**SBRR MAHAJANA FIRST GRADE COLLEGE (Autonomous)**
**POST GRADUATE WING**
**Pooja Bhagavat Memorial Mahajana Education Centre.**

## Scheme & Syllabus of
## Master of Computer Application w.e.f. 2019-20

## List of HardCore Courses

| Sl.No | Courses | Credit Pattern [L:T:P] | Credits |
|---|---|---|---|
| 1. | C Programming | 3:0:1 | 4 |
| 2. | Discrete Mathematical Structures | 3:1:0 | 4 |
| 3. | Operating System | 3:1:0 | 4 |
| 4. | Fundamentals of Data Structures | 3:0:1 | 4 |
| 5. | Database Management System | 3:0:1 | 4 |
| 6. | Object Oriented Programming with C++ | 3:0:1 | 4 |
| 7. | Advanced Software Engineering | 3:1:0 | 4 |
| 8. | Java Programming | 3:0:1 | 4 |
| 9. | Web Programming | 2:0:2 | 4 |
| 10. | Analysis and Design of Algorithms | 2:1:1 | 4 |
| 11. | Python Programming | 3:0:1 | 4 |
| 12. | Linux Programming | 3:0:1 | 4 |
| 13. | Dissertation Work | 0:2:10 | 12 |

## List of SoftCore Courses

| Sl.No | Courses | Credit Pattern [L:T:P] | Credits |
|---|---|---|---|
| 1. | Computer Organisation and Architecture | 4:0:0 | 4 |
| 2. | Computer Graphics | 2:1:1 | 4 |
| 3. | Data Communication and Networks | 3:1:0 | 4 |
| 4. | Fundamentals of IoT Technology | 3:1:0 | 4 |
| 5. | Communication Skills | 3:1:0 | 4 |
| 6. | Mobile Application Development with Android | 2:1:1 | 4 |
| 7. | Cloud Computing | 3:1:0 | 4 |
| 8. | Advanced Java | 2:1:1 | 4 |
| 9. | Machine Learning | 2:1:1 | 4 |
| 10. | Graph Theory | 3:1:0 | 4 |
| 11. | Distributed Computing | 3:1:0 | 4 |
| 12. | Numerical Algorithms | 3:0:1 | 4 |
| 13. | Probability and Statistics | 3:1:0 | 4 |
| 14. | Theory of Languages and Automata | 2:1:1 | 4 |
| 15. | Digital Image Processing | 3:0:1 | 4 |
| 16. | Cryptography and Network Security | 3:1:0 | 4 |
| 17. | C# Programming | 3:0:1 | 4 |
| 18. | Operations Research | 3:1:0 | 4 |
| 19. | System Software | 3:0:1 | 4 |

| | | | |
|---|---|---|---|
| 20. | System Analysis and Design | 3:1:0 | 4 |
| 21. | Information Retrieval | 3:0:1 | 4 |
| 22. | Big Data Analytics | 2:1:1 | 4 |
| 23. | Information Systems Management | 3:1:0 | 4 |
| 24. | E – Commerce | 3:1:0 | 4 |
| 25. | Simulation and Modelling | 3:0:1 | 4 |
| 26. | Artificial Intelligence | 3:1:0 | 4 |
| 27. | Pattern Recognition | 2:1:1 | 4 |
| 28. | Entrepreneurship Development | 3:1:0 | 4 |
| 29. | Cyber Security and Forensic Development | 3:1:0 | 4 |
| 30. | Values and Ethics | 3:1:0 | 4 |
| 31. | Mobile Communication | 3:1:0 | 4 |

A Masters Degree program is of 6 semesters-three year's duration for regular candidates and 4 semester- two years duration for lateral entry candidates. A regular candidate can avail a maximum of 12 semesters – 6 years (in one stretch) to complete Masters Degree (including blank semesters, if any) whereas lateral entry candidates can avail a maximum of 8 semesters – 4 years (in one stretch) to complete Masters Degree (including blank semesters, if any).

A candidate has to earn a minimum of 112 credits, for successful completion of a Master's degree with a distribution of credits for different courses as given in the following table.

| **Course Type** | **Credits** |
|---|---|
| Hard Core | 60 |
| Soft Core | A minimum of 40, but not exceeding 48 |
| Open Elective | A minimum of 4, but not exceeding 12 |

Lateral entry students must earn a minimum of 76 credits, for successful completion of a Master's degree with a distribution of credits for different courses as given in the following table.

| **Course Type** | **Credits** |
|---|---|
| Hard Core | 40 |
| Soft Core | A minimum of 28, but not exceeding 32 |
| Open Elective | A minimum of 4, but not exceeding 8 |

Every course including project work, practical work, field work, seminar, self study elective should be entitled as hard core or soft core or open elective by the BoS concerned.

## HC C PROGRAMMING 3:0:1

**Objectives:**

- Obtain knowledge on the need of programming languages, basics of C programming, operators and expressions, Input and output operations.
- Gain knowledge on Decision making, branching statements and structured data types.
- Understand the need of user defined functions.
- Understand pointers and file handling operations.

**Outcomes:**

Students will be able to:

- Employ the basics of C to write and execute simple C programs.
- Use Branching and looping statements in the logic of the program.
- Implement user defined functions effectively.
- Apply the concept of pointers and file handling operations in C.

### Unit I: Overview of C

Importance of C, Basic structure of C Programs, Basic programming constructs-Character set, tokens, Constants, Variables, and Data Types, Keywords, Identifiers and symbolic constants.

Operators and Expression – Arithmetic, relational, logical, increment and decrement, conditional, bitwise, Expression, precedence of operators, type conversion and casting, mathematical functions.

Managing Input and Output Operations - Reading a character, writing a character, formatted input/output and unformatted input/output.

### Unit II: Decision Making and Branching

Decision Making and Branching – If statement – Different forms of if statement, switch, break and continue, Looping statements in C – for, while, do while, nested loops. Structured data types in C – Array – One dimensional, two dimensional and Multi-dimensional array. Strings, Structures and union

### Unit III: User-Defined Functions

Need for user-defined functions, multi-function program and general form of C function. Category of functions, nesting of functions, Recursion, functions with arrays and structures. Storage Classes - scope and lifetime of variables in functions.

**Unit IV: Pointers and File Handling**

Understanding pointers, accessing the address of a variable, declaring, initializing, assigning values to pointers and accessing a variable through its pointer. File Handling– Definition, need of file, opening and closing a file, Input and output operations on files and random access to files with example.

**References**

1. C programming Language -Kernigham and Ritchie, 2nd Edition, PHI Publications

2. Programming in ANSI C - E Balaguruswamy, 2nd Edition Tata McGraw Hill.

3. Let Us C – YashwantKanetkar, 13th Edition, BPB publication

4. Problem Solving with C - M.T. Somashekara, PHI Learning, New Delhi.

## HC DISCRETE MATHEMATICAL STRUCTURES 3:1:0

**Objectives:**

- Analyze to solve problems using simple techniques of counting theory, and set theory
- Learn the fundamentals of logic and identify the Use of quantifiers, the nature of proofs.
- Learn the basic concepts of mathematical induction, Relations and functions.
- Learn the concepts of graph theory and applications.

**Outcomes:**

Students will be able to:

- Apply the principles of counting and set theory.
- Identify the quantifiers and their uses and Make use of fundamentals of logic theory and proofs.
- Apply the concepts of mathematical induction, relations and functions to solve given problem.
- Make use of basic concepts of graph theory and solve the given problem.

**Unit I**

Principles of Counting: The Rules of Sum and Product, Permutation, Combinations, combinations with repetition. Problems.

Sets and Subsets: Set Operations ,Membership table method and Venn diagram method and the Laws of Set Theory, Addition principle-Counting and Venn Diagrams, A First Word on Probability.

**Unit II**

Fundamentals of Logic: Basic Connectives and Truth Tables, Logic Equivalence – The Laws of Logic theory, Logical Implication – Rules of Inference. Argument – Definition, validity and invalidity.

The Use of Quantifiers: Quantifiers, Definitions ,Argument representation using quantifiers, validity.

Proofs of Theorems- Direct and Indirect method - contradiction and contrapositive method.

**Unit III**

Relations and Functions: Properties of the Integers: Mathematical Induction, The Well Ordering Principle- Mathematical Induction (Alternative form)(problems),Recursive Definitions

Cartesian Products and Relations, Functions – Plain and One-to-One, Onto Functions – Stirling Numbers of the Second Kind, Special Functions, The Pigeon-hole Principle, Function Composition and Inverse Functions.

**Unit IV**

An Introduction to Graph Theory: Definitions and examples Sub graphs, Complements, and Graph Isomorphism, Vertex Degree : Euler Trails and Circuits, Planar Graphs, Hamiltonian Paths and Cycles.

Graph coloring and Chromatic Numbers. Definitions, Properties and examples Rooted trees, Trees and sorting. Weighted Trees and Prefix codes. Spanning trees- minimal spanning tree by Prim's and Kruskal's Algorithm.

**References:**

1. Discrete and Combinatorial Mathematics - Ralph P. Grimaldi, Pearson Education,
2. Discrete Mathematics and its Applications - Kenneth H. Rosen, McGraw Hill.
3. Discrete Mathematical Structures with Applications to Computer Science - Tremblay and Manohar , McGraw-Hill Publications.
4. A Treatise on Discrete Mathematical Structures– JayantGanguly, Sanguine-Pearson.
5. Discrete Mathematical Structures –Dr.D.S.Chandrashekaraiah.

## HC OPERATING SYSTEM 3:1:0

**Objectives:**

- Understand the fundamental principles of operating system, processes and their communication.
- Understand the concepts of process management.
- Understand the concepts of Memory Management.
- Know the concepts of filesystems and the disk managementin Operating Systems.

**Outcome:**

Students will be able to:

- Understand the usage of the operating system components and its services.
- Employ the concepts of process management.
- Employ the concepts of Memory Management
- Applythe file handling concepts in OS perspective.

**Unit I**

Introduction -Computer System Organisation – Computer system architecture – Operating system operations - Operating systems services-System calls- Types of system calls – Operating system structure.

Processes-process concept- process scheduling-operation on processes.Multithreaded programming – Multithreading models – Threading issues.

**Unit II**

Process Scheduling - Scheduling criteria-Scheduling algorithms – Thread scheduling - Multiple-processor Scheduling.

Process Synchronization – Critical Section problem – Peterson's solution - Semaphores-Classical problems of synchronization - critical regions – Introduction to Monitors.

**Unit III**

Deadlocks – System model - Deadlock Characterization - Deadlock handling - Deadlock Prevention - Deadlock avoidance - Deadlock Detection - Deadlock Recovery.

Memory Management – Swapping - Contiguous Memory allocation -Segmentation Paging.

Virtual Memory Management - Demand paging – Copy on write - Page Replacement - Thrashing.

**Unit IV**

File System – File concept – Access methods – Directory structure – Directory and disk structure - File Systems structures - Directory Implementation - Allocation Methods - Free Space management.

Disk Structures – Disk attachment - Disk Scheduling – Disk management.

**References:**

1. Operating Systems Concepts - Abraham Silberschatz Peter B Galvin, G.Gagne, 9thEdition, John Wiley & Sons.
2. Modern operating Systems-Andrew S.Tanenbaum, Third Edition, PHI Learning Pvt. Ltd.
3. Operating Systems: A Concept-based Approach - D M Dhamdhere, Second Edition, Tata McGraw-Hill Education
4. Operating Systems-H M Deital, P J Deital and D R Choffnes3rd edition, Pearson Education
5. Operating Systems: Internals and Design Principles-William Stallings, Seventh Edition, Prentice Hall,

## HC FUNDAMENTALS OF DATA STRUCTURES 3:0:1

**Objectives:**

- Impart the basic concepts of data structures and algorithms
- Understand concepts about searching and sorting techniques
- Know the basic concepts about stacks,queues,lists,trees and graphs
- Have knowledge of trees and graphs concepts

**Outcomes:**

Students will be able to:

- Analyse algorithms and algorithm correctness.
- Summarize searching and sorting techniques
- Describe stack,queue and linked list operation.
- Solve the problems writing algorithms by using fundamental data structures

**Unit I**

Introduction – Need for data structures, classification of data structures, Introduction to algorithm- Sequential, Selection and Iteration, Algorithmic notations, Concept and terminology for non-primitive Data structures.

Arrays-Memory Representation of 1D and 2D, Operations on Arrays.

Stacks- Definitions and Concepts, Operations on stacks, Applications of stacks- Recursion, Infix to postfix, and Evaluating postfix expressions.

**Unit II**

Queues- Linear, Circular and Priority Queues, Operation on queues, applications.

Linked list: Pointers and Linked Allocation, Linked linear lists, Operations on Linear lists.

Circular linked lists- Memory Representation.
Doubly linked linear lists- Memory Representation.

**Unit III**

Nonlinear Data Structures.

Trees - Definition and concepts, Operations on Binary Trees, Storage Representations of Binary Trees- Sequential and Linked, Tree Traversal, Binary Search Tree- Creation and Traversal.

**Unit IV**

Sorting and searching.

Sorting- Selection sort, Bubble Sort, Insertion Sort, Merge Sort, Quick Sort, Radix sort.

Searching- Sequential and Binary searching.

**References:**

1. An Introduction to Data Structures with Applications 2nd edition - J.P.Trembly and Sorenson, McGraw Hill.
2. Data structures using C , Aaron M Tenenbaum, YedidyahLangsam, Pearson
3. Data Structures And Program Design In C, Robert L Cruse, Pearson
4. Systematic Approach to Data Structures Using C by Padma Reddy

## HC DATABASE MANAGEMENT SYSTEM 3:0:1

**Objectives:**

- Understand the different issues involved in the design and implementation of a database system.
- Study the physical and logical database designs, database modelling, relational, hierarchical, and network models.
- Understand and use data manipulation language to query, update, and manage a database.
- Design and build a simple database system and demonstrate competence with the fundamental tasks involved with modelling, designing, and implementing a DBMS.

**Outcome:**

Students will be able to:

- Describe the database architecture and system concepts.
- Employ the techniques of SQL in Relational database.
- Implement simple database system by utilising Data models and schema.
- Employ normalization techniques to overcome Database anomalies.

**Unit I**

Introduction to Database System Concepts and Architecture, Databases and Database Users, Characteristics of the Database Approach, Actors on the Scene, Advantages of Using a DBMS.

Data Models, Schemas and Instances, DBMS Architecture and Data Independence, Database Languages and Interfaces, The Database System Environment. Data Modeling Using the Entity-Relationship Model.

Entity Types, Entity Sets, Attributes, and Keys, Relationship Types, Relationship Sets, Roles, and Structural Constraints, Weak Entity Types**,** ER Diagrams, Naming Conventions and Design Aspects.

**Unit II**

SQL-The Relational Database Standard.

Data Definition, SQL Data Types and Schemas, Constraints, Basic Queries in SQL, Insert, Delete, and Update Statements in SQL, Set Operations, Aggregate functions, Views (Virtual Tables) in SQL, Joins – Inner, Outer and Self, Additional Features of SQL,DCL-commit, Rollback, Save-point, Grant privileges.

**Unit III**

Relational Data Model Relational Constraints, and Relational Algebra. Relational Model Concepts, Relational Model Constraints and Relational Database Schemas, Basic Relational

Algebra Operations, Additional Relational Operations, Examples of Queries in Relational Algebra.

**Unit IV**

Normalization- Functional Dependencies, Transitive and Multivalued dependency, First Normal form, Second Normal Form, Third Normal Form and Boyce Codd Normal Form, Advantages of RDBMS- Codd's Rules.

Transaction- Concepts, States, ACID properties, Concurrent executions and Serializability.

**References:**

1. Fundamentals of Database Systems -Navathe and Elmasri –Pearson Education, Fifth Edition.
2. Database Systems Concepts, 3rd edition - Abraham Silberschatz, Henry Korth and S. Sudarshan McGraw Hill International Editions.
3. Introduction to Database systems - CJ Date, Published by Addison-Wesley.
4. Principles of database systems - Ullman, Computer Science press.

## HC OBJECT ORIENTED PROGRAMMING WITH C++ 3:0:1

**Objectives:**

- Understand how C++ improves C with object-oriented features.
- Learn how to write various C++ functions efficiently.
- Learn the concepts of extended Object oriented programming
- Understand the concepts of files and I/O operations

**Outcome:**

Students will be able to:

- Employ the syntax and semantics of the C++ programming language.
- Use function prototyping and different methods involved in function implementation.
- Implement extended Object oriented programming techniques.
- Describe and implement the significance of files and I/O operations.

**Unit I : Introduction**

Procedure-oriented programming, Concepts of Object-oriented programming, benefits of OOP, Applications of OOP, Structure of C++ program.

Tokens, Keywords, Identifiers and constants, Basic Data Types, User-defined data types, Derived data Types, Symbolic constants, Type compatibility, Declaration of variables, Dynamic initialization of variables, Reference variables, Operators in C++, Scope resolution operator, Member dereferencing operators, Memory management operators, Manipulators, Type cast operator, Expressions and their types, Special assignment expressions, Implicit conversions, Operator overloading, Operator precedence, Control structures.

**Unit II : Functions**

The main function, Function prototyping, Call by Reference, Return by Reference, Inline functions, Default arguments, const arguments, Function overloading, Friend and Virtual functions.

**Classes and Objects**

Specifying a Class, Defining member functions, Making an Outside function Inline, Nesting of member functions, Private member functions, Arrays within a Class, Static data members, Static member functions, Arrays of Objects, Objects as function arguments, friendly functions, Returning Objects, const member functions, Pointers to members.

**Constructors and Destructors**

Constructors, Parameterized constructors, Multiple constructors in a class, Constructors with default arguments, Dynamic initialization of objects, Copy constructor, Dynamic constructor, Constructing Two-dimensional arrays, const Objects, Destructors.

**Unit III : Operator Overloading and Type Conversions**

Defining operator overloading, Overloading unary operators, Overloading Binary operators, Rules for overloading operators, Type conversions.

**Inheritance and Polymorphism**: Introduction, defining derived classes, single inheritance, making a private member inheritable, multilevel inheritance, hierarchical inheritance, hybrid inheritance, virtual base classes, abstract classes, constructors in derived classes, polymorphism – introduction, pointers, pointers to objects, this pointers, pointers to derived classes, virtual functions, pure virtual functions.

**Unit IV : Console I/O Operations, Files and Templates**

C++ streams, C++ stream classes, Unformatted I/O operations, Formatted I/O operations, managing output with manipulators.

**Files:** Classes for file stream operations, opening and closing a file, detecting end of file, more about open(): file modes, file pointers and their manipulations, sequential input and output operations.

**Templates:** Function templates and Class templates

**References:**

1. Object Oriented Programming with C++ - E. Balagurusamy.
2. Object Oriented Programming with C++ - M.T. Somashekara, D.S. Guru, H.S. Nagendraswamy, K.S. Manjunatha, PHI Learning, New Delhi.
3. Object Oriented Programming in C++ - Robert LaforeTechmedia Publication.
4. The complete reference C – Herbert shieldt Tata McGraw Hill Publication.

## HC ADVANCED SOFTWARE ENGINEERING 3:1:0

**Objectives:**

- Understand the importance of domain knowledge and its work around.
- Know the importance team work and stewardship.
- Analyze and implement solutions to complex problems involving computers.
- A solid understanding to the methods of modern software engineering.

**Outcome:**

Students will be able to:

- Work in one or more significant application domains.
- Work as an individual and as part of a multidisciplinary team to develop and deliver quality software.
- Demonstrate an understanding of and apply current theories, models, and techniques that provide a basis for the software lifecycle.
- Demonstrate an ability to use the techniques and tools necessary for engineering practice

**UNIT I: Requirements**

Introduction - Professional and ethical responsibility. Critical systems: Systems dependability, availability, reliability, safety and security. Software processes: Software process models, process iteration, process activities, Project Management: Management activities, project planning and project scheduling. Requirement - Software requirements: Functional and non-functional requirements, user and system requirement. System models: Context, behavioural, data, object and structural method models.

**UNIT II: Design**

Architectural Design: System organization and control styles. Distributed systems architectures: client-server architectures and Distributed object architectures. Application architectures: Data processing systems and Transaction processing systems. User interface design: Design issues, UI design process, user analysis and interface evaluation.

**UNIT III: Development**

Rapid software development: Extreme programming, Rapid application development and software prototype. Critical systems development: Dependable processes, Dependable programming, Fault tolerance and Fault-tolerant architecture.

**UNIT IV: Verification and Validation**

Verification and Validation: Planning verification and validation and Software inspection. Software testing: System testing, Component testing, Test Case design and test automation.

Critical system validation: Reliability validation, Safety assurance and Security assessment. Software cost estimation: Software productivity and estimation technique. Quality management: Process and product quality.

**References:**

1. Software Engineering - Ian Sommerville, 8th Edition, Pearson Education Ltd.,
2. Software Engineering – A practitioners approach, Roger. S. Pressman, Tata-McGraw Hill 6th Edition.
3. Fundamentals of software engineering - Rajib Mall, Phi learning Pvt. Ltd, 3rd edition.

## HC JAVA PROGRAMMING 3:0:1

**Objectives:**

- Gain knowledge about basic of Java language syntax and semantics.
- Understand the fundamentals of object-oriented programming in Java, including defining classes, objects, invoking methods etc and exception handling mechanisms.
- Gain knowledge on multi-threads programming,applet programming and Graphics Programming.
- Understand networking concepts and connecting Java application with database of Java.

**Outcomes:**

Students will be able to:

- Identify classes, objects, members of a class and relationships among them needed for a specific problem.
- Write Java programs to implement error handling techniques using exception handling
- Demonstrate the concepts of applet and graphics programming.
- Develop a java application to connect with database using JDBC connectivity.

**Unit I: Introduction to Java**

Origin and features of Java. Java Program Structure, Java Tokens, Java statements, Java Virtual machine, Command Line Parameters, Java Variables and Data Types, Operators, Decision Making, Branching and looping statements.

Classes, Objects and Methods used in Java: Class fundamentals, Methods, Constructors, Overloading, Inheritance, Interfaces, One and two dimensional arrays, Vectors, Strings, Wrapper Classes.

**Unit II: Java Packages**

API packages, system packages, naming conventions, creating and accessing a package, adding a class to a package, hiding classes.

Multi-threads Programming: Java thread Model, Main Thread, creating a Thread, Creating Multiple Threads, Extending the thread class, Stopping and blocking a thread, Life cycle of a thread, Managing Errors and Exceptions.

**Unit III: AppletProgramming**

Introduction, how applet differs from application, Applet life cycle, Applet tag, passing parameters to applet. Abstract Windows Toolkit: Components, Container, Panel, Label, Button, Checkbox, Checkbox Group, Choice, List, Text Field, Text Area, Scrollbars.

Graphics Programming: The Graphics class, Lines and Rectangles, Circles and Ellipses, Drawing Arcs, Drawing Polygons, Line Graphs, Using Control Loops in Applets.

**Unit IV: Managing Input/output Files in Java**

Stream Classes, Byte Stream Classes, Character Stream Classes, Creation of Files, Reading/Writing characters, Reading/Writing Bytes, Handling Primitive Data Types, Concatenating and Buffering Files, Random Access Files.

Networking: InetAddress, TCP/IP Client Sockets, TCP/IP Server Sockets, URL, URLConnection, JDBC connectivity

**Reference Books:**

1. Programming with Java – A PRIMER by E.Balagurusamy, Tata McGraw-Hill 3rd Edition
2. The Complete Reference - Java-2 by Patrick Naughton and Herbert SchildPublished by Tata McGraw-Hill India.
3. The Complete Reference – J2EE by Jim Keogh, published by Tata McGraw-Hill.

## HC WEB PROGRAMMING 2:0:2

**Objectives:**

- Understand the fundamentals concepts of Web programming.
- Know the different techniques involved in Cascading Style Sheets (CSS).
- Learn to implement the concepts of JavaScript.
- Learn scripting withPerl building blocks.

**Outcomes:**

Students will be able to:

- Apply a structured approach to identifying needs, interests, and functionality of a website.
- Modify existing HTML, CSS, and JavaScript code to extend and alter its functionality, and to correct errors.
- Use JavaScript to add dynamic content to pages.
- Write scripts using the fundamental Perl building blocks.

**UNIT I:Fundamentals of Web**

Internet, WWW, Web Browsers, and Web Servers; URLs; MIME; HTTP; Security; the Web Programmers Toolbox. HTML: Origins and evolution of HTML; Basic syntax; Standard HTML document structure; Basic text mark-up, Hypertext Links; Lists; Tables; Forms; Frames.

**UNIT II: Cascading Style Sheets (CSS)**

Introduction; Levels of style sheets; Style specification formats; Selector forms; Property value forms; Font properties; List properties; Color; Alignment of text; The Box model; Background images; Redefining Tags.

**UNIT III:JavaScript**

Overview of JavaScript; Object orientation and JavaScript; General syntactic characteristics; Primitives, operations, and expressions; Screen output and keyboard input; Control statements; Object creation and modification; Arrays; Functions; Constructor; Pattern matching using regular expressions; Errors in scripts; Examples.

**UNIT IV: Perl and CGI Programming**

Origins and uses of Perl, Scalars and their operations, Assignment statements and simple input and output, Control statements, Fundamentals of arrays, Hashes, References, Functions, Pattern matching, File input and output; Examples.

Using Perl for CGI Programming: The Common Gateway Interface; CGI linkage; Query string format; Cookies.

**References:**

1. Programming the World Wide Web – Robert W. Sebesta, 4th Edition, Pearson Education.
2. Internet & World Wide Web How to H program – M. Deitel, P.J. Deitel, A. B. Goldberg, 3rd Edition, Pearson Education / PHI.
3. Web Programming Building Internet Applications – Chris Bates, 3rd Edition, Wiley India.
4. The Web Warrior Guide to Web Programming – Xue Bai et al, Thomson.

## HC ANALYSIS AND DESIGN OF ALGORITHMS 2:1:1

**Objectives:**

- Introduce basic concepts of algorithms.
- Learn mathematical aspects and analysis of algorithms.
- Understand sorting and searching algorithms.
- Implement different algorithm design methods.

**Outcomes:**

Students will be able to:

- Model, and analyze a given problem as an algorithm.
- Investigate whether the algorithm found is the most efficient.
- Formulate thespace needs, time order analysis for the implementation of an algorithm.
- Apply appropriate approximation algorithms for P and NP type problems.

**Unit I**

Algorithms- Analysis, Design, Complexity Analysis, Analysis and Profiling, Expressing in Order notations, Establishing Bounds, Iterative and Recursive algorithms, Review of Data Structure based algorithms, Sets-Union and Intersection, Matrices, Binary tree structures, Heaps-check, insertion, creation, deletion, sorting, Case studies- Base conversion, Prime and Fibonacci numbers, Sorting Algorithms- Selection, Exchange, Insertion, Greater Common Divisor, Least Common Multiple.

**Unit II**

Divide and Conquer- Binary search, Max-Min search, Merge sort, Quick sort, Transfer and Conquer – solution to simultaneous equations by triangularization, diagonalization algorithms.

**Unit III**

Greedy Algorithms- Tape filling, Knapsack, Job sequencing, Optimal merge pattern, Single source shortest paths, Minimum spanning trees-Kruskal's algorithm, Prim's algorithm.
Dynamic Programming – multistage graphs, all pairs shortest paths, Traveling salesman problem, 0/1 Knapsack problem

**Unit IV**

Search and Traversal: BFS; DFS, Backtracking method- 8-queen Problem, sum of subsets problem, Branch and Bound method – 0/1 knapsack problem, traveling salesman problem.
Complexity issues- P type, NP type, two stage algorithm approach for NP problem

**References:**

1. Computer Algorithms by Ellis Horowitz, SartajSahni and SanguthevarRajasekaran

2. How to solve it by Computer by R.G.Dromey
3. Introduction to the Design & Analysis of Algorithms by Anany V. Levitin
4. Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein.

## HC PYTHON PROGRAMMING 3:0:1

**Objectives:**

- Introduce the basic concepts Python programming.
- Understand programming paradigms brought in by Python with a focus on Regular Expressions, List and Dictionaries.
- Understand the concepts of image processing.
- Know the techniques of Data mining.

**Outcomes:**

Students will be able to:

- Apply the basic concepts of Python programming.
- Impart the Hands on Regular Expression, Text Processing scripts and file handling scripts.
- Implement Python for Data and Image processing.
- Get hands on experience of Cluster Analysis using Python.

**Unit I**

Python Fundamentals: Introduction, Python Objects, Built-in Functions, Numbers and Strings, Conditionals and Loops, Functions, Passing Arguments, String Functions

Operators, Built-in Functions, List Type Built-in Methods, Special Features of Lists, Tuples, Tuple Operators and Built-in Functions, Special Features of Tuples File Objects, File Built-in Function, File Built-in Methods, File Built-in Attributes, Standard Files, Command-line Arguments, File System, File Execution, Persistent Storage Modules

**Unit II**

Regular Expressions: Introduction/Motivation, Special Symbols and Characters for REs, REs and Python. Dictionaries: Introduction, Operators, Built-in Functions, Built-in Methods, Dictionary Keys.

Data Processing : Storing in List and Strings, Dispersion, Central Tendency, Mean Median Mode,FrequencyDistribution, Standard Deviation Using Files for large dataset, statistics with real data, reading data from internet, Accessing Stock Market Data, Correlating Stock data

**Unit III**

Image Processing and Data Mining : Introduction, RGB Color Model, Object for Image Processing, Image Processing (Negative Images, Gray Scale, Resizing, Stretching, Flipping, Edge Detection)

**Unit IV**

What is Data Mining? Implementing Cluster Analysis on Simple Data, Distance between two points, Clusters and Centroids, File Processing, Visualization.

**References:**

1. Core Python Programming - Chun, J Wesley, Second Edition, Pearson.
2. Python Programming in Context -Bradley N Miller, David L Ranum, Second Edition.
3. Head First Python - Barry, Paul, 2nd Edition, O Reilly.
4. Learning Python, - Lutz, Mark, 4th Edition, O Reilly.
5. The Python Tutorial at https://docs.python.org/3/tutorial/index.html
6. Beginners Guide to Python at https://wiki.python.org/moin/BeginnersGuide

## HC LINUX PROGRAMMING 3:0:1

**Objectives:**

- Understand and make effective use of Linux utilities and Shell scripting language (bash) to solve Problems.
- Implement in C some standard Linux utilities such as ls, mv, cp etc. using system calls.
- Develop the skills necessary for systems programming including file system programming, process and signal management, and inter-process communication.
- Develop the basic skills required to write network programs using Sockets.

**Outcomes:**

Students will be able to:

- Work confidently in Linux environment.
- Work with shell script to automate different tasks.
- Write simple system programs involving file and process management.
- To write simple socket programs.

**Unit I**

A brief history of Unix and Linux, Architecture, Features.

**Unix/Linux Shell :**

Linux shell commands for getting help: Commands for getting help :whatis, man, info, apropos.

Useful unix/linux shell commands :pwd, whoami, who, ls, env, echo, history, passwd, cat, more, less, file, chmod, chown, cp, mv, mkdir, rmdir, whereis, which, locate, ln.

Quick overview of basic Linux Utilities: File handling utilities, links: hard and symbolic links, Security by file permissions, Process utilities, Disk utilities, Networking commands, Filters: grep, Text processing utilities and Backup utilities.

Shell programming with Bourne again shell(bash)- Introduction, shell responsibilities, tab completion, pipes and Redirection, here documents, running a shell script, the shell as a programming language, shell meta characters, file name substitution, shell variables, command substitution, shell commands, the environment, quoting, test command, control structures, arithmetic in shell, shell script examples.

**Unit II**

**Sed and Awk:**Sed: Scripts, Operation, Addresses, Commands.

Awk: Execution, Fields and Records, Scripts, Operation, Patterns, Actions, Associative Arrays, String and Mathematical functions, System commands in awk, Applications.

**System Calls:**

**Files and Directories**: File Concept, File types, File System Structure, file metadata: inodes, kernel support for files, system calls for file I/O operations: open, create, read, write, close, lseek, dup2, file status information: stat family, fcntl, file permissions: chmod, fchmod, file ownership: chown, lchown, symbolic and hard links: symlink, link, unlink.

Directories: Creating, removing and changing Directories: mkdir, rmdir, chdir, obtaining current working directory: getcwd, Directory contents, Scanning Directories: opendir, readdir, closedir, rewinddir functions.

**Unit III**

**Process** : Process concept, Layout of a C program image in main memory. Process environment :environment list, environment variables, getenv, setenv, Kernel support for process, process identification, process control : process creation, replacing a process image, waiting for a process, process termination, zombie process, orphan process, system call interface for process management-fork, vfork, exit, wait, waitpid, exec family, Process Groups, Sessions and Controlling Terminal, Differences between threads and processes.

**Unit IV**

**Interprocess Communication**: Introduction to IPC, IPC between processes on a single computer system, IPC between processes on different systems, pies-creation, IPC between related processes using unnamed pipes, FIFO: creation, IPC between unrelated processes using FIFOs(Named pipes), differences between unnamed and named pipes, popen and pclose library functions.

**Sockets**: Introduction to Berkeley Sockets, IPC over a network, Client-Server model, Socket address structures (unix domain and Internet domain), Socket system calls for connection oriented protocol and connectionless protocol, example: client/server programs-Single Server-Client connection, Comparison of IPC mechanisms.

**References:**

1. Linux “man” pages and “info” pages.
2. The Linux Documentation Project : http://www.tldp.org/
3. Unix Concepts and Applications- Sumitabha Das, 4th Edition, TMH.
4. Beej's Guide to Network Programming : https://beej.us/guide/bgnet/
5. System Programming using C++ - T. Chan, Unix PHI.
6. Unix Network Programming - W. R. Stevens , PHI.
7. Beginning Linux Programming -N. Mathew, R. Stones, 4th Edition, Wrox, Wiley India Edition.
8. C Programming Language -Kernighan and Ritchie, PHI.

## SC COMPUTER ORGANIZATION AND ARCHITECTURE 4:0:0

**Objectives:**

- Understand the organization of a computer and its principal components.
- Understand the design components of a digital subsystem that required realizing various components such as ALU, Control, etc.
- Understand the memory organization and I/O interface.
- Understand the CPU organization and Computer Arithmetic.

**Outcomes:**

Students will be able to:

- Acquire knowledge and understand thetheory of Digital Design and Computer Organization to provide an insight of how basic computer components are organized.
- Understandthe functions of various hardware components and their building blocks.
- Gain in-depth understanding of realization of different combinational / sequential circuits.
- Understand memory hierarchy and design of primary memory.

**Unit I: Data and numbers**

Data and number representation- binary-complement representation, BCD-ASCII, conversion of numbers from one number system to the other, (r-1)'s & r's complement representation. Binary Arithmetic, Boolean Algebra and Logic Gates, Fundamentals of Boolean algebra, Logic gates (AND, OR, NOT, XOR, NAND, NOR) MINTERM, MAXTERM, truth table, Boolean expression, simplification, Boolean Algebra, K-map up-to 4 variable, Canonical Forms.

**Unit II: Combinational Circuits**

Adder, subtractor, BCD adder, multiplexer, De-multiplexer, encoder, decoder, Sequential Circuits, Flip-Flop (SR, JK, D, T, Master-slave), Application of flip-flop-- Asynchronous counter up-to 4 bit, decade counter, mod-n-counter, Synchronous counter—ring counter, Johnson's count, Up down counter, Register.

**Unit III: Memory Organization and I/O Interface**

Types of memory-RAM, ROM, EPROM, DRAM, SRAM, Addressing Modes, Associative memory, main memory, virtual memory, Cache memory, secondary memory.

I/O: I/O interface, polling, interrupts, DMA, mode of data transfer.

**Unit IV: CPU Organization and Computer Arithmetic**

CPU organization, instruction format, addressing mode, RISC, CISC, Von- Neumann Architecture Pipeline & vector processing, Pipeline structure, speedup, efficiency, throughput and bottlenecks, Arithmetic pipeline and Instruction pipeline.

**Reference Books:**

1. Computer System Architecture - Morris Mano, PHI
2. Computer Architecture - Carter, Schaum Outline Series, TMH
3. Computer Organization - Hamacher, MGH
4. System Architecture - Buad, VIKAS
5. The Fundamentals of Computer Organization - Raja Rao, Scitech

## SC COMPUTER GRAPHICS 2:1:1

**Objectives:**

- Provide an overview of various device level algorithms.
- Understandthe homogeneous coordinates and various 2D and 3D transformations
- Understand 3D concepts like projections, curves.
- Know how to implement the computer graphics concepts using OpenGL.

**Outcomes:**

Students will be able toAcquire knowledge and understanding of:

- The structure of an interactive computer graphics system, and the separation of system components.
- Device level algorithms that renders various shapes and clipping operations.
- 2D and 3D geometrical transformations and viewing.
- Techniques for representing 3D geometrical objects.

**Unit I**

Graphics hardware: Video display devices, Raster-scan systems, Graphics software : Coordinate representations, Graphics functions, standards, Introduction to OpenGL.

Graphics Output Primitives: Coordinate reference frames, Two-Dimensional reference frame in OpenGL, OpenGL Point Functions, Line Functions, Curve functions.

Scan-Conversion : Line-Drawing Algorithms: DDA, Bresenhams, Setting frame-buffer values, Circle-Generating algorithms : Midpoint Circle Algorithm.

**Unit II**

Scan conversion for solids: Scan-line polygon fill algorithm, Boundary fill algorithm, Flood fill algorithm, Inside-outside tests.

2D geometrical transformations: Basic two-dimensional geometric transformations, Homogeneous Coordinates and Matrix Representation, Inverse Transformations,Brief overview of Composite transformations, Reflection, Shear, OpenGL functions for two-dimensional geometric transformations, Programming examples.

**Unit III**

2D viewing:Windows and viewports, Two-dimensional viewing pipeline, clipping window, Normalization and viewport transformations, Brief overview of OpenGL 2D viewing functions.

2D Clipping Algorithms: Point clipping, Line clipping: Cohen- Sutherland and Liang-Barsky Line clipping, polygon fill-area clipping: Sutherland-Hodgman algorithm, Text clipping.

3D geometrical transformations: 3D translation, 3D scaling. 3D rotation: coordinate-axis rotations, general 3D rotations, Other 3D transformations, Affine transformations, OpenGL geometric transformation functions.

**Unit IV**

Three-dimensional viewing: Overview, Three-dimensional viewing pipeline, Projection transformations, Parallel and Perspective projection matrices. 3D viewing functions.

Spline representations : Interpolation and Approximation splines, parametric and Geometric continuity conditions, Bezier spline curves, B-Spline curves.

**References**

1. Computer Graphics with OpenGL, Fourth Edition - Donald D. Hearn, M. Pauline Baker, Warren Carithers, Pearson India Education Services.
2. Computer Graphics Principles & Practice in C - Foley, Vandam, Feiner, Hughes, Pearson Education, 2001.
3. Open GL Super Bible: Comprehensive Tutorial and Reference, -Richard S Wright and Jr. Michael Sweet, 7nd Edition, Pearson Education.
4. Computer Graphics- Roy A. Plastock, Gordon Kalley, Schaum's Outlines, McGraw Hill
5. Computer Graphics - Steven Harrington,2nd Edition (Paperback), Tata McGraw Hill

## SC DATA COMMUNICATION AND NETWORKS 3:1:0

**Objectives:**

- Understand the basics of data communication components.
- Learn the protocols of Data link layer.
- Understand different network layer services and routing protocols
- Know the different techniques involved transport layer and application layer

**Outcomes:**

Students will be able to:

- Acquire knowledge on basics of Data communication components.
- Understand the usage of different protocols of Data link layer.
- Working of network layer and routing protocols.
- Gain In-depthknowledge in the different concepts involved in transport layer and application layer.

**UNIT – I: Data Communications**

Components – Direction of Data flow – Networks –Network Types, TCP/IP Protocol suite, OSI model, Multiplexing, Transmission media, Circuit Switched Networks.

**UNIT – II: Data link layer**

Introduction, Framing, Data Link Layer protocols, Flow and error control, Medium Access Sub Layer: ALOHA, CSMA/CD, Wired LAN – Ethernet, Wireless LAN – IEEE 802.11

**UNIT – III: Network layer**

Services, Packet Switching, Unicast Routing protocols, Multicast routing protocols.

**UNIT – IV: Transport Layer and Application Layer**

UDP and TCP protocols, Application Layer: client/server programming, WWW, HTTP, FTP, Telnet, email, SSH, DNS.

**References:**

1. Data Communications and Networking - Behrouz A. Forouzan, Fourth Edition, TMH.
2. Computer Networks - Andrew S Tanenbaum, 5th Edition. Pearson Education, PHI.
3. Data communications and Computer Networks - P.C .Gupta, PHI.
4. An Engineering Approach to Computer Networks - S. Keshav, 2nd Edition, Pearson Education.
5. Understanding communications and Networks, 3rd Edition, W.A. Shay, Cengage Learning.
6. Computer Networking: A Top-Down Approach Featuring the Internet - James F. Kurose & Keith W. Ross, 3rd Edition, Pearson Education.
7. Data and Computer Communication- William Stallings, Sixth Edition, Pearson Education.

## SC FUNDAMENTALS OF IOT TECHNOLOGY 3:1:0

**Objectives:**

- Learn the impact of IoT applications and architectures in real world.
- Illustrate the various methods of deploying smart objects and connect them to network.
- Infer the role of data analytics in IoT.
- Understand the role of IoT in Smart and Connected Cities and Public Safety.

**Outcomes**:

Students will be able to:

- Interpret the impact of IoT networks in new architectural models.
- Compare and contrast the deployment of smart objects and technologies to connect them as network.
- Elaborate the need of data analytics in IoT.
- Identify the application of IoT in Smart and Connected Cities and Public Safety.

**Unit I: Basics of IoT**

What is IoT?, Genesis of IoT, IoT and Digitization, IoT Impact, Convergence of IT and OT, IoT Challenges, IoT Network Architecture and Design, Drivers Behind New Network Architectures, Comparing IoT Architectures, A Simplified IoT Architecture, The Core IoT Functional Stack, IoT Data Management and Compute Stack.

**Unit II: Smart Objects and Access Technologies**

Smart Objects: The "Things" in IoT, Sensors, Actuators, and Smart Objects, Sensor Networks, Connecting Smart Objects, Communications Criteria, IoT Access Technologies (Any Three)

**Unit III: Data Analytics for IoT**

Data and Analytics for IoT, An Introduction to Data Analytics for IoT, Machine Learning, Big Data Analytics Tools and Technology, Edge Streaming Analytics, Network Analytics.

**Unit IV: IoT in Industry**

IoT in Industry: Smart and Connected Cities-An IoT Strategy for Smarter Cities, Smart City IoT Architecture, Smart City Security Architecture, Smart City Use-Case Examples-Smart Traffic Control.

Public Safety-Overview of Public safety, An IoT Blueprint for public safety, Emergency Response IoT Architecture, IoT Public Safety Information Processing, School Bus Safety.

**References:**

1. IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things- David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry, 1st Edition, Pearson Education.
2. Internet of Things- Srinivasa K G, CENGAGE Leaning India.
3. Internet of Things (A Hands-on-Approach)-Vijay Madisetti and ArshdeepBahga, 1stEdition, VPT.
4. Internet of Things: Architecture and Design Principles - Raj Kamal,1stEdition, McGraw Hill Education.

## SC COMMUNICATION SKILLS 3:1:0

**Objectives:**

- Know how communication style influences how we are perceived by others.
- Learn the factorsgoverning good communication.
- Understand How good communication skills can be developed.
- Know how to use effective communication skills in business.
- Learn the need to modify communication depending on business situation andcircumstances.

**Outcomes:**

Students will be able to:

- Apply knowledge of human communication and language processes as they occur across various contexts, e.g., interpersonal, intrapersonal, small group, organizational, media, gender, family, intercultural communication, technologically mediated communication, etc. from multiple perspectives.
- Evaluate key theoretical approaches used in the interdisciplinary field of communication. i.e., students will be able to explain major theoretical frameworks, constructs, and concepts for the study of communication and language, summarize the work of central thinkers associated with particular approaches, and begin to evaluate the strengths and weaknesses of their approaches.
- Find, use, and evaluate primary academic writing associated with the communication discipline.
- Communicate effectively orally and in writing.

**Unit – I**

Importance of communication, its basic model, formal and informal communications, barriers to communication, feedback and its effectiveness, Non- Verbal communication - Etiquettes.

**Unit – II**

Oral communication, Speaking: Paralanguage: Sounds, stress, intonation- Art of conversation – Presentation skills, – Public speaking- Expressing Techniques, importance of listening, role of visual aids, persuasive communication.

**Unit – III**

Written communication – Effective writing – Paragraph – Essay- Reports – Letters- Articles – Notices, Agenda & Minutes.

**Unit – IV**

Interview sills: Types of Interviews – Preparing for interview – Preparing a CV – Structuring the interview- Mock Interview - Quick Tips.

**References:**

1. Soft sill: know yourself & Know the world- Dr. Alex K..
2. Communication for results –C Hamilton & Parker
3. Instrument of Communication – P Meredith.
4. Basic Management skills for all – E H McGrath.
5. Managerial Communication – P M Timm.
6. Thesis and Assignment writing – Anderson.

## SC MOBILE APPLICATION DEVELOPMENT WITH ANDROID 2:1:1

**Objectives:**

- Understand the concepts of mobile applications.
- Learn to design mobile applications
- Learn android application development environment.
- Gain knowledge on Google maps and publishing android applications

**Outcome:**

Students will be able to:

- Acquire knowledge on basics of mobile application development.
- Acquire knowledge on mobile application design patterns.
- Implement android application using android application environment.
- Students must independently develop android applications and publish them.

**Unit I: Introduction to mobile applications:**

Embedded systems - Market and business drivers for mobile applications – Publishing and delivery of mobile applications – Requirements gathering and validation for mobile applications, Basics of embedded systems design – Embedded OS - Design constraints for mobile applications, both hardware and software related – Architecting mobile applications – User interfaces for mobile applications – touch events and gestures.

**Unit II: Advanced Design:**

Designing applications with multimedia and web access capabilities Integration with GPS and social media networking applications – Accessing applications hosted in a cloud computing environment – Design patterns for mobile applications – Achieving quality constraints – performance, usability, security, availability and modifiability.

**Unit III: Android Establishing the development environment:**

Android architecture, Android Application structure, Emulator- Android virtual device, UI design, Fragments, Activity, Services, broadcast Receiver, Intents/Filters, Content provider- SQlite Programming, SQlite Open Helper, SQlite Database, Interaction with server side applications.

**Unit IV: Advanced Android:**

Using Google Maps, GPS and Wi-Fi Integration, Android Notification, Audio manager, Bluetooth,Camera and Sensor integration, Sending SMS, Phone Calls. Publishing Android Application.

**References:**

1. Professional Mobile Application Development - Jeff McWherter and Scott Gowell, Wrox.
2. Android in Practice - Charlie Collins, Michael Galpin and Matthias Kappler, ,DreamTech.
3. Beginning Objective C - James Dovey and Ash Furrow, Apress.
4. Android for programmers: An App-Driven Approach - Paul Deitel ,Harvey Deitel, Abbey Deitel and Michael Morgano, Pearson.

## SC CLOUD COMPUTING 3:1:0

**Objectives:**

- Ability to understand various basic concepts related to Cloud Computing technologies.
- Demonstrate the architecture and concept of different cloud models: IaaS, PaaS, SaaS
- Learn cloud services for individuals.
- Understand the technologies for data security in cloud.

**Outcomes:**

Students will be able to:

- Demonstrate the main concepts, key technologies, strengths, and limitations of cloud computing and the possible applications.
- Identify the architecture and infrastructure of cloud computing, including SaaS, PaaS, IaaS, public cloud, private cloud.
- Identify the cloud services for the individuals
- Acquire the knowledge on the core issues of cloud computing such as security, privacy, and interoperability.

**Unit I**

Introduction: Cloud Computing in a Nutshell, Layers and Types of Clouds, Desired Formats of Cloud, Cloud Infrastructure Management, Challenges and Risks. Virtualization: Virtualization of Computing, Storage and Resources.

**Unit II**

Cloud Services: Introduction to Cloud Services IaaS, PaaS and SaaS.

Software as a Service (SaaS): Evolution of SaaS, Challenges of SaaS Paradigm, SaaS Integration Services, SaaS Integration of Products and Platforms, Business – to Business Integration, B2B Services.

Infrastructure As a Services (IaaS): Introduction, Background & Related Work, Virtual Machines Provisioning and Manageability, Virtual Machine Migration Services, VM Provisioning and Migration in Action, Provisioning in a Cloud Context.

Platform As a service (PaaS): Integration of Private and Public Cloud, Technologies and Tools for Cloud Computing, Resource Provisioning Services.

**Unit III**

Migrating into a Cloud: Cloud Services for Individuals, Cloud Services Aimed at the Mid-Market, Enterprise Class Cloud Offering, Migration.

**Unit IV**

Management and Monitoring: Accounts Monitoring, User profiles in Cloud, Resource Allocation and Pricing in Cloud.

Security: Introduction, Cloud Storage: from LANs to WANs, Technologies for Data Security in Cloud Computing, Security Concerns, Legal issues and Aspects, Securing the Private and Public Cloud Architecture.

**References:**

1. Cloud Computing: Principles and Paradigms - RajkumarBuyya, James Broberg,Andrzej M Goscinski, Wiley publication.
2. Cloud Computing: A Practical Approach - Toby Velte, Anthony Velte, McGraw-Hill Osborne Media.
3. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud - George Reese, O'Reilly Publication.
4. Cloud Computing Explained: Implementation Handbook for Enterprises -John Rhoton, Recursive Press.

## SC ADVANCED JAVA 2:1:1

**Objectives**

- Define JDBC and describe the various JDBC drivers
- List the advantages and explain the life cycle of a servlet
- Understand various types of properties in Java beans

**Outcomes**

Students will be able to:

- Develop component-based Java software using JavaBeans
- Develop server side programs in the form of servlets
- Implement Entity Java bean in stateless and stateful environment

**Unit I: J2EE overview and JDBC**

The ABC of Programming Languages, Taking Programming Languages up a notch, Distributive Systems – Real Time Transmissions, Software objects, Web services, The Tier – Clients, Resources and Components, J2EE Multi – Tier Architecture, Client tier implementation, Enterprise Application Strategy, A new Strategy, The Enterprise Application.

**Unit II: Servlets**

Introduction, Life cycle of servlet, A simple Java servlet, Anatomy of Java servlet – Deployment Descriptor, Reading Data from a client, Reading HTTP Request Headers, Sending Data to a client and writing the HTTP Response Header, Cookies and Tracking Sessions

**Unit III: Java Server Pages**

Introduction, JSP tags – Variables and Objects, Methods, Control statements, Loops, Tomcat, Request String, User Sessions, Cookies, Session objects

**Unit IV: Enterprise JavaBeans**

Introduction, EJB containers, classes and interfaces, Deployment Descriptors – Anatomy, Environment Elements, Referencing EJB and other resources, query element; Session Java Bean- Stateless and stateful, creating a session java bean; Entity Java Bean – Container Managed Persistence, Bean Managed Persistence; The JAR File

**References:**

1. The Complete Reference J2EE – Jim Keogh
2. Core and Advanced Java, Black Book - Dreamtech Press

## SC MACHINE LEARNING 2:1:1

**Objective:**

- Understand basicsofmachine learning techniques.
- Learn to apply the techniques in the area of pattern recognition and data analytics.
- Understand the supervised and unsupervised machine learning algorithms.

**Outcomes:**

Students will be able to:

- Acquire the knowledge on basics of machine learning techniques.
- Implement different supervised and unsupervised machine learning algorithms.
- Choose appropriate techniques for real time problems

**Unit I**

Introduction to Machine Learning, types of machine learning, examples. Supervised Learning: Learning class from examples, VC dimension, PAC learning, noise, learning multiple classes, regression, model selection and generalization, dimensions of a supervised learning algorithm. Parametric Methods: Introduction, maximum likelihood estimation, evaluating estimator, Bayes' estimator, parametric classification.

**Unit II**

Dimensionality Reduction: Introduction, subset selection, principal component analysis, factor analysis, multidimensional scaling, linear discriminant analysis. Clustering: Introduction, mixture densities, k-means clustering, expectation-maximization algorithm, hierarchical clustering, choosing the number of clusters. Non-parametric: Introduction, non-parametric density estimation, non-parametric classification.

**Unit III**

Decision Trees: Introduction, univariate trees, pruning, rule extraction from trees, learning rules from data. Multilayer perceptron: Introduction, training a perceptron, learning Boolean functions, multilayer perceptron, backpropagation algorithm, training procedures.

**Unit IV**

Kernel Machines: Introduction, optical separating hyperplane, v-SVM, kernel tricks, vertical kernel, defining kernel, multiclass kernel machines, one-class kernel machines. Bayesian Estimation: Introduction, estimating the parameter of a distribution, Bayesian estimation, Gaussianprocesses.

Introduction to Graphical Models.

**References**

1. Introduction to Machine Learning - E. Alpaydin. 2nded, MIT Press.
2. Machine Learning: A Probabilistic Perspective - K. P. Murphy, MIT Press.
3. Machine Learning in Action - P. Harrington , Manning Publications.
4. Pattern Recognition and Machine Learning - C. M. Bishop, Springer.
5. Machine Learning: An Algorithmic Perspective -S. Marsland,,1st Ed. Chapman and Hall.
6. Machine Learning T. Mitchell, McGraw-Hill.

## SC GRAPH THEORY 3:1:0

**Objectives:**

- Have familiarity with the Graph and its application.
- Understand the Tree, circuit and their relation.
- Know how to represent the problem in matrix representation.
- Understand the directed and dual graph.

**Outcomes:**

Students will be able to:

- Demonstrate different matrix problem in Graph.
- Analyze and solvethe different graph problems.
- Divide the problem into modules with their relation.

### Unit I: Introduction of Graph, Paths and Circuits

Overview of graph, applications, Finite and Infinite Graphs, Incidence and Degree, Isolated Vertex, Pendant Vertex and Null Graph, Brief history of Graph Theory, Isomorphism, Subgraphs, A puzzle with multicolored cubes, Walks, Paths and Circuits, Connected Graphs, Disconnected Graphs and Components, Euler Graphs, Operations on Graphs, More on Euler Graphs, Hamiltonian path & circuits, Travelling salesman problem.

### Unit II: Trees and Fundamental Circuits, Cut-sets and Cut-vertices

Trees, Properties of trees, Pendant vertices in a tree, Distance and Centers in Tree, Rooted and Binary trees, On counting trees, Spanning Trees, Fundamental Circuits, Finding all spanning trees of a Graph, Spanning trees in a weighted graph, Cut-sets, Properties of Cut-set, Cut-sets in graph, Fundamental circuits and cut-sets, Connectivity and separability, Network flows

### Unit III: Planar and Dual Graphs, Matrix representation of graphs

Combinatorial Vs. Geometric Graphs, Planar Graphs, Kuratowski's Two Graphs, Different representations of planar graph, Detection of Planarity, Geometric Dual, Combinatorial Dual, More on Criteria of Planarity, Thickness and Crossings, Incidence matrix, Submatrices of A(G), Circuit matrix, Fundamental circuit matrix and rank of B, An application to switching network, Cut-set matrix, Relationships among Af, Bf, Cf, Path matrix, Adjacency matrix.

### Unit IV: Directed graphs, Graph Theoretic algorithms and computer programs

Directed graphs, Types of diagraphs, Diagraphs and binary relations, Directed paths and connectedness, Euler Digraphs, Trees with Directed Edges, Fundamental circuits in Diagraphs, Matrices A, B and C of diagraphs, Adjacency matrix of a digraph, Algorithms, Some basic algorithms, Shortest-path algorithms, Depth-first search on graph.

**References:**

1. Graph Theory and Applications -N.Deo. Kluwer Academic Publishers Norwell, MA, USA.
2. Graph Theory and Applications -Hararay. Academic Press Inc. U.S.
3. Algorithm Design, Addison- J. Kleinberg, E.Tardos, Wesley,2005

## SC DISTRIBUTED COMPUTING 3:1:0

**Objectives**

- Get Exposure on both abstraction and details of file systems.
- Introduce concepts related to distributed computing systems.
- Focus on performance and flexibility issues related to systems design decisions.
- Current literature in distributed systems

**Outcomes**

Students will be able to:

- Demonstrate the basic principles of distributed computing
- Develop an idea about balancing techniques and agreement protocols
- Analyze the difference between distributed file system and distributed database

**Unit- I:**

Introduction to distributed systems (DS), Design goals, transparencies, fundamental issues, interconnection networks, Client server computing

**Unit-II:**

Naming and binding, Distributed co-ordination, Process synchronization, Inter-process communication

**Unit-III:**

Dead locks in distributed systems, Load Scheduling and balancing techniques, Agreement protocols

**Unit-IV:**

Distributed file system design, Distributed database system : A Case study

**References**

1. Distributed Systems: Princples and paradigms - Andrew S Tanenbaum and Maarten van Steen : PHI(2002)
2. Distributed Computing Systems - T.L. Casavant and M. Singhal, IEEE computing society press
3. Distributed algorithms and protocols - M. Raynal and J. Howlett , Wiley and Sons

## SC NUMERICAL ALGORITHMS 3:0:1

**Objectives:**

- Introduce the steps involved in numerical computing and its characteristics.
- Understand different methods of numerical integration and Ordinary Differential Equations.
- Learn different methods of solving simultaneous equations.
- Learn different interpolation and statistical methods.

**Outcome:**

Students will be able to:

- Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions.
- Apply numerical methods to obtain approximate solutions to mathematical problems.
- Derive numerical methods for various mathematical operations and task such as solution of nonlinear equations, numerical integration and ordinary differential equations.

**Unit – I**

**Introduction to Numerical Computing**

Introduction, Numeric Data, Analog Computing, Digital Computing, Process of Numerical Computing and Characteristics of Numerical Computing.

**Approximations and Error in Computing**

Introduction, Significant Digits, Inherent Errors, Numerical Errors, Modelling errors, Blunders, Absolute and relative Errors, Blunders and Error Propagation.

**Roots of Nonlinear Equations**

Bisection method, False position method, Newton Raphson method and Secant method.

**Unit – II**

**Numerical Integration**

Trapezoidal rule, Simpson's $1/3^{rd}$ rule and Simpson's $3/8^{th}$ rule.

**Ordinary Differential Equations**

Euler's method, Modified Euler's method, Runge-Kutta II and IV order methods.

**Unit - III**

**Solutions of Simultaneous Linear Algebraic Equations**

Gauss Elimination method, Gauss Jordan method and LU Decomposition method.

**Iterative methods**

Jacobi's iterative method and Gauss-Seidel iterative method.

**Unit – IV**

**Interpolation:** Newton-Gregory forward interpolation, Newton-Gregory backward interpolation, Divided differences, Newton's divided difference and Lagrange's interpolation.

**Statistical methods:** Introduction, Definitions, Classifications, Frequency Distribution, Mean – Arithmetic Mean for grouped and ungrouped data and Geometric Mean for grouped and ungrouped data.

## References:


1. Numerical Methods – E Balaguruswamy, Tata McGraw-Hill Publishing Company Limited.
2. Engineering Mathematics - Dr. K.S. Chandrashekar, SudhaPublcations.
3. Computer Oriented Numerical Methods -Rajaraman V.
4. Fundamentals of Mathematical Statistics - Gupta and Kapoor
5. Probability and Statistics for engineers and scientists - Ronald E. Walpole and Raymond H Mayers
6. Mathematical Statistics - John Freund.

## SC PROBABILITY AND STATISTICS 3:1:0

**Objectives:**

- Extend and formalize knowledge of the theory of probability and random variables.
- Introduce new techniques for carrying out probability calculations and identifying probability distributions.
- Study elementary concepts and techniques in statistical methodology.

**Outcomes:**

Students will be able to:

- Use axioms and theorems to describe events and compute probabilities.
- Identify the types of random variables involved in a given problem and calculate relevant probabilities.
- Describe an appropriate statistical model for the given data and compute population parameters using appropriate estimators.

**Unit I:**

Probability: The concept of probability, the axioms and theorems, conditional probability, Independent Event's, Bayes Theorem. Random Variables and Probability Distributions:

Random variables, discrete probability distributions and Distribution functions: Bernoulli, Binomial, Hyper Geometric, Geometric, Poisson, Uniform.

**Unit II:**

Continuous Probability distribution and Distributions functions: Exponential, Normal, Uniform, Concepts of Chi square, t joint Distributions, Independent random variables, Functions of random Variables.

**Unit III:**

Mathematical Expectation:Definition, Functions of Random variables. The variance and Standard Deviation, Moments, Moment Generating Functions, Covariance, Correlation Coefficient. Sampling Theory & Estimation:Population and sample, Random Sampling with and without replacement, the sample mean, sampling distribution of means, proportions, differences. The sample variance, the sample distribution of variances, Point estimates, Interval estimates. Variance analysis.

**Unit IV:**

Tests of Hypotheses and Significance: Statistical Decisions, Statistical hypotheses, Null Hypotheses, Tests of hypotheses and significance, Type I and Type II errors, level of significance, Tests involving the Normal distribution, One-Tailed and Two-tailed, Special tests of Significance for large and small samples, The Chi-square test for goodness of fit. Introduction to regression and curve fitting.

**References:**

1. Fundamentals of Statistics - S C Gupta and V K Kapoor.
2. Fundamentals of Statistics - S C Gupta.
3. Probability and Statistics with Reliability, Queuing and ComputorApplicsations -Jusgir S Trivedi, Prentics Hall of India.
4. Probability, Random Variables and Stochastic Processes - Papoulis and S. Unnikrishna Pillai, McGraw Hill, 4th Edition.
5. Probability and Statistics for Engineers- Richard A Johnson, Prentice Hall India.

## SC THEORY OF LANGUAGES AND AUTOMATA 2:1:1

**Objectives:**

- Introduce concepts in automata theory and theory of computation
- Identify different formal language classes and their relationships
- Design grammars and recognizers for different formal languages
- Prove or disprove theorems in automata theory using its properties

**Outcomes:**

Students will be able to:

- Acquire a fundamental understanding of the core concepts in automata theory and formal languages
- Design grammars and automata (recognizers) for different language classes.
- Identify formal language classes and prove language membership properties.
- Prove and disprove theorems establishing key properties of formal languages and automata.

**Unit I**

Brief introduction to Formal Proof: Deductive Proofs, Poving equivalences about sets, the contrapositive, Proof by contradiction, Counterexamples, Central concepts of automata theory: Alphabets, strings, languages.

Finite Automata: Deterministic Finite Automata, Nondeterministic Finite Automata, Equivalence of DFA and NFA, Finite Automata with Epsilon transitions.

**Unit II**

Regular Expressions, Finite Automata and Regular Expressions: Converting DFAs to regular expressions by eliminating states, converting regular expressions to automata, Applications of regular expressions, Brief overview of algebraic laws of regular expressions.

Properties of Regular Languages: The pumping lemma for regular languages, Applications of the pumping lemma, Closure properties and decision properties of regular languages (proofs not necessary), Minimization of DFAs

**Unit III**

Context-Free Grammars, Parse Trees, Applications of context-free grammars, Ambiguity in grammars and languages.

Pushdown Automata : Definition, Languages of a PDA, Equivalence of PDAs and CFGs, Deterministic Pushdown Automata.

Normal Forms of Context-free grammars

**Unit IV**

The pumping lemma for context-free languages, Closure properties of context-free languages (proofs not necessary).

Brief introduction to Turing Machine: Notation for Turing Machine, Instantaneous descriptions for Turing Machines, Transition Diagrams for Turing Machine. Definition of Post's Correspondence Problem.

**References**

1. Introduction to Automata Theory, Languages and Computation - Hopcroft J. E and Ullman,J.D, Narosa Publishing House, Delhi.
2. Introduction to Languages and Theory of Computation, -John C Martin3rd edition. TMH Publication,

**SC** **DIGITAL IMAGE PROCESSING** **3:0:1**

## Objectives:

- Understand the fundamentals of digital image processing.
- Learn the different Image enhancement techniques.
- Understand the image segmentation techniques.

## Outcome:

Students will be able to:

- Demonstrate the fundamentals of digital image processing.
- Impart image enhancement in spatial and frequency domains.
- Implement the techniques of image segmentation.

## Unit I: Introduction and Digital Image Fundamentals

What is Digital Image Processing?, The Origins of Digital Image Processing, Examples of Fields that use Digital Image Processing, Fundamental steps in Digital Image Processing, Components of Image Processing System, Elements of Visual Perception, Image Sampling and Quantization, Some Basic Relationships Between Pixels, Linear and Nonlinear Operations

## Unit II: Image Enhancement in the Spatial Domain

Some Basic Gray Level Transformations, Histogram Processing, Enhancement using Arithmetic/Logic Operations, Basics of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters.

## Unit III: Image Enhancement in the Frequency Domain

Introduction to the Fourier Transform and the Frequency Domain, Smoothing Frequency Domain Filters, Sharpening Frequency Domain Filters, Homomorphic Filtering.

## Unit IV: Image Segmentation

Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region-based Segmentation, Segmentation by Morphological Watersheds.

## Reference:

1. Digital Image Processing – Rafel C. Gonzalez and Richard E. Woods, 2nd Edition, Pearson Education.

## SC CRYPTOGRAPHY AND NETWORK SECURITY 3:1:0

## Objectives:

- Understand the principles Computer Security.
- Learn conventional cryptosystem.
- Know public key cryptosystem
- Have a detailed knowledge about authentication, hash functions and application level security mechanisms.

**Outcomes:**

Students will be able to:

- Implement the principles and practices of cryptographic techniques.
- Build simple cryptosystems by applying encryption algorithms.
- Comprehend secure identity management (authentication), message authentication, and digital signature techniques.
- Employ the authentication protocol and web security methods.

**Unit I: Computer Security Concepts and Classical Encryption Techniques**

Introduction-computer security concepts, attacks, security services, security mechanisms; Classical encryption techniques-symmetric cipher models, substitution techniques, transposition techniques, rotor machines

**Unit II: Block Ciphers-DES and Introduction to Public Key Cryptography**

Symmetric ciphers-Block cipher principles; DES-Algorithm, strengths and weaknesses of DES, attacks on DES and defense, multiple encryptions; Asymmetric ciphers-Essential mathematics, public key cryptography,

**Unit III: RSA, MAC and Digital Signatures**

RSA, Diffie Hellman key exchange, random number generation, Data integrity and authentication Hash functions; MAC; Digital signatures;

**Unit IV: Key Management, Authentication and System Security**

Key management; Authentication, Web and system security, Web security; IP security; E mail security; System security-intruders, malicious software, firewalls

**References:**

1. Cryptography and Network Security -Principles and Practice - William Stallings, PEARSON
2. Cryptography and Network Security -AtulKahate, Tata McGraw Hill

## SC C# PROGRAMMING 3:0:1

**Objectives:**

- Understand Object-Oriented Paradigm using C# programming.
- Learn extended OOP's concept in C# environment.
- Understand the concepts of interfaces and multithreading.

**Outcome:**

Students will be able to:

- Acquire the knowledge on .NET framework and basics of C#.
- Implement the extended the OOP's concept in C# environment.
- Develop an applications using standard C# libraries

**Unit – I**

**Understanding .NET: The C# Environment**

The .Net Strategy, The Origins of .Net Technology, The .NET Framework, The Common Language Runtime, Framework Base Classes, Benefits of the .NET Approach.

**Overview of C#**

Introduction, A Simple C# Program, Namespaces, Adding Comments, main Returning a Value, Using Aliases for Namespace Classes, passing String Objects to WriteLine Method, Command Line Arguments, Main with a Class, Providing Interactive Input, Using mathematical Functions, Multiple main Methods, Compile Time Errors, Program Structure, Program Coding Style.

**Methods in C#**

Introduction, Declaring Methods, The Main Method, Invoking Methods, Nesting of Methods, Method Parameters, Pass by Value, Pass by Reference, The Output Parameters, Variable Argument Lists, Method Overloading.

Arrays, Strings, Structures and Enumerations.

**Unit – II**

**Classes and Objects**

Introduction, Basic Principles of OOP, Defining a Class, Adding Variables, Adding Methods, Member Access Modifiers, Creating Objects, Accessing Class members, Constructors, Static Members, Static Constructors, Private Constructors, Copy Constructors, Destructors, Member Initialization, The this Reference, Nesting of Classes, Constant Members, Read-only Members, Properties, Indexers.

**Operator Overloading**

Introduction, Overloadable Operators, Need for Operator Overloading, Defining Operator Overloading, Overloading Unary Operators, Overloading Binary Operators, Overloading Comparison Operators.

**Unit - III**

**Inheritance**

Introduction, Classical Inheritance, Containment Inheritance, Defining a Subclass, Visibility Control, Defining Subclass Constructors, Multilevel Inheritance, Hierarchical Inheritance.

**Run-Time Polymorphism**

Overriding methods, Hiding Methods, Abstract Classes, Abstract Methods, Sealed Classes, and Sealed Methods.

**Managing Errors and Exceptions**

Introduction, What is Debugging?, Types of Errors, Exceptions, Syntax of Exception handling Code, Multiple Catch Statements, Using Finally Statements, Nested Try Blocks, Throwing Our Own Exceptions, Checked and Unchecked Operators.

## Unit - IV

**Interfaces**

Introduction, Defining an Interface, Extending an Interface, Implementing Interfaces, Interfaces and Inheritance, Abstract Class and Interfaces.

**Multithreading in C#**

Introduction, Understanding the System.Threading Namespace, Creating and Starting a Thread, Scheduling a Thread, Synchronizing Threads, Thread Pooling.

**Delegates and Events**

Introduction, Delegates, Delegate Declaration, Delegate Methods, Delegate Instantiation, Delegate Invocation, Multicast Delegates, Events.

**References:**

1. PROGRAMMING IN C# - A PRIMER by E Balaguruswamy, Third Edition, Tata McGraw-Hill Publications, New Delhi.
2. C# 4.0: The Complete Reference by Herbert Schildt, Tata McGraw-Hill Edition.

## SC OPERATIONS RESEARCH 3:1:0

**Objectives:**

- Understand the scientific methods of providing various departments of an organization with a quantitative basis of decision making.
- Know the importance of various tools and techniques in finding optimal solutions to problems.
- Understand the concept and importance of Transportation problems.

**Outcomes:**

Students will be able to:

- Understand the meaning, definitions, scope, need, phases and techniques of operations research.
- Formulate as L.P.P and derive optimal solutions to linear programming problems by graphical method, Simplex method, Big-M method and Dual Simplex method.
- Implement Transportation and Assignment problems and derive optimum solutions for transportation, Assignment and travelling salesman problems.

**Unit I:**

Definition of the term Operations Research – Nature , Management Application , Modeling , Principles of modeling , features , Different Phases , scope , Advantages and Limitations of O.R. General method for solving O.R models and Role o O.R in decision making. Some important definitions – solutions to LPP, feasible solution, basic solutions, Basic feasible solution, Optimum basic feasible solution, unbounded solution. Assumptions in LPP, Limitations of LPP, Applications of LPP and advantages of LPP.

**Unit-II:**

Linear Programming – Formulation of a Linear Programming Solving L.P.P. by Graphical Method Problem and Simplex Method.

Artificial Variable Technique – Two phase method and Big M method,

Duality – Meaning, definitions of primal problem, General rules for converting any primal problem into its dual. Characteristics of Dual problem, Advantages of Duality, Dual formulation procedure and Problems to obtain the dual of LPP.Fundamental Duality theorems, Primal and Dual correspondence.

**Unit III:**

Transportation Problems – Initial basic notations, North West corner method, least cost method, Vogel's approximation method- Solution for transportation problem, Assignment problem using Hungarian method.

**Unit-IV:**

Sequencing Problems – Definitions, terminology and notations, Principle assumptions, Processing 'n' jobs through two machines

Travelling Salesman (Routing) Problems - Formulations of TSP as an assignment problem

**Reference Books:**

1. Quantitative Techniques - N D Vohra.
2. Operations Research -HamdyTaha.
3. Operations Research -S.D.SharmaKedarnathRamnath Publishers 16th edition.
4. Operations Research - J.K Sharma, 5th Edition, MacMillan Publishers.
5. Operations Research - S.K. Kumar, First Edition, Khataria and Sons Publishers

## SC SYSTEM SOFTWARE 3:0:1

**Objectives:**

- Understand the design of an assembler for a simple machine architecture.
- Understand the need and design of a macro processing facility.
- Learn about loading, different loading schemes and issues related to it, and implementation of a loader.
- Get an overview of compiler functions and learn about basic lexical analysis and parsing.

**Outcomes:**

Students will be able to:

- Demonstrate the design of assembler.
- Impart various issues related to processing macros.
- Employ different loaders schemes, and related issues.
- Implement simple lexical analyser and parser with Lex and Yacc.

**Unit I**

Introduction, general machine structure, general approach to a new machine, assemblers, general design procedure, design of assembler- statement of problem, data structure, format of data bases, algorithm, look for modularity.

**Unit II**

Macro language and the macro processor – macro instructions, features of a macro facility, macro instruction arguments, conditional macro expansion, macro calls within macros, macro instructions defining macros, implementation of a restricted facility.

**Unit III**

Loaders, Loader schemes, design of an absolute loader, design of a direct linking loader- specification of problem, specification of data structures, format of data bases, algorithm.

**Unit IV**

Introduction to Compilers: Language Processors, Structure of a Compiler.

Introduction to Lex and Yacc: The Simplest Lex Program, Recognizing Words With LEX, Symbol Tables, Grammars, Parser-Lexer Communication, A YACC Parser, The Rules Section, Running LEX and YACC, Using LEX, Using YACC – Grammars, What YACC Cannot Parse, A YACC Parser - The Definition Section, The Rules Section, Symbol Values and Actions

**References**

1. Systems Programming - John J. Donovan, Tata McGraw-Hill Edition.
2. Compilers: Principles, Techniques, and Tools - Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, 2nd Edition, Pearson.
3. Lex &Yacc - John R. Levine, Tony Mason, Doug Brown, 2nd Edition, O'Reilly, 2012
4. System Software: An introduction to system programming - Leland L.Beck and D.Manjula, 3rd edition.
5. Systems Programming and Operating Systems - D. M. Dhamdhere, ,Second Revised Edition, Tata McGraw-Hill.

## SC SYSTEM ANALYSIS AND DESIGN 3:1:0

**Objectives:**

- Understand the basics of system concepts and learn the feasibility study of the system.
- Learn the data analysis of a new system and tools associated in structured analysis.
- Understand the concepts of system testing and standards related to Documentation and management
- Understand the concepts of system security and recovery management

**Outcomes:**

Students will be able to:

- Gather data for analysis and specify the requirements of a system.
- Design system components and environments.
- Build general and detailed models that assist programmers in implementing a system.
- Design a user interface for data input and output, as well as controls to protect the system and its data.

**Unit I:**

System Concept: Definition, Characteristics, Elements of system, Physical and abstract system, open & closed system and man-made information systems.

System Development Life Cycle: Various phases of system development, Considerations for system planning and control for system success.

Initial Investigation: Determining user's requirements and analysis, fact finding process and techniques.

Feasibility study: Determination of feasibility study, Technical, Operational & Economic Feasibilities, System performance constraints, identification of system objectives and feasibility report.

**Unit II:**

Cost/Benefit Analysis: Data analysis, cost and benefit analysis of a new system and categories determination.

Tools of structured Analysis: Logical and Physical models, context, diagram, data dictionary, data diagram, IPO and HIPO charts, Gantt charts and pseudo codes. Flow charts- system flow chart, run flow charts etc., decision tree and decision tables.

**Unit III:**

Input/ Output and Form Design: Input and output form design methodologies, menu, screen design and layout consideration.

Management standards: Programming and operating standards.

Documentation standards: User and programming manual.

System testing & quality: System testing, quality assurance and software maintenance.

**Unit IV:**

System security: Data Security, Disaster/ recovery and ethics in system development.

Organization of EDP: Introduction, Job Responsibilities & duties of EDP Personnel- EDP manager, System Analyst, Programmers, Operators etc. Selection of Data Processing Resources: purchase, lease, rent-advantages and disadvantages.

**References:**

1. System Analysis and Design- Awad, Elias M- 2nd Edition, Galgotia Publication Pvt.Ltd.
2. System Analysis & Design - V K Jain, Dreamtech Press
3. Modern System Analysis &Design - A Hoffer, F George, S Valaciah Low Priced Edition, Pearson Education.
4. Information Technology & Computer Applications -V.K.Kapoor, Sultan Chand & Sons, New Delhi.

## SC INFORMATION RETRIEVAL 3:0:1

**Objectives:**

- Become familiar with difference between Information retrieval and data Base Management Systems.
- Learn different indexing techniques used in retrieval system.
- Understand the concepts of cluster analysis.
- Understand the text classification techniques.

**Outcomes:**

Students will be able to:

- Locate relevant information in large collections of data
- Impart features of retrieval systems for Text data
- Analyze the performance of retrieval systems using test collection.
- Implement different clustering algorithms

**Unit I :Boolean retrieval and classical models**

An example information retrieval problem, A first take at building an inverted index, Processing Boolean queries; The term vocabulary and postings lists: Document delineation and character sequence decoding, Determining the vocabulary of terms, Faster posting list intersection via skip pointers, Positional postings and phrase queries. Index construction – Blocked sort-based indexing, Single-pass in-memory indexing, Distributed indexing, Dynamic indexing, other types of indexes.

**Unit-II: Computing scores in a complete search system**

Efficient scoring and ranking, components of an information retrieval system, vector space scoring and query operator interaction, information retrieval system evaluation, Standard test collections, Evaluation of unranked and ranked retrieval results, Assessing relevance, A broader perspective: System quality and user utility, Results snippets

**Unit-III: Data Cluster analysis**

What is Cluster Analysis, Different Types of clustering's, Different types of clusters, Kmeans – the basic K-means algorithm, additional Issues, K – means and different types of clusters, Strengths and weaknesses, K – means as an optimization Problem, DBSCAN – Center based approach, The DBSCAN Algorithm, Strengths and weaknesses, Fuzzy Clustering, Minimum spanning tree clustering

**Unit-IV: Text classification and naive bayes**

The text classification problem, Naive bayes text classification, properties of Naive bayes, feature selection, Evaluation of text classification; Support vector machines and machine learning on documents – Support vector machines and machine learning on documents - Support vector machines: The linearly separable case, Issues in the classification of text documents, Machine – learning methods in ad hoc information retrieval; Web search basics – Background and history, Web characteristics, Advertising as the economic model, The serach user experience;

**References:**

1. Introduction to information Retrieval – Christopher D.Manning, Prabhakar Raghavan, HinrichSchutze
2. Introduction to Data Mining – Pang – Ning Tan, Vipin Kumar, Michael Steinbach
3. Information Retrieval: Algorithms and Heuristics - David A. Grossman, Ophir FriederSecond Edition, The Information Retrieval Series, Vol. 15, Springer.
4. Algorithms for Clustering Data - Anil K Jain, R. C. Dubes

## SC BIG DATA ANALYTICS 2:1:1

**Objectives:**

- Identify the characteristics of datasets and compare the trivial data and big data for various applications
- Introduce students the concepts and challenges of big data
- Know the implementation of parallel processing with Map Reduce
- Teach students in applying skills and tools to manage and analyze the big data

**Outcomes:**

Students will be able to:

- Understand the concept and challenge of big data and why existing technology is inadequate to analyze the big data
- Collect, manage, store, query, and analyze various forms of big data
- Map the impact of big data for business decisions and strategy
- Understand the significance of No SQL databases over RDBMS

**Unit I: Wholeness of Big Data**

Introduction;Understanding Big Data,;Caselet: IBM Watson : A Big Data system; Capturing Big Data; Benefitting, Management, Organizing and Analyzing Big data; Technology Challenges for Big Data; Big Data Sources and Applications

**Unit II: Big Data Architecture and Distributed Computing Using Hadoop**

Google query Architecture; Standard Big Data Architecture; Big data Architecture Examples – IBM Watson, Ebay, Netflix, Paypal; Introduction to Hadoop Framework, HDFS Design Goals, Master Slave Architecture; Installing HDFS – Reading and Writing Local files into HDFS, Reading and Writing Data Streams into HDFS

**Unit III: Parallel Processing with Map Reduce:**

Introduction, How Google search Works, Map Reduce overview; Sample Map Reduce Application:Wordcount, Map Reduce Programming, Map Reduce Jobs Execution, Hive and Pig Language capabilities

**Unit IV:No SQL databases**

Introduction, RDBMS Vs NOSQL, Types of NoSQL Databases, Architecture of No SQL, CAP theorem; HBase – Architecture Overview, Reading and Writing Data; Cassandra – Architecture Overview, Protocols, Data Model, Cassandra Writes and Reads, Replication

**References:**

1. Big Data Made Accessible -Anil Maheshwari
2. Big Data Analytics - M. VijayalakshmiRadhaShankarmani
3. Data Science and Analytics - VK Jain

## SC INFORMATION SYSTEMS MANAGEMENT 3:1:0

**Objectives:**

- Understand the role information system in business.
- Learn different functional business management systems.
- Understand e-commerce applications and decision support systems.
- Analyzing security and ethical challenges in IT.
- Understand security management of IT.

**Outcomes:**

Students will be able to:

- Acquire the knowledge on role of ISM in business.
- Identify the applications of e-commerce and issues of e-commerce.
- Identify the security and ethical issues in IT.
- Develop security mechanisms in IT by using security management tools.

**UNIT I: Information System Concepts**

Information Systems in Business: Introduction, The real world of Information Systems, The fundamental role of IS in business, Trends in IS, Types of Information systems, Managerial challenges of IT.

System Concepts: A foundation, Components of an Information System, Information System Resources, Information System activities, Recognizing Information Systems.

**UNIT II: Enterprise Business Systems and Functional Business System**

Enterprise Business Systems: Introduction, Cross-functional enterprise applications, Enterprise application integration, Transaction processing systems, Enterprise collaboration systems.

Functional Business Systems: Introduction, Marketing systems, Manufacturing systems, Human resource systems, Accounting systems, financial management systems.

Customer relationship management: Introduction, What is CRM? The three phases of CRM, Benefits and challenges of CRM, Trends in CRM, Enterprise resource planning: Introduction, What is ERP? Benefits and challenges of ERP, Trends in ERP. Supply chain Management: Introduction, What is SCM? The role of SCM, Benefits and challenges of SCM, Trends in SCM

**Unit III: Electronic Commerce and Decision Support Systems**

Electronic commerce fundamentals: Introduction, The scope of e-commerce, Essential e-commerce, processes, Electronic payment processes.

e-Commerce applications and issues: E-commerce application trends, Business-to- Consumer e-commerce, Web store requirements, Business-to-Business e-commerce, e-commerce marketplaces, Clicks and bricks in ecommerce.

Decision Support Systems- Decision support in business: Introduction, Decision support trends, Decision support systems (DSS), Management Information Systems, On-line analytical processing, Using DSS, Executive information systems, Enterprise portals and decision support,

Knowledge management systems, Business and Artificial Intelligence (AI), An overview of AI, Expert systems.

**Unit IV: Security and Ethical Challenges , Security Management in IT**

Security and Ethical Challenges: Security, Ethical and societal challenges of IT: Introduction, Ethical responsibility of business professionals, Computer crime, Privacy issues, other challenges, Health issues, societal solutions. Security management of IT: Introduction, Tools of security management, Internetworked security defenses, other security measures, System Controls and audits.

**References:**

1. Management information systems: Managing information technology in the internet worked enterprise - Jams. AO'brienTMH publishing company limited.
2. Management information systems – Laudon and Laudon Publishers.
3. Management information systems - S Sadogopan, PHI
4. Information systems for modern management - G.R. Murdick,2nd edition PHI.

## SC E-COMMERCE 3:1:0

**Objectives:**

- Impart knowledge on E-Commerce, Various applications connected with E-Commerce.
- Enable the learner for aiming careers in special software development involving E-Commerce technologies.
- Understand the security issues in E - commerce

**Outcomes:**

Students will be able to:

- Analyze the impact of E-commerce on business models and strategy
- Describe Internet trading relationships including Business to Consumer, Business-to-Business, Intraorganizational structures.
- Assess electronic payment systems and its securities.
- Recognize and discuss global E-commerce issues

**Unit I: Introduction to E-Commerce**

Definition, Scope of E-Commerce, Hardware requirements, E-Commerce and Trade Cycle, Electronic Markets, Electronic Data Interchange and Internet Commerce.

**Unit II: Business to Business E-Commerce**

Electronic Markets, Electronic Data Interchange (EDI): Technology, Standards (UN/EDIFACT),Communications, Implementations, Agreements, Security, EDI and Business, Inter-Organizational Ecommerce. Business models for E-commerce, Business Process Re-Engineering.

**Unit III: Business to Consumer E-Commerce and E-Business**

Consumer trade transaction, Web metrics, Elements of E-Commerce, Industry impacts of E-business.Integrating Intranet and internet web applications across multiple networks. Internet bookshops, Softwaresupplies and support, Electronic Newspapers, Internet Banking, Virtual Auctions, Online Share Dealing,Gambling on the net, E-Diversity, Case studies through internet.

**Unit IV:Security Issues**

How criminals plan attacks, passive attack, Active attacks, cyber stalking, SecureElectronic Transaction (SET) Protocol, Electronic cash over internet, Internet Security, Search engines,Intelligent agents in E-Commerce Electronic payment systems

**References:**

1. E-Commerce: Strategy, Technologies & Applications - David Whitley, Mcgraw Hill.
2. E-commerce: The Cutting Edge of Business - K. K. Bajaj and Debjani Nag, 2nd Edition, Mcgraw Hill.

3. Handbook of Electronic Commerce - Shaw et al.,Springer,.
4. Global Electronic Commerce: Theory and Case Studies - C. Westland and T. H. K. Clark, UniversityPress.
5. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives –SunitBelapure and Nina Godbole, Wiley India.

## SC SIMULATION AND MODELING 3:0:1

**Objectives:**

- Know the basic principles of Simulation.
- Learn basic components of a system with classification and examples.
- Understand different methods for random number generation.
- Know different types of simulations with respect to output analysis.

**Outcomes:**

Students will be able to:

- Implement different algorithms associated with generation of Random numbers.
- Analyze the real time problems with respect to verification and validation of Simulation Models.
- Understand the output analysis for different types of Simulations.

**Unit I: Introduction to Simulation**

Definition of Simulation, Simulation as a Appropriate and In appropriate tool, Applications of Simulation; Systems and System Environment, Components of a system Model of a system, types and examples; discrete and continuous systems;

**Unit II: Random Number Generation**

Properties of Random Numbers, Generation of Pseudo-Random Numbers, Techniques for Generating Random Numbers, Tests for Random Numbers(Algorithms and Problems)-Frequency tests, Runs Tests, Gap tests.

**Unit III: Random Variate Generation**

Inverse Transform Technique; Direct Transformation for the normal Distribution; Convolution Method, Acceptance-Rejection Technique

**Unit-IV: Verification and Validation of Simulation Models**

Model Building, Verification and Validation, Verification of Simulation Models, Calibration and Validation of models – Validating Input – Output Transformations; Output Analysis for a Single Model – Types of Simulations with Respect to Output Analysis, Output Analysis for Terminating Simulations, Output Analysis for steady state Simulations – Replication Method

**References:**

1. Discrete System Simulation - Jerry Banks, John S Carson II, Barry L Nelson, David M Nicol, Pearson Education Asia
2. System Simulation - Geoffrey Gordon, Prentice Hall India
3. System Simulation with Digital Computers - N. Deo, PHI

## SC ARTIFICIAL INTELLIGENCE 3:1:0

**Objectives:**

- Know an overview of artificial intelligence (AI) principles and approaches.
- Have a basic understanding of the building blocks of AI in terms of intelligent agents like Search, Knowledge representation, inference, logic, and learning.
- Understand expert systems, learning and planning which plays a considerable role in certain applications.

**Outcomes:**

Students will be able to:

- Understand different types of AI agents.
- Know the task domains of Artificial Intelligence.
- Gain insight into variousknowledgeRepresentation issues.
- Comprehend expert system, leaning, planning and make use of these concepts further in real time environment.

**Unit I: Introduction**

AI Problems, AI Techniques, Defining the Problem as State Space Search, Production Systems, Problem Characteristics, Production System Characteristics, Issues in the Design of Search Programs.

**Unit II :Heuristic Search Techniques and Knowledge Representation**

Generate and Test, Hill climbing, BFS, DFS, problem reduction, constraints satisfaction, means-ends analysis, Knowledge Representation Issues, Approaches to Knowledge Representation, Issues in Knowledge Representation, Representing simple facts in logic using predicate logic, Procedural Versus Declarative Knowledge, Inferential Versus Inheritable Knowledge, Normal Forms in Predicate Logic and Clausal Forms, Introduction to Non-monotonic Reasoning, Logics for Non-monotonic Reasoning.

**Unit III: Knowledge Representational Structures**

Weak Slot and Filler Structures: Semantic Nets, Frames.

Strong Slot and Filler Structure: Conceptual Dependency, Scripts.

**Unit IV: Game Playing, Planning and Expert Systems**

Game Playing: Minimax Search Procedure, Adding Alpha-Beta Cut Offs, iterative deepening, Planning –components of a planning systems, Goal Stack Planning, Non linear planning using constraint hosting, Hierarchical planning, Learning, rote learning, learning by taking advice, learning by problem solving, learning from examples Expert Systems: Representing and using domain knowledge, Expert system shells, explanation, Knowledge Acquisition.

**References:**

1. Artificial Intelligence- Rich Elaine Knight Kevin , Tata McGraw Hill .
2. Introduction to Artificial Intelligence and Expert system - Patterson W Dan,Prentice Hall.

## SC PATTERNRECOGNITION 2:1:1

**Objective:**

- Understand the basics of pattern recognition systems
- Learn the different techniques of estimations and component analysis.
- Learn the different supervised leaning techniques.
- Learn the different unsupervised leaning techniques.

**Outcome:**

Students will be able to:

- Acquire the knowledge on basics of pattern recognition systems
- Demonstrate the techniques of estimations and component analysis.
- Implement different supervised leaning techniques.
- Implement different unsupervised leaning techniques.

**Unit I: Introduction**

Machine perception,Pattern recognition systems, Design cycle, Learning and adaptation.

Introduction, Bayesian decision theory - Continuous features, Classifiers Discriminate functions and Decision surfaces, Normal density and Discriminant functions for the Normal Density, Bayes decision theory- Discrete features

**Unit II: Maximum Likelihood and Bayesian Parametric Estimation**

Introduction, Maximum likelihood estimation, Bayesian estimation, Bayesian parametric estimation, sufficient statistics, Problems of dimensionality, Component Analysis and Discriminants

**Unit III: Nonparametric Techniques**

Introduction, Density estimation, Parzen windows, K-Nearest Neighbor estimation, The nearest neighbor rule, Metrics and Nearest Neighbor Classification, Fuzzy Classification, Basics of Neural networks, Support vector machines

**Unit IV Unsupervised Learning**

Mixture Densities and Identifiability, Maximum – Likelihood Estimates, Application to Normal Mixtures, Unsupervised Bayesian Learning, Data Description and Clustering, Criterion Functions for Clustering, Hierarchical clustering, Online clustering, Graph Theoretic Methods,

**References**

1. Pattern Classification, 2nd Edition - R.O Duda, P.E. Hart and D.G. Stork, Wiley publications
2. Pattern Recognition and Image Analysis - Earl Gose, Richard, Johnsonbaugh, Steve Jost, Prentice Hall of India, Pvt Ltd.

## SC ENTREPRENEURSHIP DEVELOPMENT 3:1:0

**Objective:**

- Understand the basic concepts in the area of entrepreneurship.
- Have the knowledge on the role and importance of entrepreneurship for economic development.
- Develop a personal creativity and entrepreneurial initiative,adopting of the key steps in the elaboration of business idea.
- Develop the stages of the entrepreneurial process and the resources needed for the successful development of entrepreneurial ventures.

**Outcome:**

Students will be able to:

- The students will gain sufficient knowledge and confidence to explore the various Entrepreneurial opportunities.
- Analyze the business environment in order to identify business opportunities.
- Evaluate the effectiveness of different entrepreneurial strategies.
- Specify the basic performance indicators of entrepreneurial activity.

**Unit 1**: Entrepreneurship: Definition, requirements to be anentrepreneur, Characteristics of entrepreneur, intrapreneur,entrepreneur vs. manager, growth of entrepreneurship inIndia, Women entrepreneurship, Social Entrepreneurship.

**Unit II:**Entrepreneurial Motivation: motivating factors,motivation theories- McClelland's Need AchievementTheory, Government's policy actions towardsentrepreneurial motivation in the form of Subsidies andTraining, Entrepreneurship development programmes.

**Unit III:**Business Plan: Identification and Selection of projects;Project report: contents and formulation, concept of projectevaluation. Feasibility study report.Detailed Project Report.

Types of Enterprises: Small scale, Medium scale and Largescale enterprises as per MSME Act 2006. Role of smallenterprises in economic development, proprietorship,partnership, Limited Liability Partnership and PublicLimited companies, Formation, Capital structure and Sourceof finance. Venture Capital, Angel Capital.

**Unit IV**: Institutional Support and Policies: Institutional Supporttowards the development of entrepreneurship in India, technical consultancy organizations, government policies forsmall scale enterprises. Role of EDII, DIC, NIESBUD,NASSCOM and IFCI. Make in India, Skill India and Newstart-ups.Case Studies: Successful and Failed Entrepreneurs.

**References:**

- Dynamics of Entrepreneurship Development – Vasant Desai.
- Entrepreneurship: New Venture Creation – David H. Holt
- Entrepreneurship Development New Venture Creation – Satish Taneja, S.L.Gupta
- Project management – K. Nagarajan.
- Entrepreneurship: Strategies and Resources – Marc J. Dollinger

## SC CYBER SECURITY AND FORENSIC DEVELOPMENT 3:1:0

**Objectives:**

- Provide an understanding of Information security fundamentals.
- Learn various computer forensics technologies.
- Understand the concepts of ethical hacking.
- Acquire knowledge about IPR in cyberspace.

**Outcomes:**

Students will be able to:

- Acquire the knowledge on definition of information security fundamentals.
- Describe the types of computer forensics technology.
- Analyze various ethical hacking systems.
- Summarize concepts of IPR in cyberspace

**UNIT-I:Introduction to Information Systems**

Types of information Systems, Introduction to information security, Need for Information security, Threats to Information Systems, Information Security Investigations. Security threats - Sources of security threats- Motives - Target Assets and vulnerabilities – Consequences of threats- E-mail threats - Web-threats - Intruders and Hackers, Insider threats, Security Threats to E-Commerce, Cyber-crimes.

**UNIT-II:Cyber Forensics**

Cyber Security, Cyber Security roles, Cyber Security Principles, Difference between information Security and Cyber Security, Types of Computer Forensics Technology, Types of Military Computer Forensic Technology, Types of Law Enforcement: Computer Forensic Technology, Types of Business Computer Forensic Technology, Specialized Forensics Techniques, Hidden Data and How to Find It, Spyware and Adware, Encryption Methods and Vulnerabilities, Protecting Data from Being Compromised Internet Tracing Methods, Security and Wireless Technologies, Avoiding Pitfalls with Firewalls Biometric Security Systems.

**UNIT-III: Ethical Hacking**

Essential Terminology, Hacking windows – Network hacking – Web hacking – Password hacking, Malware, Scanning, Cracking. Digital Evidence in Criminal Investigations: The Analog and Digital World, Training and Education in digital evidence, Evidence Collection and Data Seizure: Why Collect Evidence, Collection Options Obstacles, Types of Evidence, The Rules of Evidence, Volatile Evidence, General Procedure, Collection and Archiving, Methods of Collection, Artifacts, Collection Steps, Controlling Contamination: The Chain of Custody, Reconstructing the Attack, The digital crime scene, Investigating Cybercrime, Duties Support Functions and Competencies.

**UNIT-IV: Cyber Crimes and Cyber Security Standards**

Crime incident Handling Basics: Cyber activism, Tracking hackers, clues to cyber-crime, privacy act, search warrants, common terms, organizational roles, procedure for responding to incidents, reporting procedures, legal considerations, Information Technology Act 2000: Scope, jurisdiction, offense and contraventions, powers of police, adjudication, Intellectual property issues in cyberspace, ISO, Copyright Act, Patent Law, Cyber Laws in India.

**References:**


1. Cryptography and Information Security - V.K. Pachghare, PHI Learning Private Limited, India.
2. Computer Security: Principles and Practice - William Stallings and Lawrie Brown, Prentice Hall.
3. Threat Modeling- Swiderski, Frank and Syndex, Microsoft Press.
4. Cyber Security Operations Handbook -John W. Rittinghouse, William M. Hancock, ElsevierPub.
5. Computer Ethics -Deborah G Johnson, 4th Edition, Pearson Education Publication.
6. "Ethical Decision making and IT: An Introduction with Cases - Earnest A. Kallman, J.P Grillo, McGraw Hill Publication.
7. Introduction to Information Security and Cyber Law - Dr. Surya Prakash Tripathi, RitendraGoyal, Praveen Kumar Shukla, WilleyDreamtech Press.
8. Cyber Security and Global Information Assurance: Threat Analysis and Response Solutions, Kenneth J. Knapp, IGI Global.
9. Cyber Laws and Its Protection, Cahnder, Harish, PHI Learning Private Limited,Delhi,India.
10. Principles of Information Security - Michael E. Whitman, Herbert J. Mattord, Cengage Learning Pub.
11. Analyzing Computer Security, Charles P. Pfleeger, Shari LawerancePfleeger, Pearson Education India.
12. Computer Network Security - Joseph M Kizza, Springer Verlag.

## SC VALUES & ETHICS 3:1:0

**Objectives:**

- Creating awareness about the importance of professional ethics.
- Understand the effect of technology on the social issues.
- Build an awareness how to develop technologies that do not disturb the psychological wellbeing of the society.

**Outcomes:**

Students will be able to:

- Know the importance of ethics and methods of developing technologies
- Describe the structure and function of an ethical society.
- Identify the values and ethics of professional development.
- Explain the causes, effects and control measures for various types of societal failures.
- Get knowledge about various ethical management methods

**Unit I:Effects of Technological Growth**

- Science, Technology and Engineering as Knowledge and as Social and Professional Activities.
- Rapid Technological growth and depletion of resources. Related latest Reports, Limits of growth; sustainable development.
- Energy Crisis; Renewable Energy Resources.
- Environmental degradation and pollution. Eco-friendly Technologies. Environmental Regulations. Environmental Ethics.
- Appropriate Technology Movement of Schumacher: later developments.
- Technology and developing nations. Problems of Technology transfer. Technology assessment, impact analysis.
- Human Operator in Engineering projects and industries. Problems of man machine interaction. Impact of assembly line and automation. Human centered Technology.

**Unit II: Profession and Human Values:**

- Nature of values: Value Spectrum of a ‘good’ life.
- Value Crisis in contemporary society.
- Psychological values: Integrated personality; mental health Societal values: The modern search for a ‘good’ society, justice, democracy, secularism, rule of law; values in Indian Constitution.
- Aesthetic values: Perception and enjoyment of beauty, simplicity, clarity.
- Moral and ethical values: Nature of moral judgments; canons of ethics; Ethics of virtue; ethics of duty; ethics of responsibility.

**Unit III:Ethics of Profession**

- Engineering profession: Ethical issues in engineering practice. Conflicts between business demands and professional ideals. Social and ethical Responsibilities of Technologists. Codes of professional ethics. Whistle blowing and beyond. Case studies

**Unit IV: IPR**

- Introduction to IPR, IPR Laws in India

**References:**

1. Blending the best of the East & West - Dr.Subir Chowdhury, EXCEL.
2. Ethics & Management. & Indian Ethos - Ghosh ,VIKAS.
3. Business Ethics- Pherwani,EPH.
4. Ethics, Indian Ethos & Management. - Balachandran,Raja,Nair,Shroff Publishers.
5. Values & Ethics of Profession & Business - S.K.Sarangi, Asian Books Private Limited.

## SC MOBILE COMMUNICATION 3:1:0

**Objectives:**

- Make students familiar with fundamentals of mobile communication systems.
- Choose system (TDMA/FDMA/CDMA) according to the complexity, installation cost, speed of transmission, channel properties etc.
- Identify the requirements of mobile communication as compared to static communication.
- Identify the limitations of 2G and 2.5G wireless mobile communication and use design of 3G and beyond mobile communication systems.

**Outcomes:**

Students will be able to:

- Understand the concept of cellular communication.
- Understand the basics of wireless communication.
- Have knowledge of GSM and CDMA mobile communication standard, its architecture, logical channels, advantages and limitations.
- Understand multicarrier communication systems.

**Unit I:**

**Introduction** - Introduction to Mobile Communication, History of wireless communication, A simplified reference model.

**Wireless transmission** - Signals, Antennas, Signal propagation: Path loss of radio signals, Additional signal propagation effects and Multi-path propagation. Multiplexing: Space, Frequency, Time and Code division multiplexing. Modulation: Amplitude, Frequency and Phase shift keying.

Spread spectrum: Direct sequence spread spectrum & Frequency hopping spread spectrum and cellular system.

**Unit II:**

**Medium access control** - Motivation for specialized MAC: Hidden and exposed terminals &Near and far terminals. SDMA, FDMA, TDMA: Fixed TDM, Classical Aloha and Slotted Aloha, CDMA and Comparison SDMA/FDMA/TDMA/CDMA.

**Unit III:**

**Telecommunication systems -** GSM: System architecture, Protocols and Handover.
DECT: System architecture and Protocol architecture, TETRA, UMTS: UMTS releases and standardization & UMTS system architecture and IMT-2000.

**Satellite systems** - History, Applications, Basics: GEO, LEO and MEO, Routing, Localization and Handover.

**Unit IV:**

**Broadcast systems**: Overview, Cyclical repetition of data, Digital audio broadcasting, digital video broadcasting: DVB data broadcasting and DVB for high-speed internet access & convergence of broadcasting and mobile communication.

**Wireless LAN:** Infra red vs radio transmission, IEEE 802.11: System architecture. Bluetooth: User scenarios & Architecture.

**References:**

1. Mobile Communications -Jochen Schiller, 2nd Edition, Pearson Education.
2. Introduction To Digital Mobile Communication - Yoshihiko Akaiwa, Wiley India Pvt Ltd
3. Mobile Cellular Communication - Rao, Pearson Education.