Course Scheme and Syllabus
for

Master of Computer Science
(Two Years Degree Course)
(Programme ID-70)
1st to 4th Semester

(As per Choice Based Credit System)

Syllabi Applicable for 2018 Batch
### Master of Science in Computer Science Syllabi 2018

#### Semester 1

<table>
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*The Major Project will be of 20 to 24 weeks duration. It will include the development of application/system software in industries, commercial or scientific environment. For evaluation, 20% weightage will be given to the synopsis of the project and 80% weightage will be given to the Viva, Project Execution, and Project Report.*

### Discipline Elective-I

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### Discipline Elective-II

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<td>CSA675</td>
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Course Title: Discrete Structures  
Course Code: MTH570  
Course Duration: 45-60 Hours

Course Objective: To provide basic knowledge about mathematical structures viz. sets, groups, binary trees, graphs, propositions, functions, recurrence relations, etc required for the implementation of various computer science courses.

UNIT – A  
12 Hours

Set Theory
- Set and its Representations, Types of sets
- Subsets
- Operations on Sets-Union, Intersection and Difference of Sets
- Venn Diagrams, Statement Problems
- Laws- Associative Laws, Distributive Laws, Demorgan’s Laws

Relation and Functions
- Relations, Pictorial Representations of Relations, Composition of Relations, Types of Relations, Closure Properties
- Equivalence Relations and Partitions, Hasse diagram, Lattices, Bounded Lattices, Distributive Lattices.
- Functions, Special functions, Composition of Functions, one-one, onto and Inverse of a function
- Mathematical functions, Exponential and Logarithmic Functions

UNIT – B  
13 Hours

Group Theory
- Group Axioms, Semi groups, Properties of Groups
- Subgroups
- Cosets, Normal subgroup
- Permutation Group
- Dihedral Group

Recurrence relations
- Characteristic Equation
- Homogeneous and non-homogeneous linear recurrence relations with constant coefficients
- Generating Functions for some standard sequences

UNIT – C  
13 Hours

Graphs
- Basic Terminology, Special Graphs,
- Handshaking Theorem,
- Isomorphism of Graphs,
- Walks, Paths, Circuits, Eulerian and Hamiltonian Paths
- Planar and Non Planar Graphs,
- Coloring of Graph, Directed graphs, Travelling Salesman Problem
Logic and Propositional Calculus
- Propositions,
- Basic logic operators
- Logic equivalence involving Tautologies and Contradiction
- Algebra of Propositions
- Conditional and Biconditional Statements
- Logical Implication, Propositional Functions, Quantifiers

UNIT – D 12 Hours
Vectors and Matrices
- Vectors, Matrices
- Matrix Addition, Scalar Multiplication
- Matrix Multiplication, Transpose
- Square matrices
- Invertible Matrices, Inverses, Determinants

Counting and Probability Theory
- Basic counting principle, Factorial Notation
- Binomial Coefficients, Permutations, Combinations
- Sample Space and Events
- Finite Probability Spaces
- Conditional Probability
- Independent Events, Binomial Distribution
- Random variables

Reference Books:
Course Title: Computer System Organization and Architecture

Course Code: CSA503
Course Duration: 45-60 Hours

Course Objective: The objective of the course is to introduce students to the design and organization of modern digital computers by showing the relationship between hardware and software and focusing on the concepts of microprocessors.

UNIT – A 18 Hours

Information Representation
- Signed and unsigned numbers, Addition and subtraction, multiplication, division, Floating point representation, logical operation
- Binary Codes: Gray Code, Decimal Code and Alphanumeric Codes
- Error Detection and Correction codes: Parity Check

Binary Logic
- Logic gates, Boolean algebra, Boolean functions
- Truth tables, simplification of Boolean functions
- K-maps for 2, 3 and 4 variables

UNIT – B 15 Hours

Basic Building Blocks
- Combinational logic design:
  - half-adder, full adder, half-subtractor, full subtractor
  - Encoder, Decoder
  - Multiplexer, De-Multiplexer

Sequential Circuits
- Concept, flip-flops (D, RS, JK, T, and Master-Slave)
- Registers:
  - Register with parallel load
  - Buffer, Bidirectional Shift Register with parallel load and Controlled shift registers
- Counters: Binary, Ripple, Ring, Johnson Counter

UNIT – C 15 Hours

Computer Organization
- Microcomputer Organization; Microprocessor Organization, Instruction codes
- Memory Reference, Register Reference and Input-Output Reference Instructions
- Instruction cycle, Instruction formats
- Processing UNIT Design: one, two and three bus Organization.
- Addressing Mode, CISC, RISC

Memory Organization
- Memory Hierarchy, Types of Memory: RAM and ROM Chips,
- Associative Memory, Cache Memory, Auxiliary Memory, Virtual Memory
• Memory Address Map, Memory Connection to CPU.

UNIT – D  12 Hours

Input Output Organization

• Input output Interface, Memory Mapped I/O; Interrupt, isolated versus memory mapped I/O, Modes of transfer-Programmed I/O
• Asynchronous Data Transfer: Strobe Control, Handshaking
• Priority Interrupts: Daisy-Chaining, Parallel Interrupt, Priority Encoder
• Interrupt Cycle, Types of Interrupt: Program interrupt
• Priority Interrupts, Direct Memory Access (DMA).
• Input output processor-CPU-IOP communication
• Introduction to Assembly Language.

Reference Books:

Course Title: Advances in Operating Systems
Course Code: CSA504
Course Duration: 45-60 Hours

Course Objective: To understand and learn the fundamentals of Operating System including dealing with memory management, process management, CPU scheduling, deadlocks and file management.

UNIT– A 15 Hours
Introduction to Operating System
- OS, History of OS, Types of OS
- Functions/operations of OS, User services/jobs, system calls
- Traps, architectures for operating systems

Process Management
- Process overview, Process states
- Interrupt mechanism

UNIT – B 18 Hours
CPU Scheduling and Process Synchronization
- Scheduling algorithms
- Preemptive scheduling & Non-Preemptive scheduling
- Levels of schedulers
- Process Synchronization, Critical section and mutual exclusion problem
- Classical synchronization problems,. Multithreading.

System Deadlock
- Deadlock characterization, Deadlock prevention and avoidance
- Deadlock detection and recovery, practical considerations

UNIT– C 15 Hours
Storage Management
- Storage allocation methods: Single contiguous allocation
- Multiple contiguous allocation

Memory Management
- Paging, Segmentation combination of Paging and Segmentation
- Virtual memory concepts, Demand Paging, Page replacement Algorithms
- Thrashing. Address Protection,
- Cache memory, hierarchy of memory types, associative memory.

File Management
- Overview of File Management System
- Disk Space Management, Directory Structures
- Protection Domains, Access Control Lists, Protection Models
- Queue management, File and directory systems

Device Management
- Goals of I/O software, Design of device drivers, Device scheduling
policies

UNIT – D

Disk Scheduling Algorithms
- FCFS, SSTF, SCAN, CSCAN, LOOK, CLOOK

Android
- Android Overview, Android architecture, Linux Kernel, Android Run-time
- Android Application Framework, Android Application architecture
- Android Security

Reference Books:

Course Title: Database Management System
Course Code: CSA505
Course Duration: 45-60 Hours

Course Objective: The concepts related to database, database design techniques, transaction management, SQL, PL/SQL and database operations are introduced in this subject. This creates strong foundation for data base creation.

UNIT – A 15 Hours
Data Base Concepts
- Data base vs. file oriented approach, Data Independence
- Data Base Models
- General Architecture of a Data Base Management Software, Components of a DBMS
- Advantages and Disadvantages of DBMS

Introduction to Data Models
- Entity Relationship model, hierarchical model
- from network to hierarchical, relational model
- object oriented database, object relational database
- Comparison of OOD & ORD, comparison of network, hierarchical and relational models.

UNIT – B 15 Hours
Data Base Design
- Entities, Attributes, ER Diagrams
- Functional dependencies; Normalization
- Multivalued dependencies, decomposition
- Relational algebra and calculus
- Need and types of query optimization procedures, phases of query optimization

Data Base Protection
- Concurrency, recovery
- Integrity, Protection, essentials of security
- authorization, types of database security

UNIT – C 15 Hours
Relational Query Language
- SQL, client/server architecture
- Technical introduction to Oracle.

Software Development using SQL
- SQL data types, Querying database tables
- Conditional retrieval of rows, working with Null values, matching a pattern from the table
- querying multiple tables: Equi joins, Cartesian joins, Outer joins, Self joins;
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- Set operator: Union, Intersect, Minus, Nested queries

UNIT – D
Introduction to PL/SQL
- The PL/SQL block structure, PL/SQL data types
- Variables and constants, assignment and expressions
- Writing PL/SQL code, cursor management in PL/SQL
- Concept of stored procedures
- Database triggers, types of triggers, Dropping triggers, storage of triggers
- Program Design & Development for Program Design & Development for Payroll, University Examination and Student Management System

Reference Books:
Course Title: JAVA Programming
Course Code: CSA572
Course Duration: 45-60 Hours

Course Objective: The objective of this course is to get insight of the subject and after completion of this course, students will be able to:
- Use the advanced features of Java Technology
- Develop good program to handle exceptions and errors in program.
- Work with collection API and develop fast programs.
- Use the java.io package in detail.
- Use the serialization concepts of java technology.
- Develop good multithreaded programs

UNIT – A  15 Hours

Introduction
- Features of Java
- Data Types, Operators & Expressions
- Control Structures, Arrays,
- Class, Objects & Methods, Constructors
- Garbage Collection, Access Qualifiers, String Handling – String Operations
- Inheritance, static Classes, Abstract Classes, Final Classes
- Wrapper Classes: Autoboxing and Unboxing, Garbage Collection & Finalize method
- Enumerated Types and Annotations, Handling String and String Buffer Classes, Method Overloading and Overriding
- Nesting of Methods and Methods with Varargs.

UNIT-B  15 Hours

Packages and Interface
- Packages, Access Protection
- Importing Packages, Interfaces
- Defining, Implementing
- Applying Interfaces
- Extending Interfaces

Exception Handling
- Exception Types
- Uncaught Exceptions
- Multiple Catch Clauses
- Nested Try Statements Built-in Exceptions
- Creating Your Own Exceptions.

Multithreading
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- Java Thread Model, Creating Multiple Threads, Thread Priorities
- Synchronization, Interthread Communication
- Suspending, Resuming and Stopping Threads

UNIT – C

Applets
- Local & Remote Applets
- Applet Architecture
- Passing Parameters to Applets
- I/O Streams: Console I/O
- Reading Console Input, Writing Console Output
- Files I/O – Byte Streams, Character Streams
- Collection Interfaces & Classes
- Delegation Event Model

UNIT – D

AWT Classes
- Window Fundamentals
- Working with Graphics
- Working with Color & Fonts
- AWT Controls
- Layout Managers & Menus

Introduction to Graphic Programming
- Applying 2-D transformations on Objects
- Event Listeners: Action Listener and Item Listener

Reference Books:

Course Title: Database Management System Laboratory  
Course Code: CSA507

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Implementation of SQL: DDL, DML, DCL, TCL  
Practice of PL/SQL.

Course Title: JAVA Programming Laboratory  
Course Code: CSA574

- Implementation of OOP concepts using JAVA  
- Packages and Interfaces  
- Exception Handling  
- Applets  
- AWT classes
Course Title: Data Structures and File Processing using C  
Course Code: CSA508  
Course Duration: 45-60 Hours

Course Objective: The emphasis of this course is on the organization of information, the implementation of common data structures such as lists, stacks, queues, trees, and graphs.

UNIT – A  
15 Hours  
Preliminaries
- Introduction to Data Structures: Primitive and Composite
- Various data structures
- Common operations on data structures, algorithm complexity
- Big O notation, timespace tradeoff between algorithms
- Complexity of Algorithms, Records and Pointers.
Arrays
- Arrays defined, representing arrays in memory, various operations on linear arrays
- Multi dimensional arrays, Records, Matrices, Sparse Matrices
- Linear Search, Binary Search
- Insertion Sort, Selection Sort, Bubble Sort
- Merge Sort, Radix Sort
- String, Representation and Manipulation

UNIT – B  
15 Hours
Linked Lists
- Types of linked lists, representing linked lists in memory
- Advantage of using linked lists over arrays
- Various operation on linked lists
Stacks
- Description of stack structure, implementation of stack using arrays and linked lists
- Applications of stacks converting arithmetic expression from infix notation to polish and their subsequent evaluation
- Quicksort technique to sort an array, parenthesis checker.
Queues
- Implementation of queue using arrays and linked lists
- Deques, Priority Queues and their implementation, applications of queues.

UNIT – C  
13 Hours
Trees
- Description of tree structure and its terminology, binary search tree
- Implementing binary search tree using linked lists
• Various operations on binary search trees, AVL Trees
• Threaded Binary Trees, BTrees, B+ trees

Heaps
• Description of heap structure, implementing heaps using arrays
• Various operations on heaps, Applications of heaps
• Heapsort technique to sort an array

UNIT – D 18 Hours
Graphs
• Representation of Graphs and Applications: Adjacency Matrix, Path Matrix
• Warshall’s Algorithm, Linked Representation of a Graph
• Traversing a Graph, DFS and BFS.

Hash Tables
• Direct address tables, hash tables
• Collision resolution by chaining, hash functions
• Open addressing – linear probing, quadratic probing, double hashing

Files
• Operations on files, Types of files
• File Organizations: Sequential files, Indexed Sequential file, Directed files and multikey files
• File performance criteria and terms.

Reference Books:

Course Title: Computer Networks and Data Communication
Course Code: CSA510
Course Duration: 45-60 Hours

Course Objective: As part of this course, students will be introduced to computer networks and data communication paradigms, about network models and standards, network protocols and their use, wireless technologies.

UNIT – A 18 Hours
Introduction to Data Communication
- Components of Data Communication, Data Representation
- Transmission Impairments, Switching, Modulation, Multiplexing

Review of Network Hardware
- LAN, MAN, WAN
- Wireless networks, Internetworks

Review of Network Software
- Layer, Protocols, Interfaces and Services

Review of Reference Models
- OSI, TCP/IP and their comparison

Physical Layer
- Transmission Media: Twisted pair, Coaxial cable, Fiber optics
- Wireless transmission (Radio, Microwave, Infrared)
- Introduction to ATM, ISDN
- Cellular Radio and Communication Satellites

UNIT – B 15 Hours
Data Link Layer
- Framing, Error control, Sliding window protocols (one bit, Go back n, selective repeat)
- Examples of DLL Protocols–HDLC, PPP

Medium Access Sub layer
- Channel Allocation, MAC protocols – ALOHA, CSMA protocols
- Collision free protocols, Limited Contention Protocols
- Wireless LAN protocols
- IEEE 802.3, 802.4, 802.5 standards and their comparison

Bridges
- Transparent, source routing, remote

UNIT – C 15 Hours
Network Layer
- Design Issues, Routing Algorithms (Shortest Path, Flooding, Distance Vector, Hierarchical, Broadcast, Multicast
-Internetworking, IP Protocol, ARP, RARP.
UNIT – D

Transport Layer

- Addressing, Establishing and Releasing Connection
- Flow Control, Buffering
- Internet Transport Protocol (TCP and UDP).
- Congestion Control Algorithms (Leaky bucket, Token bucket, Load shedding)

Application Layer

- Domain name system, Email, File transfer protocol

Reference Books:

Course Title: Computer Based Optimization Techniques
Course Code: CSA578
Course Duration: 45-60 Hours

Course Objective: To introduce linear programming, dynamic programming and related Optimization Theories to solve real life / simulated problems.

UNIT – A
Introduction
• The Historical development
• Nature, Meaning and Management Application of Operations Research Modelling
• Its Principal and Approximation of O.R.Models
• Main Characteristic and Phases
• General Methods of solving models
• Scientific Methods, Scope, Role on Decision Making
• Development of Operation Research in India

UNIT – B
Linear Programming
• Mathematical formulation of linear programming problems
• Canonical and standard forms of linear programming problems
• Solution by Graphical & Simplex method
• Revised simplex method
• Two phase & Big-M method, Duality, Primal-Dual Relationship
• Simplex Method
• Economic Interpretation of Optimal simplex Solution

Special Types of Linear Programming Problems
• Transportation
• Assignment Problems

UNIT – C
Integer & Dynamic Programming
• Integer programming problem
• Branch and Bound Techniques
• Characteristics
• Deterministic DP Problems, Recursive Approach and Tabular method

PERT / CPM
• Project Planning
• Scheduling
• Activity Cost
• Network Diagram Representation
• Difference between CPM and PERT
• Floats and Slack Times

UNIT-D 15 Hours

Queuing Models
• Introduction, Applications
• Characteristic, Waiting and Ideal time costs
• Transient and Steady states
• Kendall's Notations
• M/M/1, M/M/C, M/Ek/1 and Deterministic Models

Reference Books:

Course Title: Interactive Computer Graphics
Course Code: CSA579
Course Duration: 45-60 Hours

Course Objective: The aim is to introduce the students to key concepts of Computer Graphics like display devices, co-ordinate system, transformations, line and circle drawing, pointing, positioning, projections, etc.

UNIT – A
15 Hours

Display Devices
- Line and point plotting systems
- Raster, vector, pixel and point plotters
- Continual Refresh and storage displays
- Digital frame buffer
- Plasma panel displays, Display processors
- Character generators
- Color-display techniques: shadow mask and penetration CRT, Color look-up tables

Elementary Drawing Algorithms
- Line drawing using direct method, simple DDA, integer DDA
- Incremental method, and Bresenham’s algorithm
- Circle drawing using incremental method, Bresenham’s and MidPoint algorithm
- drawing arcs, sectors
- Flood Fill Algorithms, Boundary Fill Algorithms

UNIT – B
15 Hours

Geometric Transformations.
- Two Dimensional Translation, rotation, scaling, reflection and shear
- Concept of homogenous coordinates
- Building composite transformations

Viewing Transformations
- Concept of Windows & Viewport
- Window-To-Viewport Mapping
- Clipping Operations - Point Clipping
- Line Clipping Algorithms (Cohen - Sutherland, Mid-Point, Subdivision, Cyrus - Beck),
- Sutherland - Hodgeman Polygon Clipping Algorithm

UNIT – C
15 Hours

Three-dimensional concepts
- 3-D representations and transformations
- perspective and parallel projections
- spline curves and surfaces
• Quadtree and Octree data structures

**Hidden line/surface Removal**
• Back Face Removal
• Z-Buffer Algorithm
• Painters (Depth Sort) Algorithm
• Subdivision Algorithms - Warnock’s Algorithm
• Scan Line Algorithms - Scan Line

**UNIT – D**

**15 Hours**

**Rendering**
• Introduction, a simple illumination model
• Shading - Gouraud shading &Phong Shading
• Ray Tracing, Shadows, Textures

**Open GL**
• Primitives of the language and interface with C/C++

**Reference Books:**

Course Title: Theory of Computer Science  
Course Code: CSA580  
Course Duration: 45-60 Hours

Course Objective: Understanding and development of theoretical models of computations and their analysis. The models of computations include (i) Finite Automata (and Regular Languages), (ii) Push Down Automata (and Context-free Languages), (iii) Turing Machine (and their Languages).

UNIT – A  
15 Hours  
Automata Theory  
- Deterministic Finite Automata, Moves  
- Non Deterministic Finite Automata  
- Moore and Mealy Machines  
- Minimization Algorithm  
Regular Languages  
- Regular Sets  
- Regular Expressions  
- Pumping Lemma for Regular Sets

UNIT – B  
15 Hours  
Context Free Grammars  
- Context free grammars (CFG)  
- Derivation Graphs  
- Ambiguities in Grammars and Languages  
- Properties of Context Free Languages  
- Normal Forms  
- Pumping Lemma for CFL  
- Closure Properties  
Pushdown Automaton  
- Pushdown Automaton (PDA)  
- Deterministic Pushdown Automaton (DPDA)  
- Non-equivalence of PDA and DPDA  
- Language Accepted by PDA

UNIT – C  
15 Hours  
Linear Bounded Automata (LBA)  
- Power of LBA  
- Closure properties  
Turing Machines  
- Turing Machine as A Model of Computation  
- Programming with a Turing Machine  
- Variants of Turing Machine and Their Equivalence
Turing Machines and Languages

UNIT – D  
15 Hours  
Undecidability

- Chomsky Hierarchy of Languages
- Recursive and Recursive Enumerable Languages
- Halting Problem, Undecidable Problems about Turing machines
- Rice theorem
- The Equivalence of the Automata and the Appropriate Grammars

Reference Books:

Course Title: Data Structures and File Processing using C Laboratory
Course Code: CSA512

Implementation of Data Structures using C: Arrays, Linked List, Stack, Queues, Trees, etc.

Course Title: Interactive Computer Graphics Laboratory
Course Code: CSA582

Implementation of various algorithms of drawing line, circle, ellipse, etc. and 2D transformations
Course Title: Microprocessors and Its Applications  
Course Code: CSA671  
Course Duration: 45-60 Hours

Course Objective: The purpose of this course is to teach students the fundamentals of microprocessor and to introduce students to features and technology of microprocessor systems. The students studying the subject are supposed to learn the architecture of a typical microprocessor and also get general information about microprocessor based control systems.

UNIT – A
Introduction
- Introduction to Microprocessor
- Microcontroller and Microcomputer

Microcomputer structure
- Processor, memory and I/O; Bit slices and 8/16/32-bit microprocessors
- Microprocessor architecture (registers, index and stack pointers, addressing modes)
- I/O interface adapters (parallel and serial) interface devices, system clock, clock phase and bit rates

Architecture of 8085/8086 Microprocessor
- Description of various pins
- Configuring the 8086/8088 microprocessor for minimum and maximum mode systems description of system mode interfaces
- Internal architecture of the 8086 / 8088 microprocessor, system clock, Bus cycle, instruction execution sequence.

UNIT – B
Memory Interface
- Memory Devices
- Address Decoding, 8-bit, 16-bit, 32-bit and 64-bit memory interfaces
- Dynamic RAM

Basic I/O Interface
- I/O Port Address Decoding
- Programmable Peripheral Interface
- 8279 Programmable Keyboard/Display Interface
- 8254 Programmable Interval Timer
- 16550 Programmable Communication Interface

UNIT – C
Interrupts
- Basic Interrupt Processing
- Hardware Interrupts
- Expanding the Interrupt Structure
- 8259A Programmable Interrupt Controller

Direct Memory Access (DMA)
• Basic DMA Operations
• 8237 DMA Controller
• Shared Bus Operations

UNIT – D  
Bus Interface  
15 Hours

• ISA, EISA  
• VESA Buses, PCI, USB Bus

Assembly Language Programming
• Addition, Subtraction, Complement First and Second, Shifting of 8  
  and 16-bit number by one and two bits.

Reference Books:

Course Title: Mobile Computing  
Course Code: CSA672  
Course Duration: 45-60 Hours

Course Objective: To familiarize students with wireless technology, wireless networking, WAP architecture, WAP applications, database management issues like data replications in mobile computers, data delivery models, mobile agent computing, security in wireless and mobile systems.

UNIT-A  
Introduction  
15 Hours
- Issues in Mobile Computing
- Overview of Wireless Telephony: cellular concepts, GSM, Channel structure.
- Location Management: HLR- VLR, handoffs, channel allocation in cellular systems, CDMA, GPRS
- Impacts of mobility and portability in computational model and algorithms for mobile environment.
- Analysis of algorithms and termination detection.

UNIT-B  
Wireless Networking  
15 Hours
- Wireless Networking
- Wireless LAN Overview: MAC Issues, IEEE802.11, Bluetooth, Wireless multiple access protocol, TCP over wireless
- Wireless applications, Data broadcasting, Mobile IP
- WAP Architecture: Protocol Stack, Application Environment, Applications

UNIT-C  
Data Management Issues  
15 Hours
- Data Replication for mobile computers
- Adaptive Clustering for wireless networks, File System, Disconnected operations

Data delivery models
- Push and pull. Data dissemination in wireless channels
- Broadcast disks. Effects of caching

UNIT-D  
Mobile Agent Computing  
15 Hours
Master of Science in Computer Science Syllabi 2018

- Transaction processing in Mobile Computing Environment

**Security in Wireless and Mobile Systems**

- Security and fault tolerance, Threats, Vulnerabilities, Attacks, Integrity, Confidentiality, Policy and relevant definitions
- Authentication – Different techniques
- Cryptography – Symmetric Key Cryptography, Asymmetric key Cryptography, Key management, Digital signatures, Certificate
- Wireless and Mobile system security – Strategies, Routing security, Different schemes for MANET

**Reference Books**

Course Title: Emerging Trends in Information Technology
Course Code: CSA673
Course Duration: 45-60 Hours

Course Objective: This course provides understanding of emerging trends in multimedia, lossless and lossy compression techniques, wireless delivery techniques, software intelligent agent and familiarize students with emerging technologies such as Multimedia, Parallel Computing, Mobile Computing and intelligent Agent Technologies

UNIT-A 15 Hours
Introduction to Information Technology
- Latest development in Computer hardware :RISC V/S CISC architecture,
- Intel V/S, Motorola chips, Computer peripherals.
- Programming Paradigms, Software Agents, Interoperable objects

Multimedia Systems
- Architecture and Subsystems of Multimedia Computer Systems
- Multimedia applications, multimedia building blocks (text, hypertext, image, audio, video, animation)
- Multimedia Authoring- Introduction, methodologies (Frame Based, Time based, Icon Based)

UNIT-B 15 Hours
Compression Technologies of Multimedia
- Introduction and Need of Compression
- Compression Basics, Lossless Compression Techniques
- Lossy Compression Techniques

Audio and Video Conferencing
- Technology & Applications
- Application to information technology to various function areas such as education, banking, communication etc.

UNIT-C 15 Hours
Data Management technologies
- Data Ware Housing and Data Mining
- Data Marts and Conceptual Foundation of ERP

Networking Technologies
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- Computer Networks, LAN, WAN, MAN, topologies.
- Internet, ISDN, PSDN, Wireless Networks
- Internet Telephony, Virtual learning environment, Mobile communications.
- IP Addressing

UNIT-D

Mobile Computing

- Mobile connectivity-Cells, Framework, wireless delivery technology and switching methods
- Mobile information access devices, mobile data internetworking standards
- Cellular data communication protocols, mobile computing applications
- Mobile databases-protocols, scope, tools and technology, M-Business

Intelligent Agent Technology

- Introduction to agents, intelligent software systems
- Attributes, intelligent architectures, components of intelligent agent based distributed systems
- Agent communication protocols, Internetworking applications of intelligent Agents.

Reference Books

Course Title: Information Systems
Course Code: CSA674
Course Duration: 45-60 Hours

Course Objective: This course provides a comprehensive understanding of the information systems, types of systems, subsystems, management information systems, decision support systems, expert systems, enterprise information systems and decision making and analysis.

UNIT-A
System and Information Concepts
- General Model, Types of systems, Subsystems
- Feedback Control, Systems approach to organization, Law of requisite variety, Control by exception
- Information Concepts, Types of Information, Quality of Information, Value of Information

Management Information System
- Definitions, Role of MIS, MIS in Academics
- Structure of MIS based on management activity and functions System and Information concepts to MIS

UNIT-B
Decision Support Systems
- Conceptual Foundations of DSS, Concepts of DSS
- DSS Software, Strategies for DSS, GDSS, and Executive Support System (ESS),
- Fundamentals of Knowledge Management systems, Knowledge Based Decision Support
- DSS Application, Case Study

UNIT-C
Expert System
- Expert System Application, Comparison of Conventional & Expert System
- Case Study

Executive Information and Support Systems
- Enterprise & Executive Information System, Concept and Definition
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- Information needs of Executives, Characteristics and benefits of EIS
- Comparing and Integrating EIS and DSS.

UNIT-D 15 Hours

Decision Making Systems, Modelling and Analysis

- Decision Making Definition and Concept, Phases of Decision Making Process
- Modelling Process, Static and Dynamic Models
- Sensitivity Analysis
- Heuristic programming, Simulation

Reference Books

Course Title: Design and Analysis of Algorithms
Course Code: CSA601
Course Duration: 45-60 Hours

Course Objective: The objective of the module is to create skills in students to design and analysis of algorithms.

UNIT – A 15 Hours
Algorithms and Analysis
- Introduction
- Algorithms specification
- Recursive algorithms
- Space and Time Complexity
- Asymptotic Notation (O, Θ and Ω) practical complexities, Best, average and worst case performance of algorithms
- Introduction to recurrence relations

Divide and Conquer
- General method
- Binary Search, Merge sort, Quick sort, Selection sort,
- Analysis of these problems

UNIT – B 15 Hours
String Processing and Greedy Method
- KMP
- Boyre-Moore
- Robin Karp algorithms

Greedy Method
- General Method, Knapsack problem
- Job sequencing with deadlines
- Minimum spanning Trees
- Single Source Shortcut paths and analysis of these problems

UNIT – C 15 Hours
Dynamic Programming
- General method, Optimal Binary Search Trees
- 0/1 Knapsack
- The Travelling Salesperson Problem

Back Tracking
- General method, 8 queen's problem
- Graph Coloring
- Hamiltonian Cycles
- Analysis of these Problems
UNIT – D

Branch and Bound
- Least Cost Search and LC Branch and Bound
- Bounding
- FIFO Branch and Bound
- 0/1 Knapsack Problem
- Travelling Salesperson Problem

Introduction to Complexity Theory
- NP-Hard and NP-Complete Problem
- Basic concepts, Cook's theorem, examples of NP-Hard problems
- Approximation Algorithms

Reference Books:

Course Title: .NET Framework and C#
Course Code: CSA623
Course Duration: 45-60 Hours

Course Objective:
- To build web applications using ASP and client side script technologies use with Microsoft’s IIS.
- To build XML applications with DTD and style sheets that span multiple domains ranging from finance to vector graphics to genealogy for use with legacy browsers.

UNIT—A
Introduction to Three-Tier Architecture
- Overview of .NET Framework, Common Language Runtime (CLR)
- The .NET Framework Class Library, familiarization with visual studio .NET IDE, Design Window, Code Window, Server.
- Features of VS.NET, XML Editor, Creating a Project, Add Reference, Build the Project, Debugging a Project.

UNIT—B
Introducing C# Programming
- Introduction, Basic Language Constructs, Types (Reference and Value, Relations Between Types)
- Delegates, Generics, Collections
- Strings, Exceptions, Threads, Networking

UNIT—C
Windows Forms, Adding Controls
- Adding An Event Handler, Adding Controls at Runtime
- Attaching An Event Handler at Runtime, Writing a Simple Text Editor, Creating a Menu Adding a New Form,
- Creating a Multiple Document Interface, Creating a Dialog Form Using form Inheritance, Adding a Tab-Control, Anchoring Controls,
- Changing the Startup Form, Connecting The Dialog, Using Listview and Treeview Controls,
- Building an Image list and add Them To The Listview, Using Details inside The Listview,
- Attaching A Context Menu, Adding a Treeview, Implementing Drag And Drop, Creating Controls at Run Time, Creating a User Control, Adding a Property, Adding Functionality,
- Writing a Custom Control, Testing the Control.

UNIT—D
ADO.NET Architecture
- Understanding the Connectionobject
Building the Connection String, Understanding the Commandobject,
Understanding Datareaders, Understanding Datasets and Dataadapters, Datatable, Datacolumn, Datarow
Differences between Datareader Model and Dataset Model, Understanding the Dataviewobject, Working with System.Data.OleDb
Using Datareaders, Using Datasets, Working with SQL.NET, Using Stored Procedures, Working With Odbc.NET, Using DSN Connection

Introducing The ASP.NET Architecture
- ASP.NET Server Controls, Working with User, Controls, Custom Controls, Understanding the Web.Config File, Using the Global.asax Page

Reference Books
Course Title: Data Mining and Data Warehousing

Course Code: CSA605

Course Duration: 45-60 Hours

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Course Objective: To introduce the concepts and techniques of data mining and data warehousing, including concept, principle, architecture, design, implementation, applications of data warehousing and data mining.

UNIT-A 15 Hours

Introduction to

- Introduction to different kinds of Information Systems: ESS, EIS, DSS, MIS, KWS, TPS, OAS and EDP

Data Warehousing Architecture

- Design and Construction of Data-Warehouses, Three-Tier Data Warehouse Architecture
- Data content, metadata, distribution of data
- Tools for Data Warehousing, Crucial decisions in Designing a Data Warehouse

UNIT-B 12 Hours

Data Mart

- Types of Data Marts, Loading a Data Mart, Metadata for a data Mart
- Data Model for a Data Mart, Maintenance of a Data Mart
- Software components for a Data Mart, Tables in Data Mart, External Data, Performance issues
- Monitoring requirements for a Data Mart, Security in Data Mart.

UNIT-C 15 Hours

OLTP and OLAP Systems

- Data Modelling, Star Schema for multidimensional view, multi fact star schema
- Types of OLAP Servers: ROLAP, MOLAP, HOLAP
- Efficient Computation of Data Cubes, Indexing OLAP Data
- Efficient Processing of OLAP Queries, Categories of OLAP tools

UNIT-D 18 Hours

Data Mining

- Basic Concepts; From Data Warehouse to Data Mining
• Steps of Data Mining Process, Types of Data Mining Tasks
• Data Mining Techniques: Predictive Modeling, Database Segmentation, Link Analysis, Deviation Detection in details
• Data Mining Algorithms Viz. Classification: Decision Tree, Bayesian Classification, Rule based Classification, Back Propagation, Support Vector Machine.
• Prediction: Linear Regression, Nonlinear Regression, Other Regression-Based Methods: Generalized linear models, Log-linear models, Regression trees
• Clustering Analysis: Categorization of Major Clustering Methods: Partitioning methods, Hierarchical methods, Density based methods, Grid-based methods, and Model-based methods.

Reference Books

Title: Artificial Intelligence  
Course Code: CSA676  
Course Duration: 45-60 Hours

Course Objective: The objective of this course is to familiarize students with concepts of AI, its tools & technologies.

UNIT – A  
15 Hours

Introduction
- Background and History
- Overview of AI applications Areas

The Predicate Calculus
- Syntax and Semantic for Propositional Logic and FOPL
- Clausal Form, Inference Rules
- Resolution and Unification

Knowledge Representation
- Network Representation- Associative Network & Conceptual Graphs
- Structured Representation- Frames & Scripts

UNIT – B  
15 Hours

Search Strategies
- Strategies For State Space Search- Data Driven And Goal Driven Search
- Search Algorithms- Uninformed Search (Depth First, Breadth First, Depth First With Iterative Deepening) And Informed Search (Hill Climbing, Best First, A* Algorithm, Etc.)
- Computational Complexity
- Properties of Search Algorithms- Admissibility
- Monotonicity, Optimality, Dominance

Expert Systems
- Introduction, Examples
- Characteristics Architecture, People Involved and Their Role in Building an Expert Systems
- Case Studies of Expert Systems, MYCIN And DENDRAL; Features of Knowledge Acquisition Systems: MOLE And SALT

UNIT – C  
15 Hours

Natural Language Processing
- Component Steps of Communication
- Contrast Between Formal and Natural Languages in the Context of Grammar
- Grammars and languages
- Basic parsing techniques
Introduction to AI languages
- Introduction to LISP
- Introduction to Prolog

UNIT-D 15 Hours
Planning
- Basic Representation for Planning
- Symbolic-Centralized Vs. Reactive-Distributed

Pattern Recognition
- Introduction
- Recognition & Classification Process
- Learning classification patterns
- Clustering

Reference Books:
Course Title: Artificial Intelligence (LISP and PROLOG) Laboratory
Course Code: CSA679

Implementation of LISP and PROLOG based programs. Natural Language Processing, etc

Course Title: .NET Framework and C# Laboratory
Course Code: CSA624

- Implementation of ASP.NET classes and Tools
- Connectivity with database
Course Title: Distributed and Parallel Processing
Course Code: CSA675
Course Duration: 45-60 Hours

Course Objective: The objective of this course is to introduce students to the fundamentals and techniques of distributed computing, distributed operating systems and provides them with the basic skills of how to write distributed programs. Topics to be covered include: distributed computing, parallel processing, parallel processing architecture, concurrency, inter-process communications, distributed objects, application programming interfaces (RMI, RPC).

UNIT-A 15 Hours
Introduction
- Definition, Characteristics, Goals and applications of Distributed Computing,
- Basic design issues and user requirements

Inter-process Communication
- Client Server Communication, Group Communication
- IPC in UNIX. Remote Procedure Calls
- Design issues and implementation

UNIT-B 15 Hours
Distributed Operating Systems
- Introduction, Kernel, Process and Threads, Communication,
- Simple distributed transactions and Nested transactions, Atomic Commit protocols
- Concurrency control, N distributed transaction,
- Distributed deadlocks
- Transactions with replicated data.

Parallel Processing
- Introduction, Need for Computational speed; Applications of parallel computers in various fields including Mathematics, Physics, Chemistry and Computer Science

UNIT-C 15 Hours
Parallel Processing Architectures
- Parallelism in Sequential Machines, Abstract model of parallel computer
- Multiprocessor architecture, programmability issues

Data Dependency Analysis
- Types of Dependencies, Loop and Array Dependence
- Loop Dependence Analysis, Solving Diophantine Equations.

Thread Based Implementation
Thread Management, Thread Implementation

UNIT-D

15 Hours

Recovery and Fault Tolerance
- Transaction recovery, Fault tolerance, Hierarchical and group masking of faults.

Algorithms for Parallel Machines
- Speedup, Complexity and Cost, Parallel Reduction
- Quadrature Problem, Matrix Multiplication
- Parallel Sorting Algorithms and Solving Linear System

Reference Books

Course Title: Advanced Software Engineering
Course Code: CSA677
Course Duration: 45-60 Hours

Course Objective: This course provides the understanding of software project planning, various software process models, system design analysis, various testing techniques and software engineering tools.

UNIT-A

Introduction
- Software Engineering goals, Characteristics, Components Applications
- Software Process Models: Waterfall, Spiral, Prototyping, Fourth Generation Techniques
- Concepts of Project Management, Role of Metrics And Measurement
- Software requirements, Definition, Software requirements specifications (SRS), Components of SRS.
- Software engineering features (data abstraction exception handling and concurrency mechanism).

Software Project Planning
- Objectives, Decomposition Techniques: Software Sizing, Problem Based Estimation

UNIT-B

System Analysis
- Principles of Structured Analysis, Requirement Analysis
- DFD, Entity Relationship Diagram, Data Dictionary

Software Design
- Objectives, Principles, Concepts
- Design Mythologies: Data Design, Architecture Design
- Procedural Design, Object-Oriented Concepts

UNIT-C

System Administration and Training
- User manual, Implementation Documentation, Operation plan and maintenance

Hardware and Software Selection
- Hardware acquisition, Benchmarking, Vendor selection, Software selection, Performance and acceptance criteria, Site preparation

UNIT-D

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Testing Fundamentals

- Objectives, Principles, Testability
- Test Cases: WhiteBox & blackbox Testing
- Testing Strategies: Verification & Validation
- UNIT Test, Integration Testing, Validation Testing, System Testing
- Software documentation procedures, Software reliability and quality assurance, Quality Matrics and software models
- Software maintenance and configuration management

Software engineering tools and environment

- International software engineering standards and their relevance
- Case studies in software engineering

Reference Books

Course Title: Digital Image Processing
Course Code: CSA678
Course Duration: 45-60 Hours

Course Objective: To introduce basic image processing techniques, spatial and frequency domain, linear programming, color image processing, image compression, etc.

UNIT – A 15 Hours
Introduction
- Fundamental Steps in Image Processing
- Element of Visual Perception
- A simple image model, sampling and quantization
- Some Basic Relationships Between Pixel
- Image Geometry in 2D

Intensity Transformations and Spatial Filtering
- Basic Intensity Transformation Functions
- Image Restoration
- Image Subtraction, Image Averaging
- Filtering: Smoothing Spatial Filters, Sharpening Spatial Filters

UNIT – B 15 Hours
Introduction to the Fourier Transformation
- Discrete Fourier Transformation
- Fast Fourier Transformation
- Image Smoothing Using Frequency Domain Filters: Ideal Lowpass Filters, Butterworth low pass filters, Gaussian Lowpass Filters
- Image Sharpening Using Frequency Domain Filters: Ideal Highpass Filters, Butterworth High pass filters, Gaussian High pass Filters, Unsharp Masking, Highboost Filtering and High Frequency-Emphasis filtering.

UNIT – C 15 Hours
Techniques of Color Image Processing
- Color image signal representation
- Color System Transformations
- Extension of Processing Techniques to Color Domain

Morphological Image Processing
- Erosion and Dilation
- Opening and Closing
- Hit – or- miss Transformations

Applications of Image Processing
- Picture Data Archival
- Machine Vision
UNIT-D

Medical Image Processing

15 Hours

Introduction to Image Compression

- Coding Redundancy
- Spatial and Temporal Redundancy
- Irrelevant Information
- Measuring Image Information

Basic Compression Methods

- Huffman Coding
- LZW Coding
- Run Length Coding
- Wavelet Coding

Reference Books:


Course Title: Digital Image Processing Laboratory

Course Code: CSA680

Implementation of filters, Fourier transforms, and various digital image processing techniques
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Course Title: System Simulation
Course Code: CSA681
Course Duration: 45-60 Hours

Course Objective: In this course, students will analyze specified systems such as inventory system, queuing models and environmental dynamics. They learn the how to simulate system, simulation techniques, statistical models, random number generations, design and analysis of simulation.

UNIT-A 15 Hours
Systems and environment
- Concept of model and model building
- Model classification and representation, Use of simulation as a tool, steps in simulation study.
System simulation
- Why & when to simulate, nature and techniques of simulation, comparison of simulation and analytical methods
- Types of system simulation, real time simulation, hybrid simulation
- Simulation of pure-pursuit problem, single-server queuing system and an inventory problem
- Monte-Carlo simulation, Distributed Lag models, Cobweb model

UNIT-B 15 Hours
Continuous-time and Discrete time Systems
- Laplace transform, Transfer functions, state-space models
- Order of Systems, z-transform, feedback systems, Stability, observability, controllability
- Statistical Models in Simulation: Common Discrete and Continuous Distribution, Poisson process empirical distribution

UNIT-C 15 Hours
Random Numbers
- Properties of random numbers, generation of pseudo random numbers
- Techniques of random number generations, tests for randomness
- Random variate generation using inverse transformation
- Direct transformation, convolution method, acceptance-rejection
Design and Analysis of Simulation Experiments
- Data collection, identifying distributions with data, parameter estimation
- Goodness of fit tests, selecting input models without data
- Multivariate on time series input models, static and dynamic simulation
output analysis

- Steady state simulation, terminating simulation confidence interval estimation, output analysis for steady state stimulation, variance reduction techniques

UNIT-D 15 Hours

Queuing Models

- Characteristics of queuing systems, notation, transient and steady-state behaviour performance, network of queue

Large Scale System

- Model reduction, hierarchical control
- Decentralized control structural properties of large scale systems

Reference Books

Course Title: Soft Computing  
Course Code: CSA682  
Course Duration: 45-60 Hours

Course Objective: To introduce the concepts of artificial neural networks, fuzzy sets, fuzzy logics, various search techniques, genetic algorithms, supervised and unsupervised learning, neuro-fuzzy systems and their applications.

UNIT-A  15 Hours

Introduction
- Introduction to soft computing; introduction to biological and artificial neural network, genetic algorithm
- Introduction to fuzzy sets and fuzzy logic systems

Genetic Algorithm and Genetic Programming
- Genetic Programming: Characteristics of genetic programming: Human, Competitive, High-Return, Routine, Machine Intelligence; Data Representation: Crossing Programs, Mutating Programs, The Fitness Function.
- Advantages and Limitations of Genetic Algorithm.
- Applications of Genetic Algorithm.

UNIT-B  15 Hours

Artificial Neural Networks and Applications
- Introduction, Basic models of ANN, Important terminologies, Supervised Learning Networks, Perception Networks, Adaptive Linear Neuron
- Backpropogation Network. Associative Memory Networks. Training Algorithms for pattern association, BAM and Hopfield Networks
- Neural network applications in control systems. Neural Nets and applications of Neural Network.

Unsupervised Learning Network
- Introduction, Fixed Weight Competitive Nets, Maxnet, Hamming Network, Kohonen Self-Organizing Feature Maps
- Learning Vector Quantization, Counter Propogation Networks, Adaptive Resonance Theory Networks. Special Networks-Introduction to various networks

UNIT-C  15 Hours

Fuzzy Systems and Applications
- Introduction to Classical Sets (crisp Sets) and Fuzzy Sets - operations and Fuzzy sets
- Fuzzy reasoning; fuzzy inference systems; fuzzy control; fuzzy clustering
- Membership functions - Features, Fuzzification, membership value assignments, Defuzzification, applications of fuzzy systems
- Neuro-fuzzy systems: neuro-fuzzy modeling; neuro-fuzzy control

UNIT-D 15 Hours

Applications
- Pattern Recognitions, Image Processing, Biological Sequence Alignment and Drug Design
- Robotics and Sensors, Information Retrieval System, Share Market Analysis, Natural Language Processing

Reference Books

Course Title: System Software  
Course Code: CSA683  
Course Duration: 45-60 Hours

Course Objective: This course demonstrates an in-depth understanding system software loader, linker, assembler, compiler, and parsing techniques.

UNIT – A  
15 Hours

System Software
- Definition, Evolution of System Software

Assemblers
- Elements of Assembly Language Programming
- Overview of Assembly Process
- Design Options- One Pass Assembler & Multi Pass Assembler
- Macro Processors: Basic Functions
- Design Options-Recursive Macro Expansion
- General Purpose Macro Processors
- Macro Processing Within Language Translators

UNIT-B  
Loaders & Linkage Editors  
15 Hours

- Loading, Linking & Relocation
- Program Relocatibility
- Overview of Linkage Editing
- linking for Program Overlays

Compilers
- Phases of Compilation Process
- Logical Analysis
- Parsing, Storage Management Optimisation
- Incremental Compilers
- Cross Compilers
- P Code Compilers

UNIT – C  
15 Hours

Compilers
- Phases And Passes
- Analysis-Synthesis Model of Translation

Compiler Construction Tools
- Lexical Analysis
- Process of Lexical Analysis
- Finite State Automata, DFA And NFA
- Recognition of Regular Expressions, LEX
UNIT – D  

Parsing Techniques  
- Top Down & Bottom-Up Parsing  
- Shift Reduce Parsing, Operator Precedence Parsing  
- Predictive Parsers Automatic Construction of Efficient Parsers  
- LR Parsers  
- The Canonical Collection of LR(0) Items  
- Constructing SLR Parsing Tables  
- Constructing Canonical LR Parsing Tables, Constructing LALR Parsing Tables  

Reference Books:  

Course Title: Natural Language Processing
Course Code: CSA690
Course Duration: 45-60 Hours

Course Objective: To provide basic knowledge about Natural language processing viz. Morph, Part of speech tagging, syntactic analysis, semantic analysis etc.

UNIT – A
Introduction to Natural Language Processing
- Definition, History
- Applications, Goals
- Regular expressions and Automata
- Morphology and Finite State Transducers

UNIT-B
Syntax
- Word Classes and Part-of Speech Tagging
- Context Free Grammars for English
- Parsing with Context-Free Grammars.

UNIT – C
Word Sense Disambiguation
- Selection Restriction Based Disambiguation
- Robust WSD: Machine Learning, Supervised Learning Approaches, Bootstrapping Approaches, Unsupervised Methods, Dictionary Based Approaches.

UNIT – D
Introduction to various statistical techniques used in NLP
- Introduction to computational linguistic
- Hidden Markov Model
- Support Vector Machine
- CRF, N-Gram, HMMs

Reference Books:
Course Title: Research Methodology
Course Code: CSA627
Course Duration: 45-60 Hours

Objectives: The objective of the study is to let students understand basics of Research design and activities. The focus will be on data analysis and their effective presentation.

UNIT – A 10 Hours
Scientific Research: Nature and Objectives of research; Methods of research: historical, descriptive and experimental. Study and formulation of research problem. Scope of research and formulation of hypothesis; Feasibility, preparation and presentation of research proposal.

Statistical Analysis: Introduction to statistical analysis: Measures of central tendency and dispersion; mean, median, mode, range, mean deviation and standard deviation.

UNIT-B 12 Hours
Regression and Correlation Analysis.

Random Variables and Probability Distribution: Probability and probability distributions; Binomial, Poisson, Geometric, Negative binomial, Uniform, Exponential, Normal and Log-normal distribution.

UNIT – C 12 Hours
Test of Hypothesis: Basic ideas of testing of hypothesis; Tests of significance based on normal, t and Chi-square distributions. Analysis of variance technique.
Design of Experiments: basic principles, study of completely randomized and randomized block designs.

UNIT – D 12 Hours
Introduction to dissertation design and report writing
Presentation: Tabular and graphical representation of results, quoting of references and preparing bibliography.
Plagiarism: Introduction, types of plagiarism, plagiarism detection tools.

Text Books:

References: