, 2010.

2. Joseph C. Giarratano, Gary D. Riley," Expert Systems: Principles and Programming", 4 th Edition, 2015.

**Reference Books:**

1. Nils J. Nilsson, "Artificial Intelligence: A new Synthesis", Harcourt Asia Pvt. Ltd., 2000.

2. Kevin Night and Elaine Rich, Nair B., "Artificial Intelligence (SIE)", Mc Graw Hill2008.

3. W. Patterson, 'Introduction to Artificial Intelligence and Expert Systems', Prentice Hall of India, 2007

4. Prateek Joshi, "Artificial Intelligence with Python", Packt Publishing, 2017.

| Second Semester | | | |
|---|---|---|---|
| Title of the Paper: Python Programming | | | |
| **Paper** | **CPT 2.2** | CIE Marks | 30 |
| No of Hours/Week: | 4 | SEE Marks | 70 |
| Total Hours: | 48 | Credits | 04 |

**Course Outcomes:**

- Analyze the significance of python program development environment and apply it to solve real world applications.
- Demonstrate the usage of lists arrays and loops concepts. Learn the syntax and semantics of the Python programming language.
- Illustrate the process of structuring the data using lists, tuples
- Demonstrate the use of built-in functions to navigate the file system.
- Implement the Object Oriented Programming concepts in Python

**UNIT I**                                                                                 **8 Hours**

Installing Python, Simple program using Python, Expressions and Values, Variables and Computer Memory, error detection, multiple line statements, designing and using functions, functions provided by Python, Tracing function calls in memory model, omitting return statement. Working with Text: Creating Strings of Characters, Using Special Characters in Strings, Creating a Multiline String, Printing Information, Getting Information from the Keyboard.

**UNIT II**                                                                               **10 Hours**

A Boolean Type , Choosing Statements to Execute, Nested If Statements , Remembering the Results of a Boolean Expression Evaluation , A Modular Approach to Program Organization, Importing  UNITs , Defining Your Own  UNITs, Testing Code Semi automatically Grouping Functions Using Methods:  UNITs, Classes, and Methods , Calling Methods the Object-Oriented Way, Exploring String Methods, Underscores.

**UNIT III**                                                                              **10 Hours**

Storing Collections of Data Using Lists: Storing and Accessing Data in Lists, modifying Lists, Operations on Lists, Slicing Lists, Aliasing, List Methods, Working with a List of Lists. Repeating Code Using Loops: Processing Items in a List, Processing Characters in Strings, Looping Over a Range of Numbers, Processing Lists Using Indices, Nesting Loops in Loops, Looping Until a Condition Is Reached, Repetition Based on User Input, Controlling Loops Using Break and Continue Reading and Writing

**UNIT IV**                                                           **10 Hours**

Files: Kinds of files, Opening a File, Techniques for Reading Files, Files over the Internet, Writing Files, and Writing Algorithms that Use the File-Reading Techniques, Multiline Records. Storing Data Using Other Collection Types: Storing Data Using Sets, Storing Data Using Tuples, Storing Data Using Dictionaries, Inverting a Dictionary, Using the In Operator on Tuples, Sets, and Dictionaries, Comparing Collections.

**UNIT V**                                                            **10 Hours**

Collection of New Information Object-Oriented Programming: Understanding a Problem Domain, Function "Is instance," Class Object, and Class Book , Writing a Method in Class Book, Plugging into Python Syntax: More Special Methods ,Creating Graphical User interface: Building a Basic GUI, Models, Views, and Controllers, Customizing the Visual Style Introducing few more Widgets, Object-Oriented GUIs, Keeping the Concepts from Being a GUI Mess.

**Text Books:**

1. Practical Programming: An introduction to Computer Science Using Python, second edition, Paul Gries, Jennifer Campbell, Jason Montojo, The Pragmatic Bookshelf.

2. Learning with Python: How to Think Like a Computer Scientist Paperback – Allen Downey , Jeffrey Elkner, 2015

**Reference Books:**

1.Introduction to Python for Computational Science and Engineering (A beginner's guide), Hans Fangohr. Exploring Python, Timothy A. Budd, Mc Graw Hill Education Python for Informatics: Exploring Information, Charles Severance. Learning Python, Fourth Edition, Mark Lutz, O'Reilly publication.

| Second Semester | | | |
|---|---|---|---|
| Title of the Paper: Computer Architecture | | | |
| **Paper** | **SPT 2.3 A** | CIE Marks | 30 |
| No of Hours/Week: | 4 | SEE Marks | 70 |
| Total Hours: | 48 | Credits | 04 |

**Course Outcomes:**

- Identify various components of computer and their interconnection
- Identify basic components and design of the CPU: the ALU and control unit.
- Compare and select various Memory devices as per requirement.
- Compare various types of IO mapping techniques
- Critique the performance issues of cache memory and virtual memory

## UNIT I                                                         8 Hours

Number Systems: Binary, Octal, Hexa decimal numbers, base conversion, addition, subtraction of binary numbers, one's and two's complements, positive and negative numbers, character codes ASCII, EBCDIC etc Digital Logic Circuits: Logic gates, Boolean algebra, Map Simplification. Combinational Circuits: Half Adder, Full Adder, flip-flops. Sequential Circuits: Shift registers, Counters, Integrated Circuits, Mux, Demux, Encoder, Decoder Data Representation: Fixed and Floating point, Error detection and correction codes Computer Arithmetic: Addition and Subtraction, Multiplication and Division algorithms, Floating-point Arithmetic Operations, Decimal arithmetic operations. Structure of Computers: Computer types, Functional units, Basic operational concepts, Von- Neumann Architecture, Bus Structures, Software, Performance, Multiprocessors and Multicomputer.

## UNIT II                                                         10 Hours

Basic Computer Organization and Design: Instruction codes, Computer Registers, Computer Instructions and Instruction cycle. Timing and Control, Memory-Reference Instructions, Input Output and interrupt Central processing unit: Stack organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Complex Instruction Set Computer (CISC) Reduced Instruction Set Computer (RISC), CISC v/s RISC.

## UNIT III                                                         10 Hours

Register Transfer and Micro-operations: Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Micro-Operations, Logic Micro-Operations, Shift Micro Operations, Arithmetic logic shift unit Micro-programmed Control: Control Memory, Address Sequencing. Micro-Program example, Design of Control Unit. Input Output: I/O interface,

Programmed IO, Memory Mapped 10, Interrupt Driven IO, DMA. Instruction level parallelism: Instruction level parallelism (ILP)-over coming data hazards, limitations of ILP

### UNIT IV                                                                                    10 Hours

Processors and Memory Hierarchy: Advanced processor technology Super scalar and vector processors - Memory hierarchy technology - Virtual memory technology. Bus, Cache and Shared Memory: Bus System-Cache memory organizations-Shared memory organization Sequential and weak consistency models.

### UNIT V                                                                                     10 Hours

Parallel Computer methods: Multiprocessor and multi computers Shared-Memory multiprocessors, Distributed-Memory Multiprocessors. Multi-vector and SIMD computers, PRAM and VLSI models - Architectural development tracks - Multiple Processor Tracks, Multi- vector and SIMD Tracks, Multi-threaded and Dataflow Tracks. Thread level parallelism: Multi-threaded Architectures, Distributed Memory MIMD Architectures, Shared Memory Architectures. Architecture of Multithreaded processors, Principles of multithreading, Issues and solutions.

**Text Books:**

1. Mano M Morris, "Computer System Architecture", 3rd edition Pearson India(2019).

2. William Stallings, "Computer Organization and Architecture designing for performance", 10th edition, Pearson (2016)

3. Kai Hwang, "Advanced Computer Architecture-Parallelism, Scalability, Programmability". Tata McGraw-Hill, 2008.

**Reference Books:**

1. Dezso Sima, Terence Fountain, Peter Kacsuk, "Advanced Computer Architectures - A Design Space approach", Pearson Education, 2009

2. Carl Hamacher, Zvonks Vranesic, SafeaZaky, "Computer Architecture And Organization", 5th edition McGraw Hill New Delhi, India (2002).

| Second Semester | | | |
|---|---|---|---|
| Title of the Paper: Cyber Security and Cyber Law | | | |
| Paper | SPT 2.3 B | CIE Marks | 30 |
| No of Hours/Week: | 4 | SEE Marks | 70 |
| Total Hours: | 48 | Credits | 04 |

**Course Outcomes:**

- To analyze and evaluate the cyber security needs of an organization.
- To determine and analyze software vulnerabilities and security solutions to reduce the risk of exploitation.
- To design and develop security architecture for an organization.
- To design operational and strategic cyber security strategies and policies

**UNIT I**          **8 Hours**

**Cyber Security:** Introduction in Cyber Security -Hackers - Attackers -Types of Attackers Examples – Data Recovery.

**Cyber law:** Features of Cyber Law - Significance of Cyber Law - Advantages. Data Security - Meaning - Fundamentals of Data Security - Requirements of Data Security - Precautionary Measures.

**UNIT II**          **10 Hours**

**Tools and Methods Used in Cybercrime:** Proxy Servers and Anonymizers, Phishing, Password Cracking, Key loggers and Spywares, Virus and Worms, Steganography, DoS DDoS Attacks, SQL Injection, Buffer Over Flow, Attacks on Wireless Networks, Phishing, Identity Theft (ID Theft)Cybercrimes and Cyber security: The Legal Perspectives Why do we need Cyber law: The Indian Context, The Indian IT Act, Digital Signature and the Indian IT Act, Amendments to the Indian IT Act, Cybercrime and Punishment, Cyber law, Technology and Students: Indian Scenario.

**UNIT III**          **10 Hours**

**Authentication and Firewalls** - Authentication & Access Control: Identification - Authentication - Authentication by Passwords - Protecting Passwords - Access Control Structure - Evidences - Law of Evidence on Electronic Records, Hackers & its Types - Cracking - Pornography - Software privacy - Data Recovery - File Modification & File access, Recover Internet Usage Data, Recover Swap Files/Temporary/Cache Files, and Introduction to Encase Forensic.

**UNIT IV** 10 Hours

**Cyber security:** Organizational Implications Cost of Cybercrimes and IPR Issues: Lesson for Organizations, Web Treats for Organizations: The Evils and Perils, Security and Privacy Implications from Cloud Computing, Social Media Marketing: Security Risk and Perils for Organization, Social Computing and the Associated Challenges for Organizations, Protecting People's Privacy in the Organization, Organizational Guidelines for Internet Usage, Safe Computing Guidelines and Computer Usage Policy, Incident Handling: An Essential Component, Intellectual Property in the Cyberspace of Cyber security, Importance of Endpoint Security in Organizations.

**UNIT V** 10 Hours

**Concept of Cyber law and Cyber Space:** Introduction - Meaning and Features of Cyber law - Significance and Advantages of Cyber Law - Meaning of Cyber Space - Inclusive of Cyber Space - Facilitating Functions of Cyber Space - Major Issues in Cyber Space. Need for an Indian Cyber law: Plans of National Information Technology Policy (NITP) - Need for Protection of data - Transactions in Security - Electronic Banking.

**Text Books:**

1. Jonathan Rosenoer , Cyber law: The Law of Internet, Springer Verlog, Paperback, 17 September 2011

2. John W Ritting House, William M.Hancock, Cyber Security Operations Handbook, Read Elsevier,2004

**Reference Books:**

1. Sunit Belapure and Nina Godbole. Cyber Security: Understanding Cyber Crimes, Computer Forensics And Legal Perspectives. Wiley India Pvt Ltd. 2013.

2. Surya PrakashTripathi, Ritendra Goyal, Praveen Kumar Shukla. Introduction to information security and cyber laws. Dreamtech Press. 2015.

3. Cybersecurity Essentials Charles J. Brooks, Christopher Grow, Philip A. Craig Jr., Donald Short, ISBN: 978-1-119-36239-5 October 2018.

| Second Semester | | | |
|---|---|---|---|
| **Title of the Paper: Information and Communication Technology** | | | |
| **Paper** | **OET 2.4** | CIE Marks | 30 |
| No of Hours/Week: | 4 | SEE Marks | 70 |
| Total Hours: | 48 | Credits | 04 |

**Course Outcomes (COs):**

- Introduction to computers, classification of computers, anatomy of computer, constituents and architecture, microcontrollers

- Operating systems, functions of operating systems, classification of operating systems, kernel, shell, basics of Unix, shell programming, booting

- Prepare documents using work processing tools. Interpret data and represent it graphically using spread sheet. Prepare professional presentations.

- Internet basics, features, applications, services, internet service providers, browsing, email, searching and ICT tools.

**UNIT I**                                                                                            **8 Hours**

**Introduction to Computers and Windows:**

Introduction, History of computer, Block diagram of a computer, Generation of computer, Classification of computers, Characteristics of computer, Applications of computer.

Windows concepts, general features of windows, different parts of windows screen, Setting the date and time, Icon explanation, paint, notepad, calculator, control panel, mouse properties, multitasking, my computer, folder creation, use of recycle bin, task bar.

**UNIT II**                                                                                          **10 Hours**

**Word Processing – MS-Word:**

Introduction to MS Word, parts of MS- word, Parts of MS-word screen, Backstage view, editing the text, formatting the text, Text effects, Bullets add numbering, Paragraph formatting, Borders & Shadings, Text styles, Table formatting, Picture, clipart and shapes adding, SmartArt representing, Screenshot explanation, Header & Footer, Word art, Drop cap, Equations & Symbols, Page setup, Watermark, Envelopes and labels, Mail merge, Auto correct, Word count, Spell & grammar check, Commenting, Restrict editing, Document views, Zoom options, Navigation Pane, Arranging & Splitting word screen, Printing document, Exiting word.

## UNIT III                                                    8 Hours

**Worksheet – MS- Excel:**

Introduction to MS-excel screen, Parts of MS-excel screen, Worksheet basic, Creating worksheet, Entering text, Dates, alphanumeric and values, conditional formatting, table formatting, Cell styles, Auto sum, Sorting & Filtering, Editing the table, Illustrations, Explaining charts, Page setup, Print area, Sheet options, Arranging text & Images, Applying different Formulas, Insert functions, protecting sheet & workbook, workbook views, exiting excel.

## UNIT IV                                                     8 Hours

**Presentation Graphics – MS-Power Point**

Introduction to MS-Power point screen, Parts of MS-Power point screen, News slide & Layout options, editing text, Images & Illustrations, Photo album, Page setup, Slide Themes, Background styles & Graphics, Slide Transition effects, Sound effects for text and images, New animation effects, Order & Reordering animation, Previewing, Slide show from beginning & Custom slide shows, Rehearse timings, Media  controls, Reviewing, Slide sorter and other Views, Color/Grayscale, Window options, exiting PowerPoint.

## UNIT V                                                      14 Hours

**Fundamentals of Internet:**

What is Internet?, Internet applications, Internet Addressing – Entering a Web Site Address, Intranet, Search engine, video conference, online forms, drive,  URL–Components of URL, Searching the Internet, Browser –Types of Browsers

**Introduction to Social Networking:** Twitter, Tumblr, LinkedIn, Facebook, flickr, Skype, yahoo, YouTube, WhatsApp .

**E-mail:** Definition of E-mail -Advantages and Disadvantages –User Ids, Passwords, Email Addresses, Domain Names, Mailers, Message Components, Message Composition, Mail Management.
**G-Suite:** Google drive, Google documents, Google spread sheets, Google Slides and Google forms.

**Overview of Internet security**, E-mail threats and secure E-mail, Viruses and antivirus software, Firewalls, Cryptography, Digital signatures, Copyright issues. What are GOI digital

initiatives in higher education? (SWAYAM, SwayamPrabha, National Academic Depository, National Digital Library of India, E-Sodh-Sindhu, Virtual labs, eacharya, e-Yantra and NPTEL).

**Reference Books:**

1. Microsoft Office 2010: John Walkenbach, Herb Tyson, Michael R Groh, Faithe Wempen.
2. Microsoft Office 2010 for windows: Steve Schwartz.
3. Microsoft office 2010 The complete reference- by Virginia Andersen.
4. Microsoft Office 2010 Certification Prep By Laura Story, Dawna Walls
5. In-line/On-line: Fundamentals of the Internet and the World Wide Web, 2/e – by Raymond Greenlaw and Ellen Hepp, Publishers : TMH
6. Internet technology and Web design, ISRD group, TMH.
7. Information Technology – The breaking wave, Dennis P.Curtin, Kim Foley, Kunai Sen and Cathleen Morin, TMH.

| Second Semester | | | |
|---|---|---|---|
| **Title of the Paper: Artificial Intelligence Lab** | | | |
| **Paper** | **CPP 2.5** | CIE Marks | 15 |
| No of Hours/Week: | 4 | SEE Marks | 35 |
| Total Hours: | 48 | Credits | 02 |

### List of Practical Programs:

1.  Write a program to implement DFS and BFS

2.  Write a Program to find the solution for travelling salesman Problem

3.  Write a program to implement Simulated Annealing Algorithm

4.  Write a program to find the solution for wampus world problem

5.  Write a program to implement 8 puzzle problem

6.  Write a program to implement Towers of Hanoi problem

7.  Write a program to implement A* Algorithm
8.   Build a bot which provides all the information related to you in college.

9.   Build a virtual assistant for Wikipedia using Wolfram Alpha and Python

10. Write a program to implement Hill Climbing Algorithm

11. Implement Mini-Max algorithm for game playing (Alpha-Beta pruning)

12. Propositional Model Checking Algorithms

13.  Implement Forward Chaining Algorithm

14. Implement backward Chaining Algorithm

15.  Implement Naïve Bayes Models

16. Implement Bayesian Networks and perform inferences

| Second Semester | | | |
|---|---|---|---|
| **Title of the Paper: Python Programming Lab** | | | |
| **Paper** | **CPP 2.6** | CIE Marks | 15 |
| No of Hours/Week: | 4 | SEE Marks | 35 |
| Total Hours: | 48 | Credits | 02 |

**List of Practical Programs:**

1.  a    Demonstrate about Basics of Python Programming.

    b    Demonstrate about fundamental Data types in Python Programming. (i.e., int, float, complex, bool and string types)

    c    Demonstrate the working of following functions in Python.

    i) id()          ii) type( )      iii) range( )

    d    Write a Python program to demonstrate various base conversion functions.

    e    Write a Python program to demonstrate various type conversion functions.


2.  a    Demonstrate the following Operators in Python with suitable examples.

    i) Arithmetic Operators          ii) Relational Operators   iii) Assignment Operator

    iv) Logical Operators          v) Bit wise Operators          vi) Ternary Operator

    vii) Membership Operator      viii) Identity Operators


3.  a    Write Python programs to demonstrate the following:

    i) input ()                    ii) print( )                                    iii)'sep' attribute

    iv) 'end 'attribute            v) replacement Operator ({})

    b    Demonstrate the following Conditional statements in Python with suitable examples. i) if statement          ii) if else statement        iii) if – elif – else statement

    c    Demonstrate the following Iterative statements in Python with suitable examples.

    i) while loop            ii) for loop

    d    Demonstrate the following control transfer statements in Python with suitable examples.

       i) break        ii) continue        iii) pass

4.        Write Python programs to print the following Patterns:

```
A                E E E E E E E E           *         *
A B              D D D D D D D           * *       * *
A B C              C C C C C            * * *     * * *
A B C D              B B B            * * * *   * * * *
A B C D E              A            * * * * * * * * * *
```

5.   a    Write a Python program to demonstrate various ways of accessing the string.

         i) By using Indexing (Both Positive and Negative)

         ii) By using Slice Operator

  b    Demonstrate the following functions/methods which operates on strings in Python with suitable examples:

| | | | |
|---|---|---|---|
| i) len( ) | ii) strip( ) | iii) rstrip( ) | iv) lstrip( ) |
| v) find( ) | vi) rfind( ) | vii) index( ) | viii) rindex() |
| ix) count( ) | x) replace( ) | xi) split( ) | xii) join( ) |
| xiii) upper( ) | xiv) lower( ) | xv) swapcase( ) | xvi)  title(  ) |

         xvii) capitalize( )  xviii) startswith()    xix) endswith()

6.   a    Python program to perform read and write operations on a file.

  b    Python program to copy the contents of a file to another file.

  c    Python program to count frequency of characters in a given file.

7.   a    Demonstrate the different ways of creating list objects with suitable example programs.

  b    Demonstrate the following functions/methods which operates on lists in Python with suitable examples:

| | | | |
|---|---|---|---|
| i) list( ) | ii) len( ) | iii) count( ) | iv) index ( ) |
| v) append( ) | vi) insert( ) | vii) extend() | viii) remove( ) |
| ix) pop( ) | x) reverse( ) | xi) sort( ) | xii) copy( ) |
| xiii) clear( ) | | | |

  c    Demonstrate the following with suitable example programs: i) List slicing ii) List Comprehensions

8. a Demonstrate the different ways of creating tuple objects with suitable example programs.

   b Demonstrate the following functions/methods which operates on tuples in Python with suitable examples:

   i) len( )  ii) count( )  iii) index( )  iv) sorted( )

   v) min ( )  vi)max( )  vii) cmp( )  viii) reversed( )

9. a Demonstrate the different ways of creating set objects with suitable example programs.

   b Demonstrate the following functions/methods which operates on sets in Python with suitable examples:

   i) add( )  ii) update( )  iii) copy( )  iv) pop( )

   v) remove( )  vi)discard( )  vii) clear( )  viii) union()

   ix) intersection( )  x) difference( )

10. a Demonstrate the different ways of creating dictionary objects with suitable example programs.

    b Demonstrate the following functions/methods which operates on dictionary in Python with suitable examples:

    i) dict( )  ii) len( )  iii) clear( )  iv) get(  )

    v) pop( )  vi)popitem( )  vii) keys( )  viii) values( )
    ix) items( )  x) copy( )  xi) update( )

11. a Demonstrate the following kinds of Parameters used while writing functions in Python.

    i) Positional Parameters  ii) Default Parameters

    iii) Keyword Parameters  iv) Variable length Parameters

    b Write a Python program to return multiple values at a time using a return statement.

    c Write a Python program to demonstrate Local and Global variables.

    d    Demonstrate lambda functions in Python with suitable example programs

12.        Implement the following Searching and Sorting techniques in Python by using functions

        i) Linear Search       ii) Binary Search    iii) Bubble Sort    iv) Merge Sort

13.   a    Demonstrate the following in-built functions to use Regular Expressions very easily in our applications.

        i) compile( )      ii) finditer( )      iii) match( )      iv) fullmatch( )

        v) search( )      vi) findall( )      vii) sub( )      viii) subn( )

        ix) split( )

    b    Write a Regular Expression to represent all RGM language (Your own language) identifiers.

**Rules:**

1. The allowed characters are a-z,A-Z,0-9,#.

2. The first character should be a lower case alphabet symbol from a to k.

3. The second character should be a digit divisible by 3.

4. The length of identifier should be at least. Write a python program to check whether the given string is RGM language identifier or not?

c) Write a Regular Expression to represent all 10 digit mobile numbers.

**Rules:**

1. Every number should contain exactly 10 digits.

2. The first digit should be 7 or 8 or 9 Write a Python Program to check whether the given number is valid

| Second Semester | | | |
|---|---|---|---|
| **Title of the Paper: Preparing for Industry** | | | |
| **Paper** | **SPP 2.7 A** | CIE Marks | 15 |
| No of Hours/Week: | 4 | SEE Marks | 35 |
| Total Hours: | 48 | Credits | 02 |

**Course Objectives:**

- To develop the students' logical thinking skills

- To learn the strategies of solving quantitative ability problems

- To enrich the verbal ability of the students

- To enhance critical thinking and innovative skills

**Interview skills – Types of interview and techniques to face remote interviews and Mock Interview**

1. Structured and unstructured interview orientation
2. Closed questions and hypothetical questions
3. Interviewers' perspective, Questions to ask/not ask during an interview
4. Video interview
5. Recorded feedback
6. Phone interview preparation
7. Tips to customize preparation for personal interview and Practice rounds

**Resume skills – Resume Template and Use of power verbs and Types of resume and Customizing resume**

1. Structure of a standard resume, Content, color, font, Introduction to Power verbs and Write up
2. Quiz on types of resume
3. Frequent mistakes in customizing resume
4. Layout - Understanding different company's requirement
5. Digitizing career portfolio

**Emotional Intelligence - L1 – Transactional Analysis and Brain storming and Psychometric Analysis and Rebus Puzzles/Problem Solving**

1. Introduction, Contracting, ego states, Life positions
2. Individual Brainstorming, Group Brainstorming, Stepladder Technique
3. Brain writing, Crawford's Slip writing approach

4. Reverse brainstorming, Star bursting,
5. Charlette procedure, Round robin brainstorming,
6. Skill Test, Personality Test, More than one answer, Unique ways

## Quantitative Ability-L3 – Permutation Combinations and Probability and Geometry and mensuration and Trigonometry and Logarithms and Functions and Quadratic Equations and Set Theory

1. Counting, Grouping, Linear Arrangement, Circular Arrangements,
2. Conditional Probability, Independent and Dependent Events,
3. Properties of Polygon, 2D & 3D Figures, Area & Volumes,
4. Heights and distances, Simple trigonometric functions, Introduction to logarithms, Basic rules of logarithms,
5. Introduction to functions,
6. Basic rules of functions, Understanding Quadratic Equations,
7. Rules & probabilities of Quadratic Equations,
8. Basic concepts of Venn Diagram

## Reasoning ability-L3 – Logical reasoning and Data Analysis and Interpretation

1. Syllogisms, Binary logic, Sequential output tracing
2. Crypto arithmetic, Data Sufficiency
3. Data interpretation-Advanced
4. Interpretation tables, pie charts & bar chats

## Verbal Ability-L3 – Comprehension and Logic

1. Reading comprehension, Para Jumbles
2. Critical Reasoning
   (a) Premise and Conclusion
   (b) Assumption & Inference
   (c) Strengthening & Weakening an Argument

**Reference Books:**

1. Michael Farra and JIST Editors(2011) Quick Resume & Cover Letter Book: Write and Use an Effective Resume in Just One Day. Saint Paul, Minnesota. Jist Works

2. Daniel Flage Ph.D(2003) The Art of Questioning: An Introduction to Critical Thinking. London. Pearson

3. David Allen( 2002) Getting Things done : The Art of Stress -Free productivity. New York City. Penguin Books.

4. FACE(2016) Aptipedia Aptitude Encyclopedia.Delhi. Wiley publications

5. ETHNUS(2013) Aptimithra. Bangalore. McGraw-Hill Education Pvt. Ltd

| Second Semester | | | |
|---|---|---|---|
| Title of the Paper: Social Networking and Soft Skill Enhancement | | | |
| Paper | SPP 2.7 B | CIE Marks | 15 |
| No of Hours/Week: | 4 | SEE Marks | 35 |
| Total Hours: | 48 | Credits | 02 |

## I. SOCIAL NETWORK ETIQUETTES

Introduction to social network – Social Networking Etiquettes - Pros and Cons - Usage of Facebook, Instagram, WhatsApp, Telegram, Youtube, Evolution of Android and IOS, Introduction to Linkedin & Benefits.

**List of Practical Programs:**

- Official Mail id Creation
- Linkedin Id Creation,
- Linkedin Profile Bulilding ,
- Facebook Id and Creation
- Modifying the existing FB ID
- Create video and upload in the YouTube
- Create an account in Telegram and WhatsApp

## II. BROWSING CULTURE

Introduction to browsing – Search Engines-Google - Bing -Yahoo!-AOL -MSN –DuckDuckGo ,browsers, phishing – Cookies - URL – https:// extensions , browsing history, Incognito mode-VPN – Pros and Cons – Book mark.

**List of Practical Programs:**

- Work with different search engines
- Check the browsing history

## III NETWORKING

Basics of networking - LAN, MAN, WAN, Introduction to network topologies, Protocols , IP Commands (Command line prompt), Define online complier and editor

- Find Your System IP

- Ping Command,
- Firewall Fortinet, Basic DOS Commands

## IV. PROFESSIONALISM

Dress Code, Body Language, Appropriate, Attire, Communication Skills, Interview preparation – Introducing yourself - How to greet Superiors, Importance of Eye Contact During conversation.

Resume Skills- Structure of standard resume, types and customizing resume.

**List of Practical Programs:**

- Micro presentation
- Group Discussion
- Prepare your own Resume

## V. DIGITAL IDENTIFICATION

Introduction to NAD - Importance of Aadhar, PAN Card, Passport, Bank Account, Bar Code, QR scan, Payment Gateway (Gpay, Phone Pe, UPI, BHIM, Paytm), Mobile Banking

**List of Practical Programs:**

- NAD registration Step by Step,
- Linking bank account with net banking ,
- Register for payment gateway).
- TOTAL : 30 PERIODS
- 

## WEB REFERENCES:

### I: Social Network Etiquettes:

1. https://sproutsocial.com/glossary/social-media-etiquette/

2.https://www.shrm.org/resourcesandtools/tools-and-samples/hrqa/pages/socialnetworkingsitespolicy.aspx

3. https://www.frontiersin.org/articles/10.3389/fpsyg.2019.02711/full

4.https://medium.com/@sirajea/11-reasons-why-you-should-usetelegram-instead-of-whatsapp-ab0f80fbfa79

5. https://buffer.com/library/how-to-use-instagram/

6. https://www.webwise.ie/parents/what-is-youtube/

7. https://www.androidauthority.com/history-android-os-name-789433/

8. https://www.mindtools.com/pages/article/linkedin.htm

**II: Browsing Culture:**

1.https://sites.google.com/site/bethanycollegeofteacheredn/unit--ictconnecting-with-world/national-policy-on-information-andcommunication-technology-ict/accessing-the-web-introduction-to-thebrowser-browsing-web

2. https://www.wordstream.com/articles/internet-search-engineshistory

3. https://www.malwarebytes.com/phishing/

4. https://www.adpushup.com/blog/types-of-cookies/ 24 Syllabus IOT

5. https://www.eff.org/https-everywhere

6. https://www.sciencedirect.com/topics/computer-science/browsinghistory\

7. https://www.vpnmentor.com/blog/pros-cons-vpn/

8.         https://www.tech-wonders.com/2016/10/use-hush-privatebookmarking-extension-chrome.html

**III: Networking**

1. https://www.guru99.com/types-of-computer-network.html

2. https://www.studytonight.com/computer-networks/networktopology-types

3. https://www.cloudflare.com/learning/network-layer/what-is-aprotocol/

4. https://www.howtogeek.com/168896/10-useful-windows-commandsyou-should-know/

5. https://paiza.io/en

**IV:  Professionalism**

1. https://career.vt.edu/develop/professionalism.html

2. https://englishlabs.in/importance-dress-code/

3. https://www.proschoolonline.com/blog/importance-of-body-languagein-day-to-day-life

4. https://www.thespruce.com/etiquette-of-proper-attire-1216800

5. https://shirleytaylor.com/why-are-communication-skills-important/

6. https://www.triad-eng.com/interview-tips-for-engineers/

7.       https://www.indeed.co.in/career-advice/interviewing/interviewquestion-tell-me-about-yourself

8. https://toggl.com/track/business-etiquette-rules/

**V: Digital Identification**

1. https://nad.ndml.in/nad-presentation.html

2. https://www.turtlemint.com/aadhaar-card-benefits/

3. https://www.bankbazaar.com/pan-card/uses-of-pan-card.html

4. https://www.passportindex.org/passport.php

5.https://consumer.westchestergov.com/financial-education/moneymanagement/benefits-of-a-bank-account

6. https://en.wikipedia.org/wiki/QR_code

| Second Semester | | | |
|---|---|---|---|
| Title of the Paper: Information and Communication Technology Lab | | | |
| **Paper** | **OEP 2.8** | CIE Marks | 15 |
| No of Hours/Week: | 4 | SEE Marks | 35 |
| Total Hours: | 48 | Credits | 02 |

## List of Practical Programs:

1.  Create a Letter format by using MS-word.

2.  Create a company letter head by using MS-word.

3.  Create your own resume by using MS-word

4.  Create a greeting card.

5.  Create a Cover Page of project by using MS-word.

6.  Create a Mail merge letter.

7.  Create a Spreadsheet in MS-EXCEL and enter the marks of a student, calculate total and Print grade if the student has passed in all subjects.

8.  Enter the following details for 10 employee's employee code, name, basic salary, DA, HRA, Loans, total salary and tax.

9.  Create a Spreadsheet in MS-EXCEL Implement five functions each for Arithmetic, date and time, financial, logical and statistical functions. Write the syntax, example and output for simple programs.

10. A bank offers loan for housing and vehicle at an interest of 10.25% for housing and 14.2% for vehicle. For a loan applicants compute the monthly premium (EMI), given total installments as 24 months. Also compute the monthly interest and monthly principal amount and total amount of principal and interest using financial library functions in a spreadsheet.

11. Create a simple bar chart to high light the sales of a company for 3 different periods:

12. Create a pie chart for a sample data and give legends.

13. Create a worksheet importing data from database and calculate sum of all the columns.

14. Create text and images with effects.

15. Create a Power-point presentation with animation & sound effects consist of at least 10 slides.

16. Create Google sheet to collect the marks scored in previous examination and share the link to your friends to gather the data.

17. Design your own Google form and share with your friends to gather the data.

18. Schedule a Google meet, share the link to invite your friends and present the document as a host (use different layouts).

| Third Semester | | | |
|---|---|---|---|
| Title of the Paper: Advanced Software Engineering | | | |
| Paper | CPT 3.1 | CIE Marks | 30 |
| No of Hours/Week: | 4 | SEE Marks | 70 |
| Total Hours: | 48 | Credits | 04 |

**Course Outcomes:**

- Categorize problems based on their characteristics and practical importance.
- Apply the correct process models for software development.
- Apply the techniques, skills, and modern engineering tools necessary for engineering practice.
- Apply new Generation of Software Engineering Technology to Meet Current and Future Industrial Challenges of Emerging Software Trends

**UNIT I**                                                                                          **8 Hours**

**Software process Models and lifecycle:** Software Product, Product, Software Processes, Evolving Role of Software, Software: A Crisis on the Horizon and Software Myths, Software Engineering: A Layered Technology, Study of different Software Process Models, The Linear Sequential Model, The Prototyping Model, The RAD Model, Evolutionary Process Models, Component-Based Development, Process, Product and Process, Object Oriented Software Engineering.

**Project Management Concepts & Project Metrics:** The Management Spectrum, People, Product, Process, Project, the W5HH Principle, Metrics in the Process and Project Domains (FP & LOC), Software Measurement, Metrics for Project and Software Quality

**UNIT II**                                                                                       **10 Hours**

**Software Project Planning, Scheduling and Tracking:** Project Planning Objectives, Software Project Estimation using COCOMO Model, Software Scope and Resources, Empirical Estimation Models, Automated Estimation Tools, Basic Concepts and Relationship between People and Effort, Defining a Task Set for the Software Project, Selecting Software Engineering Tasks, Defining a Task Network and Scheduling, Earned Value Analysis and Error Tracking

**Software Requirements Specification:** Requirement Gathering and Analysis, Software Requirement Specification (SRS), Formal requirements specification and verification - axiomatic and algebraic specifications

## UNIT III                                                    10 Hours

**Analysis Modeling, Software Design Concepts and Principles:** The Elements of the Analysis Model, Data Modeling, Functional Modeling and Information Flow, Behavioral Modeling and Structured Analysis, Software Design and Software Engineering, The Design Process, Design Principles, Design Concepts, Modular Design, Design Heuristics for Effective Modularity, The Design Model ,Design Documentation, Function oriented v/s object-oriented design, Object Modeling using UML, Software Architecture and Data Design, Architectural Styles, Analyzing Alternative Architectural Designs, Mapping Requirements into a Software Architecture

**User Interface Design, Component Level Design:** User Interface Design, Task Analysis and Modeling, Interface Design Activities and Implementation Tools, Design Evaluation, Structured Programming and Comparison of Design Notation.

**Risk Analysis & Management:** Reactive versus Proactive Risk Strategies, Software Risks (Risk Identification, Risk Projection, Risk Refinement, Risk Mitigation), Risks Monitoring and Management

## UNIT IV                                                    10 Hours

**Coding, Software Testing Techniques & Software Testing Strategies:** Software Testing Fundamentals and Test Case Design, White-Box Testing and Black-Box Testing, ISO/IEC/IEEE Software Testing standards, Testing for Specialized Environments, A Strategic Approach to Software Testing and Issues, Unit Testing, Integration and Validation Testing, System Testing, Software Documentation and Debugging Techniques

**Software Quality Assurance and Configuration Management -** Quality Concepts and Software Quality Assurance, Quality Planning and Control, Software Reviews (Formal Technical Reviews), Software Reliability and Fault Tolerance, The ISO 9000 Quality Standards, The SCM Process, Identification of Objects in the Software Configuration, Six Sigma, Version Control and Change Control

## UNIT V                                                     10 Hours

**Agile Software Development:** Agile Software Development Values, principles, stakeholders, Agile Principles: Twelve Practices of Agile process, Communication, Planning, Agile Product Management: Estimation, Quality, Risk, Metrics and Measurements, Agile Requirements: User Stories, Backlog Management, Agile Architecture: Feature-Driven Development, Agile Risk Management: Risk and Quality Assurance, Agile Testing: Test-Driven Development, User Acceptance Test.

**Text Book:**

1. Roger S. Pressman, Software Engineering: A practitioner's approach, McGraw Hill.

2. Pankaj Jalote, An integrated approach to Software Engineering by Springer.

3. Ian Sommerville, Software Engineering, Addision and Wesley.

| **Third Semester** | | | |
|---|---|---|---|
| **Title of the Paper: Statistics Using R Programming** | | | |
| **Paper** | **CPT 3.2** | CIE Marks | 30 |
| No of Hours/Week: | 4 | SEE Marks | 70 |
| Total Hours: | 48 | Credits | 04 |

**Course Outcomes:**

- be able to use and program in the programming language R
- be able to use R to solve statistical problems
- be able to implement and describe Monte Carlo the technology
- be able to minimize and maximize functions using R

**UNIT I**                                                                                      **8 Hours**

Introduction, How to run R, R Sessions and Functions, Basic Math, Variables, Data Types, Vectors, Conclusion, Advanced Data Structures, Data Frames, Lists, Matrices, Arrays, Classes.

**UNIT II**                                                                                    **10 Hours**

R Programming Structures, Control Statements, Loops, - Looping Over Nonvector Sets,- If-Else, Arithmetic and Boolean Operators and values, Default Values for Argument, Return Values, Deciding Whether to explicitly call return- Returning Complex Objects, Functions are Objective, No Pointers in R, Recursion, A Quicksort Implementation-Extended Extended Example: A Binary Search Tree.

**UNIT III**                                                                                 **10 Hours**

Doing Math and Simulation in R, Math Function, Extended Example Calculating Probability-Cumulative Sums and Products-Minima and Maxima- Calculus, Functions Fir Statistical Distribution, Sorting, Linear Algebra Operation on Vectors and Matrices, Extended Example: Vector cross Product- Extended Example: Finding Stationary Distribution of Markov Chains, Set Operation, Input /output, Accessing the Keyboard and Monitor, Reading and writer Files,

**UNIT IV**                                                                                   **8 Hours**

Graphics, Creating Graphs, The Workhorse of R Base Graphics, the plot() Function – Customizing Graphs, Saving Graphs to Files.

**UNIT V**                                                                                                            **12 Hours**

Probability Distributions, Normal Distribution- Binomial Distribution- Poisson Distributions Other Distribution, Basic Statistics, Correlation and Covariance, T-Tests,-ANOVA.

Linear Models, Simple Linear Regression, -Multiple Regression Generalized Linear Models, Logistic Regression, - Poisson Regression- other Generalized Linear Models-Survival Analysis, Nonlinear Models, Splines- Decision- Random Forests.

**Text Books:**

1. The Art of R Programming, Norman Matloff, Cengage Learning

2. R for Everyone, Lander, Pearson

**Reference Books:**

1. R Cookbook, PaulTeetor, Oreilly.

2. R in Action,Rob Kabacoff, Manning

| Third Semester | | | |
|---|---|---|---|
| Title of the Paper: Cloud Computing | | | |
| Paper | SPT 3.3 A | CIE Marks | 30 |
| No of Hours/Week: | 4 | SEE Marks | 70 |
| Total Hours: | 48 | Credits | 04 |

**Course Outcomes:**

- Define Cloud Computing and memorize the different Cloud service and deployment models.

- Describe importance of virtualization along with their technologies.

- Use and Examine different cloud computing services.

- Analyze the components of open stack & Google Cloud platform and understand Mobile Cloud Computing.

- Design & develop backup strategies for cloud data based on features.

**UNIT I**           **8 Hours**

**Introduction; Principles of Parallel and Distributed Computing**

Cloud computing at a glance; Historical Developments; building Cloud computing environment; computing platforms and Technologies Principles of Parallel and Distributed Computing: Eras of Computing; parallel Vs. distributed computing; elements of distributed computing; technologies of Distributed computing

**UNIT II**           **10 Hours**

Virtualization and Cloud Computing Architecture Characteristics of virtualized environments; virtualization techniques; virtualization and cloud computing; pros and cons of virtualization; examples. Cloud Reference model; Types of clouds; cloud economics; open challenges

**Aneka:** Cloud application Platform Overview; anatomy of the Aneka container; building Aneka clouds; cloud programming and management.

**UNIT III**           **12 Hours**

Concurrent Computing and High-Throughput Computing and Map Reduce Programming Introducing parallelism; programming with threads; multithreading with Aneka; applications;

Task Computing; task based Application Model; Task based Programming; Data Intensive Computing; Technologies; Aneka Map Reduce Programming

## UNIT IV                                                                 8 Hours

Cloud Platforms in Industry and Cloud Applications Amazon Web services; Google App Engine; Microsoft Azure; Cloud scientific Applications; Business and Consumer Applications

## UNIT V                                                                 10 Hours

Advanced Topics in Cloud Computing and Cloud Security Energy Efficiency Clouds; Market based management clouds; Federated Clouds; Third Party Cloud Services; Infrastructure Security: Network level security, Host level security, and Application level security; Data security and Storage.

**Text Books:**

1. Mastering Cloud Computing, Editors: Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, MGH2013 Chapters: 1 ,2,3,4,5,6,7,8,9,10,11

**Reference Books:**

1. Cloud Computing: Principles and Paradigms, Editors: RajkumarBuyya, James Broberg, Andrzej M. Goscinski, Wile, 2011
2. Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010
3. Cloud Computing: Principles, Systems and Applications, Editors: Nikos Antonopoulos, Lee Gillam, Springer, 2012

4. Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Ronald L. Krutz, Russell Dean Vines, Wiley-India, 2010

| | Third Semester | | |
|---|---|---|---|
| Title of the Paper: Advanced Java Programming | | | |
| **Paper** | **SPT 3.3 B** | CIE Marks | 30 |
| No of Hours/Week: | 4 | SEE Marks | 70 |
| Total Hours: | 48 | Credits | 04 |

**Course Outcomes:**

- Student will be able to use advanced technology in Java such as Internationalization, and Remote method Invocation
- Student will learn how to work with applets.
- Student will be able to develop web application using Java Servlet and Java Server Pages technology.

### UNIT I                                                                                               8 Hours

**Applets :** Applet Fundamentals - Applet Class - Applet Life Cycle – Steps for developing an Applet Program – Passing values through Parameters - Graphics in an Applet – Event handling GUI Applications: Graphical User Interface - Creating Windows - Dialog Boxes – Layout Managers - AWT Component classes - Swing Component classes – Event handling – Other AWT Components – AWT graphics classes – Other Swing controls

### UNIT II                                                                                             10 Hours

Networking: Basics - Networking in Java -Socket Programming using TCP/IP – Socket Programming using UDP – URL and InetAddress Classes Java Database Connectivity: Types of drivers - JDBC Architecture – JDBC Classes and Interfaces – Basic steps in developing JDBC applications – Creating a new database and table with JDBC - Working with Database metadata

### UNIT III                                                                                           10 Hours

Servlets: - Basics – Advantages - Servlet alternatives – strengths - Architecture - Servlet Life Cycle - Generic Servlet - HTTP Servlet- Passing parameters – Retrieving parameters – server side include - Cookies –Filters

### UNIT IV                                                                                           10 Hours

Java Server Pages: Overview - JSP and HTTP – JSP Engines - Working of JSP – Anatomy of JSP – JSP Syntax – Creating simple JSP page - Components of JSP -Implicit Objects.

**UNIT V**                                                                                                          **10 Hours**

Web Programming – Client Side Programming: Client Side Programming technologies – Form design with HTML and CSS – Client side Validation using JavaScript - Content Structuring using XML – Adding interactivity with AJAX

**Web Programming - Server-Side Programming:** Web Servers - Handling Request and Response - Database Access- Session Management.

**Reference Books:**

1. Java the Complete Reference - Herbert Schildt, McGraw Hill Education, 10th Edition, New York, 2017

2. Advanced Java Programming – Uttam K.Roy , Oxford University Press, 2017

3. Core and Advanced Java, Black Book – Dreamtech Press - 2017

| Third Semester | | | |
|---|---|---|---|
| Title of the Paper: Web Programming | | | |
| Paper | OET 3.4 | CIE Marks | 30 |
| No of Hours/Week: | 4 | SEE Marks | 70 |
| Total Hours: | 48 | Credits | 04 |

**Course Outcomes:**

- To use the syntax and semantics of HTML and DHTML
- To develop different parts of a web page
- To understand how CSS can enhance the design of a webpage.
- To create and apply CSS styling to a webpage
- To get familiarity with the JavaScript language and understand Document Object Model handling of Java Script

**UNIT I**                                                                 **8 Hours**

Basics of Internet and Web The basics of Internet, World Wide Web, Web page, Home page, Web site, Static, Dynamic and Active web page, Overview of Protocols – Simple Mail Transfer Protocol, Gopher, Telnet, Emails, TFTP, Simple Network Management Protocol, Hyper Text Transfer Protocol, Client server computing concepts.

Web Client and Web Sever Web Browser, Browsers e.g., Netscape navigator, Internet Explorer, Mozilla Firefox, Client Side Scripting Languages- VB Script and Java Script, Active X control and Plug-ins; Web Server Architecture, Image maps, CGI, API web database connectivity-DBC,ODBC

**UNIT II**                                                                 **10 Hours**

Introduction to HTML Introduction to HTML, Essential Tags, Tags and Attributes, Text Styles and Text Arrangements, Text, Effects, Exposure to Various Tags (DIV, MARQUEE, NOBR, DFN, HR, LISTING, Comment, IMG), Color and Background of Web Pages, Lists and their Types, Attributes of Image Tag, Hypertext, Hyperlink and Hypermedia, Links, Anchors and URLs, Links to External Documents, Different Section of a Page and Graphics, Footnote and emailing, Creating Table, Frame, Form and Style Sheet.

**UNIT III**                                                                 **10 Hours**

DHTML Dynamic HTML, Document Object Model, Features of DHTML, CSSP (Cascading Style Sheet Positioning) and JSSS (JavaScript assisted Style Sheet), Layers of Netscape, The ID Attribute, DHTML Events.

**UNIT IV**                                                           **8 Hours**

Java Script Objects, Methods, Events and Functions, Tags, Operators, Data Types, Literals and Type Casting in JavaScript, Programming Construct, Array and Dialog Boxes, Relating JavaScript to DHTML, Dynamically Changing Text, Style, Content.

**UNIT V**                                                          **12 Hours**

Introduction to PHP Server Side Programming , Introduction to PHP, Basic Programming Concepts of PHP: Variables, Data-types, Constants, Scope of Variables, Type of Variables, Type Casting, Operators, Operators Precedence, References, Arrays; Control Structures: Branching, If statement, Switch statement; Looping: for Loop, while Loop, do while Loop, for each Loop; Functions: User Defined Functions, Built-in Function, Functions for Variables; Script Controlling Functions, Array Functions, Date and Time Functions, Mathematical Functions, String Functions, PHP Server Variables; Working with form, Uploading files to Web Server using PHP .

**Reference Books:**

1. Burdman, "Collaborative Web Development", Addison Wesley.

2. Sharma &Sharma, "Developing E-Commerce Sites", Addison Wesley

3. Ivan Bayross, "Web Technologies Part II", BPB Publications.

| Third Semester | | | |
|---|---|---|---|
| **Title of the Paper: Minor Project** | | | |
| **Paper** | **CPP 3.5** | CIE Marks | 15 |
| No of Hours/Week: | 4 | SEE Marks | 35 |
| Total Hours: | 48 | Credits | 02 |

The Mini-project is an application that should be formally initiated and should be developed and to be implemented by the respective team. The team coordination and proper communication should be promptly maintained by the team leader. Based on the ability/abilities of the students and recommendations of the mentor, a single discipline or a multidisciplinary Minor-project can be assigned to the students.

**Note:**

1. It is team project with a maximum of three in a team
2. Students shall select a domain and develop an application with social relevance
3. Documentation is to be based on the standards
4. Evaluation pattern is like Lab examination
5. Need to submit a report, presentation with demo.
6. During the examination, each student must demonstrate the project individually.

**Semester End Examination Marks Distribution:**

| Sl.No | Description | Marks |
|---|---|---|
| 1. | Project Demonstration | 20 |
| 2. | Viva-Voce | 10 |
| 3. | Project Report | 05 |
| | **Total:** | **35 Marks** |

| Third Semester | | | |
|---|---|---|---|
| Title of the Paper: Statistics Using R Programming Lab | | | |
| Paper | CPP 3.6 | CIE Marks | 15 |
| No of Hours/Week: | 4 | SEE Marks | 35 |
| Total Hours: | 48 | Credits | 02 |

### List of Practical Programs:

1. Installation of R in Windows and Linux environment

2. Write a R program to find measures of central tendency

3. Write a R program to perform different operations on Matrices

4. Write a R program to store data into a List and perform different operations

5. Write a R program to store data into Data frame and perform different operations

6. Write a R program to find biggest of three elements

7. Write a R program to find roots of a quadratic equation

8. Write a R program to find sum of elements of vector

9. Write a R program to find factorial of a number using recursion

10. Write a R program to find gcd of two numbers using recursion

11. Write a R program to mean, variance, standard deviation for the given discrete probability distribution

12. Write a R program to mean, variance, standard deviation for the given continuous probability distribution

13. Write a R program to represent the given data in the form of graphs using built in functions

14. Write a R program to fit Binomial distribution to the given data

15. Write a R program for Z test /t-test/F test/ Chi-square test/ Z test

16. Write a R program to fit a linear regression/multiple linear regression.

| Third Semester | | | |
|---|---|---|---|
| **Title of the Paper: Cloud Computing Lab** | | | |
| **Paper** | **SPP 3.7 A** | CIE Marks | 15 |
| No of Hours/Week: | 4 | SEE Marks | 35 |
| Total Hours: | 48 | Credits | 02 |

### List of Practical Programs:

1. Install Virtual box / VMware Workstation with different flavors of Linux or windows OS on top of windows7 or 8.

2. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs

3. Install Google App Engine. Create hello world app and other simple web applications using python/java.

4. Use GAE launcher to launch the web applications.

5. Simulate a cloud scenario using Cloud Sim and run a scheduling algorithm that is not present in Cloud Sim.

6. Find a procedure to transfer the files from one virtual machine to another virtual machine.

7. Find a procedure to launch virtual machine using try stack (Online Open stack Demo Version)

8. Install Hadoop single node cluster and run simple applications like word count.
   **Cloud computing (Programs on SAAS)**

9. Create an word document of your class time table and store locally and on cloud with doc and pdf format.

10. Create a spread sheet which contains employee salary information and calculate gross and total salary using formula DA=10%OF BASIC,HRA=30%OF BASIC PF= 10% OF BASIC IF BASIC<=3000 12% OF BASIC IF BASIC>3000 TAX=10% OF BASIC IF BASIC<=1500 11% OF BASIC IF BASIC>1500 AND BASIC<=2500 12% OF BASIC IF BASIC>2500 NET_SALARY=BASIC_SALARY+DA+HRA-PF-TAX 57

11. Prepare a ppt on cloud computing- introduction, models, services and architecture

12. Create your resume in a neat format using Google and Zoho cloud

### Cloud computing (Programs on SAAS)

13. Write a Google app engine program to generate n even numbers and deploy it to Google cloud

14. Google app engine program multiply two matrices

15. Google app engine program to validate user; create a database login(username, password)in mysql and deploy to cloud

16. Google app engine program to validate the user use mysql to store user info and deploy on to cloud

| Third Semester | | | |
|---|---|---|---|
| **Title of the Paper: Advanced Java Programming Lab** | | | |
| **Paper** | **SPP 3.7 B** | CIE Marks | 15 |
| No of Hours/Week: | 4 | SEE Marks | 35 |
| Total Hours: | 48 | Credits | 02 |

**List of Practical Programs:**

1. Program to display life cycle of an applet

2. Program to display digital clock using applet

3. Program to display different graphical shapes in applet

4. Program to display graphical bar chart by passing parameters in applet

5. Program to find factorial value of N using AWT high level event handling

6. Program to illustrate window closing using AWT low level event handling

7. Program to illustrate TCP/UDP based network communication

8. Program to find sum of digits using RMI

9. Program using HTML/Java script to find length of the given string

10. Program using HTML/Java script to find biggest element of an array

11. Program to compute factorial value of N using Generic Servlet/HTTP Servelet

12. Use JDBC connectivity and create Table, insert and update data.

13. Write a program in Java to create a Cookie and set the expiry time of the same.

14. Write a program in Java to create Servlet to count the number of visitors to a web page.

15. Write a program in Java to create a form and validate a password using Servlet.

16. Write a program in Java to convert an image in RGB to a Grayscale image.

| Third Semester | | | |
|---|---|---|---|
| Title of the Paper: Web Programming Lab | | | |
| **Paper** | **OEP 3.8** | CIE Marks | 15 |
| No of Hours/Week: | 4 | SEE Marks | 35 |
| Total Hours: | 48 | Credits | 02 |

### List of Practical Programs:

1.    Write a HTML code to create simple Web page to display your college information.

2.    Write a HTML code to create different types of ordered lists.

3.    Write a HTML code to insert an image of 'Tim Berners Lee' and display his Bio data.

4.    Write a HTML code to illustrate text formatting tags

5.    Write a HTML code to illustrate Img tag

6.    Write a HTML code to illustrate Hyper Link tag (Anchor tag)

7.    Write a HTML code to illustrate Frame tag

8.    Write a HTML code to embed multimedia on to a web page.

9.    Write a HTML code to create your class time table.

10.   Write a HTML code to create a form to accept student details. When the form runs in the Browser fill the textboxes with data. Write JavaScript code that verifies that all textboxes has been filled. If a textboxes has been left empty, popup an alert indicating which textbox has been left empty

11.   Write a PHP program to create and manage a database using SQL commands.

12.   Write a PHP program to create and validate a email id.

13.   Using PHP and SQL, create and validate a sample login form.

14.   Using PHP and SQL, develop a program to accept student information viz. Accession name, regno, course, sem, marks in 3 subjects from a web page and store the information in a database and to calculate total and average and to display the results with proper headings.

15. Using PHP and SQL, develop a program to accept employee information viz. Accession no, name and basic from a web page and store the Information in a database and to calculate DA, HRA, PF, TAX, Gross and net pay and to display the details with proper headings.

| Fourth Semester | | | |
|---|---|---|---|
| Title cof the Paper: Research Methodology | | | |
| Paper | CPT 4.1 | CIE Marks | 30 |
| No of Hours/Week: | 4 | SEE Marks | 70 |
| Total Hours: | 48 | Credits | 04 |

**Course Outcomes:**

- Understand the psychology of research which includes different perspectives and necessity of research.
- Apply the research knowledge to formulate a suitable problem statement by adopting different research methods and models.
- Analyze the research outcome by using suitable statistical tool.
- Write or present a scientific report and research proposal by adopting copyright based ethical values

**UNIT I**                                                                 **8 Hours**

Research Methodology: Introduction, Meaning of Research, Objectives of Research, Motivation in Research, Types of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Method, Importance of Knowing How Research is Done, Research Process, Criteria of Good Research, and Problems Encountered by Researchers in India.

**UNIT II**                                                              **10 Hours**

Defining the Research Problem: Research Problem, Selecting the Problem, Necessity of Defining the Problem, Technique Involved in Defining a Problem, an Illustration. Reviewing the literature: Place of the literature review in research, Bringing clarity and focus to your research problem, Improving research methodology, Broadening knowledge base in research area, Enabling contextual findings, How to review the literature, searching the existing literature, reviewing the selected literature, Developing a theoretical framework, Developing a conceptual framework, Writing about the literature reviewed.

**UNIT III**                                                             **10 Hours**

 Research Design: Meaning of Research Design, Need for Research Design, Features of a Good Design, Important Concepts Relating to Research Design, Different Research Designs, Basic Principles of Experimental Designs, Important Experimental Designs. Design of Sample Surveys: Introduction, Sample Design, Sampling and Non-sampling 76 Errors, Sample Survey versus Census Survey, Types of Sampling Designs.

**UNIT IV**                                                                                          **10 Hours**

Data Collection: Experimental and Surveys, Collection of Primary Data, Collection of Secondary Data, Selection of Appropriate Method for Data Collection, Case Study Method. Interpretation and Report Writing: Meaning of Interpretation, Technique of Interpretation, Precaution in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout. Types of Reports, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing Research Reports.

**UNIT V**                                                                                           **10 Hours**

Intellectual Property (IP) Acts: Introduction to IP: Introduction to Intellectual Property (IP), different types of IPs and its importance in the present scenario, Patent Acts: Indian patent acts 1970.Design Act: Industrial Design act 2000. Copy right acts: Copyright Act 1957. Trade Mark Act, 1999.

**Text books:**

1. Research Methodology: Methods and Techniques, C.R. Kothari, Gaurav GargNew Age International 4th Edition, 2018.

2. Research Methodology a step-by-step guide for beginners. (For the topic Reviewing the literature under UNIT 2) Ranjit Kumar SAGE Publications Ltd 3rd Edition, 2011 Study Material. 3. Intellectual property, Debirag E. Bouchoux, Cengage learning, 2013.

**Reference Books:**

1. Research Methods: the concise knowledge baseTrochim, Atomic Dog Publishing, 2005.

2. Conducting Research Literature Reviews: From the Internet to Paper FinkAge Publications, 2009.

| Fourth Semester | | | |
|---|---|---|---|
| Title of the Paper: Machine Learning | | | |
| Paper | CPT 4.2 | CIE Marks | 30 |
| No of Hours/Week: | 4 | SEE Marks | 70 |
| Total Hours: | 48 | Credits | 04 |

**Course Outcomes:**

- To understand the concepts of machine learning.
- To appreciate supervised and unsupervised learning and their applications.
- To appreciate the concepts and algorithms of learning.

### UNIT I                                                                                   8 Hours

**Introduction**: Definition-Examples of machine learning applications –Well posed learning problems- Designing a learning system- Perspectives and issues Concept learning and general to specific ordering: Inductive learning hypothesis- Concept learning as search – candidate elimination algorithm-inductive bias.

### UNIT II                                                                                  10 Hours

**Regression and classification:**

Regression: Linear Regression-Simple-Multiple Decision Tree-Pruning: Introduction – Representation-Algorithm- issues Classification: Support Vector machine – Naïve Bayes-Applications.

### UNIT III                                                                                 10 Hours

**Clustering and Learning:**

Clustering: k-Means clustering– adaptive Hierarchical clustering –Applications- Neural network: Perceptron, multilayer network- back propagation- introduction to deep neural network Instance based learning: k-NN– Radial basis functions Case based reasoning-Reinforcement learning -Applications.

**UNIT IV**                                                                    **10 Hours**

**Probabilistic graphical models:**

Graphical Models: Undirected graphical models - Markov Random Fields - Directed Graphical Models -Bayesian Networks - Conditional independence properties - Inference – Learning Generalization - Hidden Markov Models - Conditional random fields(CRFs).

**UNIT V**                                                                     **10 Hours**

**Machine learning experiments:**

Design-Cross validation - Measuring Performance -Hypothesis testing- Assessing Performance -Comparison of algorithms, Datasets-Case study.

**Text books:**

1. Tom M. Mitchell, Machine learning, McGraw-Hill, 1997.

2. Ethem Alpaydin, Introduction to Machine Learning, MIT Press, Third Edition, 2014.

**Reference Books:**

1. Stephen Marsland, Machine Learning – An Algorithmic Perspective, Chapman and Hall, CRC Press, Second Edition, 2014.

 2. Shalev-Shwartz, Shai, Shai Ben-David, Understanding Machine Learning: From theory to algorithms, Cambridge University Press, 2014.

| Fourth Semester | | | |
|---|---|---|---|
| **Title of the Paper: Digital Image Processing** | | | |
| **Paper** | **SPT 4.3 A** | CIE Marks | 30 |
| No of Hours/Week: | 4 | SEE Marks | 70 |
| Total Hours: | 48 | Credits | 04 |

**Course Outcomes:**

- Be able to understand basic concepts image processing, image storage and types of transformations that can be applied to images.
- Be able to compare the domains and methods of image processing.
- Be able to check the correctness of algorithms using inductive proofs and loop invariants.
- Learn Image Restoration & Enhancement techniques, colour image processing.
- Be able to make proper use of image processing tools.
- Familiar with morphological image processing

**UNIT I** **8 Hours**

**Digital Image Fundamentals**: What is Digital Image Processing, fundamental Steps in Digital Image Processing, Components of an Image processing system, Elements of Visual Perception, Image Sensing and Acquisition, Image Sampling and Quantization, Some Basic Relationships between Pixels, Linear and Nonlinear Operations.

**UNIT II** **10 Hours**

**Image Enhancement in Spatial domain**: Some Basic Gray Level Trans– formations, Histogram Processing, Enhancement Using Arithmetic/Logic Operations. Image Enhancement In Frequency Domain: Introduction to the Fourier transform, smoothing frequency domain filters, sharpening frequency domain filters.

**UNIT III** **10 Hours**

**Image Restoration**: Model of image degradation/restoration process, noise models, Restoration in the Presence of Noise, only– Spatial Filtering, Periodic Noise Reduction by Frequency Domain Filtering, Linear Position– Invariant Degradations, inverse filtering, minimum mean square error (Weiner) Filtering

**UNIT IV**                                                           **10 Hours**

Color Image Processing: Color fundamentals, color models, pseudo color Image processing, basics of full color image processing, color transformations. Image Compression: Fundamentals, Image Compression Models, Elements of Information Theory

**UNIT V**                                                            **10 Hours**

Morphological Image Processing: Dilation and Erosion, opening and closing, Some Morphological algorithms.

Image Segmentation Detection of discontinuities, Edge Linking and Boundary Detection, Thresholding, Region– Based Segmentation.

**Text books:**

1. "Digital Image Processing", Rafael C. Gonzalez and Richard E. Woods Pearson Education, 2009, 3rd edition.

**Reference Books:**

1. "Fundamentals of Digital Image Processing", Anil K. Jain, Pearson Edition, 2001.

2. "Digital Image Processing", S. Jayaraman and others.

| Fourth Semester | | | |
|---|---|---|---|
| **Title of the Paper: Internet of Things** | | | |
| **Paper** | **SPT 4.3 B** | CIE Marks | 30 |
| No of Hours/Week: | 4 | SEE Marks | 70 |
| Total Hours: | 48 | Credits | 04 |

**Course Outcomes:**

- Understand the various concepts, terminologies and architecture of IoT systems.
- Use sensors and actuators for design of IoT.
- Understand and apply various protocols for design of IoT systems
- Use various techniques of data storage and analytics in IoT
- Understand various applications of IoT
- Understand APIs to connect IoT related technologies

**UNIT I**                                                                                                 **8 Hours**

Fundamentals of IoT: Introduction, Definitions & Characteristics of IoT, IoT Architectures, Physical & Logical Design of IoT, Enabling Technologies in IoT, History of IoT, About Things in IoT, The Identifiers in IoT, About the Internet in IoT, IoT frameworks, IoT and M2M.

**UNIT II**                                                                                             **10 Hours**

Sensors Networks : Definition, Types of Sensors, Types of Actuators, Examples and Working, IoT Development Boards: Arduino IDE and Board Types, RaspberriPi Development Kit, RFID Principles and components, Wireless Sensor Networks: History and Context, The node, Connecting nodes, Networking Nodes, WSN and IoT.

**UNIT III**                                                                                         **10 Hours**

Wireless Technologies for IoT: WPAN Technologies for IoT: IEEE 802.15.4, Zigbee, HART, NFC, Z-Wave, BLE, Bacnet, Modbus. IP Based Protocols for IoT IPv6, 6LowPAN, RPL, REST, AMPQ, CoAP, MQTT. Edge connectivity and protocols

**UNIT IV**                                                                                         **10 Hours**

Data Handling& Analytics: Introduction, Bigdata, Types of data, Characteristics of Big data, Data handling Technologies, Flow of data, Data acquisition, Data Storage, Introduction to Hadoop. Introduction to data Analytics, Types of Data analytics, Local Analytics, Cloud analytics and applications

**UNIT V**                                                                                          **10 Hours**

Applications of IoT: Home Automation, Smart Cities, Energy, Retail Management, Logistics, Agriculture, Health and Lifestyle, Industrial IoT, Legal challenges, IoT design Ethics, IoT in Environmental Protection.

**Text Books:**

1. Hakima Chaouchi, ― "The Internet of Things Connecting Objects to the Web" ISBN : 978-1- 84821-140-7, Wiley Publications

2. Olivier Hersent, David Boswarthick, and Omar Elloumi, ― "The Internet of Things: Key Applications and Protocols", WileyPublications

3. Vijay Madisetti and ArshdeepBahga, ― "Internet of Things (A Hands-on-Approach)", 1 st Edition, VPT, 2014.

4. J. Biron and J. Follett, "Foundational Elements of an IoT Solution", O'Reilly Media, 2016.

5. Keysight Technologies, "The Internet of Things: Enabling Technologies and Solutions for Design and Test", Application Note, 2016.

**Reference Books:**

1. Daniel Minoli, ― "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", ISBN: 978-1-118-47347-4, Willy Publications

2. Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press

3. https://onlinecourses.nptel.ac.in/noc17_cs22/course

4. http://www.cse.wustl.edu/~jain/cse570-15/ftp/iot_prot/index.html

| Fourth Semester | | | |
|---|---|---|---|
| Title of the Paper: Mobile App Development Lab | | | |
| **Paper** | **CPP 4.4** | CIE Marks | 15 |
| No of Hours/Week: | 4 | SEE Marks | 35 |
| Total Hours: | 48 | Credits | 02 |

**List of Practical Programs:**

1. Develop an application that uses GUI components, Font and Colours

2. Develop an application that uses Layout Managers and event listeners.

3. Write an application that draws basic graphical primitives on the screen.

4. Develop an application that makes use of databases.

5. Develop an application that makes use of Notification Manager.

6. Implement an application that uses multi-threading.

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 makes use of RSS feed

11. Develop a mobile application to send an email.

12. Develop a Mobile application for simple needs

13. Develop an application that uses GUI components, Font and Colours

| Fourth Semester | | | |
|---|---|---|---|
| Title of the Paper: Machine Learning Lab | | | |
| **Paper** | **CPP 4.5** | CIE Marks | 15 |
| No of Hours/Week: | 4 | SEE Marks | 35 |
| Total Hours: | 48 | Credits | 02 |

## List of Practical Programs:

1. The probability that it is Friday and that a student is absent is 3 %. Since there are 5 school days in a week, the probability that it is Friday is 20 %. What is the probability that a student is absent given that today is Friday? Apply Baye's rule in python to get the result. (Ans: 15%) 13

2. Extract the data from database using python

3. Implement k-nearest neighbor's classification using python

4. Given the following data, which specify classifications for nine combinations of VAR1 and VAR2 predict a classification for a case where
   VAR1=0.906 and VAR2=0.606, using the result of kmeans clustering with 3 means (i.e., 3 centroids) periments

```
VAR1 VAR2 CLAS
1.713  1.586   0
0.180  1.786   1
0.353  1.240   1
0.940  1.566   0
1.486  0.759   1
1.266  1.106   0
1.540  0.419   1
0.459  1.799   1
0.773  0.186   1
```

5. The following training examples map descriptions of individuals onto high, medium and low credit-worthiness.

   Medium skiing design single twenties no -> highRisk
   high golf trading married forties yes -> lowRisk
   low speedway transport married thirties yes -> medRisk
   medium football banking single thirties yes -> lowRisk
   high flying media married fifties yes -> highRisk
   low football security single twenties no -> medRisk
   medium golf media single thirties yes -> medRisk
   medium golf transport married forties yes -> lowRisk
   high skiing banking single thirties yes -> highRisk

low golf unemployed married forties yes -> highRisk

Input attributes are (from left to right) income, recreation, job, status, age-group, home-owner. Find the unconditional probability of `golf' and the conditional probability of `single' given `medRisk' in the dataset?

6. Implement linear regression using python.

7. Implement Naïve Bayes theorem to classify the English text

8. Implement an algorithm to demonstrate the significance of genetic algorithm

9. Implement the finite words classification system using Back-propagation algorithm

| Fourth Semester | | | |
|---|---|---|---|
| Title of the Paper: Digital Image Processing Lab | | | |
| Paper | SPP 4.6 A | CIE Marks | 15 |
| No of Hours/Week: | 4 | SEE Marks | 35 |
| Total Hours: | 48 | Credits | 02 |

### List of Practical Programs:

1. Extract the total number of pixels from image

2. To convert RGB image into gray image

3. Convert RGB image into gray image and Binary Image

4. To convert original image into blurring image

5. To create python program to detect image edge.

6. To create python program to resize image.

7. To create python program to rotation image.

8. Simulation and Display of an Image, Negative of an Image (Binary & Gray Scale)

9. Implementation of Relationships between Pixels

10. Implementation of Transformations of an Image

11. Implementation of shearing of an Image

12. Implementation of normalization of an Image

13. Implementation of Image shearing

14. Image Compression by DCT, DPCM, HUFFMAN coding

15. Implementation of image restoring techniques

| Fourth Semester | | | |
|---|---|---|---|
| **Title of the Paper: Internet of Things Lab** | | | |
| **Paper** | **SPP 4.6 B** | CIE Marks | 15 |
| No of Hours/Week: | 4 | SEE Marks | 35 |
| Total Hours: | 48 | Credits | 02 |

### List of Practical Programs:

1. Select any one development board (Eg., Arduino or Raspberry Pi) and control LED using the board.

2. Using the same board as in (1), read data from a sensor. Experiment with both analog and digital sensors.

3. Control any two actuators connected to the development board using Bluetooth.

4. Read data from sensor and send it to a requesting client. (using socket communication) Note: The client and server should be connected to same local area network.

5. Create any cloud platform account, explore IoT services and register a thing on the platform.

6. Push sensor data to cloud.

7. Control an actuator through cloud.

8. Access the data pushed from sensor to cloud and apply any data analytics or visualization services.

9. Create a mobile app to control an actuator.

10. Design an IoT based air pollution control system which monitors the air pollution by measuring carbon monoxide, ammonia, etc and gives alarm or sends message when the pollution level is more than permitted range.

11. Design an IoT based system which measures the physical and chemical properties of the water and displays the measured values.

12. Identify a problem in your local area or college which can be solved by integrating the things you learned and create a prototype to solve it (Mini Project).

13. Design a business model canvas for a digital display

| Fourth Semester | | | |
|---|---|---|---|
| **Title of the Paper: Major Project** | | | |
| **Paper** | **PROJECT 4.7** | CIE Marks | 15 + 30 |
| No of Hours/Week: | 12 | SEE Marks | Viva - Voce 35 <br><br> Dissertation 70 |
| Total Hours: | 48 | Credits | 06 |

**General Guidelines for Project to be done in Fourth Semester**

The syllabus proposes the introduction of a project to be done by students in Semester IV. It is an individual student project with the allocation of 150 Marks.

The objective of introducing the Project is to introduce a Project Based Learning which helps the student

1. To explore the important core and applications areas of Computer Science.

2. To know about innovations, technological developments and new research initiatives in various areas of Computer Science.

3. To motivate students to write a research or technical paper on the project undertaken by them. This makes the course learner centered and helps them to understand the concepts covered in the syllabus and how to apply to real life situations.

Working on a project is expected to increase the problem solving ability and analytical thinking, thus helping them to face the industrial and professional demands (at least partially) once he or she completes the course.

- The projects shall be undertaken by the students under the guidance of the teacher teaching course or the experts approved by the teacher In charge.
- Each student can chose a topic with the approval of the teacher In charge.
- The topic selected should be related to the topics covered in the syllabus or any other allied area of Computer Science.
- The project work should be spread over a period of at least 16 weeks.
- The project should cover problem solving using the concepts mentioned in the syllabus, and approved by the teacher.
- Weightage shall be given to research projects, live projects and the projects with new concepts.

# Theory Question paper pattern:

**Instructions to Candidates: Answer all the Questions**

**Time: 3 Hours**          **Max. Marks = 70**

**I.  Answer any Ten Questions of the following**

**1. Answer in Brief**          **(10 X 2 = 20)**

(a)

(b)

(c)

(d)

(e)

(f)

(g)

(h)

(i)

**II. Write Short notes on the following (Answer any FOUR)**      **(4 x 5 = 20)**

2.

3.

4.

5.

6.

**III. Answer any three questions of the following**

**7. Essay type questions (Answer any THREE)**      **(3 x 10 = 30)**

(a)

(b)

(c)

(d)

(e)

**PRACTICAL EXAMINATION PATTERN:**

| | | |
|---|---|---|
| 1) | Writing and Execution of the Programs | 25 |
| 2) | Viva - Voce | 5 |
| 3) | Records | 5 |
| **Total Marks** | | 35 |
| 4) | **Internal marks for practical** | 15 |
| **Grand Total:** | | **50 Marks** |