THIRD SEMESTER IT 2018-19 (PATTERN C-17)

CODE: MA21112 **REF NO: To be filled by CD office**

Discrete Mathematics and Graph Theory

Credits: 03 **Teaching Scheme: -** Theory 03 Hrs/Week

Prerequisites: Elementary Mathematics of 10+2 standard.

Objectives:

1. To make students aware of various discrete structures and objects such as POSETS, Graphs, Trees, algebraic structures such as semi groups and groups etc. and their applications
2. To develop mathematical temperament and background in abstraction, notation, and critical thinking for the mathematics most directly related to computer science.
3. To make students aware of counting techniques such as permutations, combinations, generating functions and recurrence relations.

Course Details:

Unit 1
Logic and Relations: **(08 Hrs)**

U1.1. Logic: Propositions and logical Operations, Conditional statements; Predicate Calculus-First order logic, universal and existential quantifiers; Proof Techniques- methods of proof, Mathematical induction. **[T_1]**

Relation and Diagraphs- Properties of relations, composition of relations, closure operation on relations, equivalence relations and partitions, paths in relation and diagraphs, Operations on relations, Transitive closure and Warshall's Algorithm. Partial ordered sets (POSET), Hasse diagram, External elements of partially ordered sets, Lattices. **[T_1]**

U1.2. Self Study Topics : Mathematical Statements, Logic and Problem Solving.

Unit 2
Combinatorics: **(08 Hrs)**

U 2.1. Combinations and Permutations, Enumerating combinations and permutations, Principle of Inclusion – Exclusion and Derangements. **[T_2]**

Generating functions, Recurrence Relations, Solution of Recurrence Relations. **[T_2]**

U 2.2. Self Study Topics : The Binomial and Multinomial Theorems.

Unit 3
Graph Theory: **(08 Hrs)**

U 3.1. What is a graph? Matrices and Isomorphism, Special Graphs, Paths, Cycles and Trails, Connected Graphs, Bipartite Graphs, Eulerian paths circuits, Hamiltonian paths and circuits, Fleury's algorithm, Planar Graphs. Embedding and Eulers formula, Colouring of Graphs. **[T_3]**

U 3.2. Self Study Topics : Introductory Concepts involving Directed Graphs.

Unit 4

U 4.1. Trees and Networks: (08 Hrs)

Trees-Basic Properties, Depth first search (DFS) and Breadth first search (BFS) Algorithms, Minimal spanning tree, Shortest path problem, Kruskal's Algorithm, Prim's Algorithm, Dijkstra's Algorithm. Network Flow Problem, Ford-Fulkerson Algorithm, Max-Flow-Min-Cut Theorem. **[T_3]**

U 4.2. Self Study Topics : Enumeration of Spanning Trees .

Unit 5

Algebraic Structures and Applications: (08 Hrs)

U5.1. Binary operations, semi-groups and groups, subgroups, cosets, Lagrange's theorem, Product and quotient semi-groups and groups, Normal subgroup, Homomorphism; coding of binary information and error detection, group codes, decoding and error correction. **[T_1]**

U5.2. Self Study Topics : Other Mathematical Structures such as Rings and Fields.

Note: Five assignments to be given to the students on self study, comprising of one assignment from each unit.

Text Books:

T1. Discrete Mathematical Structures , Bernard Kolman, Robert Busby, Sharon C. Ross, Pearson Education Inc., New Delhi. / Prentice Hall of India (PHI) Pvt. Ltd., New Delhi, Sixth Edition, 2009.
Chapters 2(2.1 – 2.4), 4(4.1 – 4.5, 4.7, 4.8), 6(6.1 – 6.3), 8(8.2), 9(9.1 – 9.5), 11(11.1, 11.2).

T2. Discrete Mathematics for Computer Scientists and Mathematicians by Joe L. Mott, Abraham Kandel and Theodore P. Baker, Prentice-Hall of India Private Limited, New Delhi, Second Edition, 2000.
Chapters 2(2.2 – 2.5), 3(3.1 – 3.6).

T3. Introduction to Graph Theory, Douglas B. West, Prentice-Hall of India Pvt. Ltd., New Delhi, Second Edition, 2003.
Chapters: 1-Sections: 1.1 (up to and including 1.1.40), 1.2 (Up to and including 1.2.27), 1.3(Up to and including 1.3.6), 2-Sections: 2.1 (Up to and including 2.1.13), 2.3(2.3.1-2.3.8), 4- Sections: 4.1 (4.1.1, 4.1.2, 4.1.7 to 4.1.11), 4.3(Up to and Including 4.3.11), 5 – Section: 5.1 (Up to including 5.1.21), 6: Section 6.1 (Up to and including 6.1.13, 6.1.21 to 6.1.24), 7 – Section 7.2 (7.2(Up to and Including 7.2.19)).

Reference Books

R1. Discrete Mathematics and Its Applications With Combinatorics and Graph Theory, Kenneth H. Rosen, Tata McGrawHill Education Private Limited, New Delhi, Seventh Edition, Third Reprint, 2012.
R2. Elements of Discrete Mathematics, C. L. Liu and D. Mohaptra, Tata McGraw Hill Education, New Delhi, Third Edition, 2008.
R3. Discrete and Combinatorial Mathematics, Ralph P. Grimaldi, Pearon Education, New Delhi, Fifth Edition, 2005.
R4. Discrete Mathematics, Norman L. Biggs, Oxford University Press, Second Edditon, Tenth Impression, 2010..
R5. Discrete Mathematics and Applications, Thomas Koshy, Second Edition, Elsevier Publication (India), New Delhi.
R6. A First look at Graph Theory, John Clark and Derek Allan Holton, Prentice Hall.
R7. Mathematical Structure for Computer Science, A modern treatment to Discrete Mathematics, J.L. Gersting, W. H. Freeman and Macmillan (India), Fifth / Sixth Edition (Asian Student Editions), 2008.
R8. Discrete Mathematical Structures, D. S. Malik and M. K. Sen, CENGAGE Learning India Pvt. Ltd., New Delhi, First Edition, 2005.
R9. Discrete Mathematics, Richard Johnsonbaugh, Pearson Education Inc., New Delhi, Seventh Edition, 2010.
R10. Discrete Mathematics with Proof, Eric Gossett, Wiley India, Second Edition, Second Edition, 2010 (Reprint).

Course Outcome

Upon successful completion of this course, students will:
1. Construct mathematical arguments using logical connectives and quantifiers.
2. Verify the correctness of an argument using propositional and predicate logic and truth tables.
3. Demonstrate the ability to solve problems using counting techniques and combinatorics.
4. Solve problems involving recurrence relations and generating functions.
5. Use graphs and trees as tools to visualize and simplify situations.
6. Perform operations on algebraic structures such as semi groups, monoides, and groups.
7. Apply group to rectify codes in a data transmission problem.
8. Construct proofs using direct proof, proof by contraposition, proof by contradiction, proof by cases, and mathematical induction.

CODE: MA2112 **REF NO: To be filled by CD office**

THIRD SEMESTER IT 2018-19 (PATTERN C-17)

Discrete Mathematics and Graph Theory [TUTORIAL]

Credits: 01 **Teaching Scheme: -** Tutorial 01 Hrs/Week

Prerequisites: Elementary Mathematics of 10+2 standard.

Objectives:

1. To make students aware of various discrete structures and objects such as POSETS, Graphs, Trees, algebraic structures such as semi groups and groups etc. and their applications
2. To develop mathematical temperament and background in abstraction, notation, and critical thinking for the mathematics most directly related to computer science.
3. To make students aware of counting techniques such as permutations, combinations, generating functions and recurrence relations.

List of Contents

Tutorial No. 1: Problem Solving involving Propositional and Predicate Logic.
Tutorial No. 2: Some Problems for practice involving Relations.
Tutorial No. 3 Problem Solving involving Permutations and Cmbinations.
Tutorial No. 4: Problem Solving involving Generating Functions and Recurrence Relations.
Tutorial No. 5: Some Problems Involving Fundamentals of Graph Theory.
Tutorial No. 6: Problem Solving Involving Euler and Hamiltonian Graphs. ,
Tutorial No. 7: Problem Solving involving Planar Graphs and Colouring of Graphs.
Tutorial No. 8: Some Problems Involving Fundamentals of Trees.
Tutorial No. 9: Probmels involving DFS, BFS, Kruskal's Algorithm, Prim's Algorithm, Dijkastra's Algorithm.
Tutorial No. 10: Some problems for practice involving Networks.
Tutorial No. 11: Some problems for practice on Semi groups and Groups.
Tutorial No. 12: Some problems for practice on Coding and Decoding. .

Text Books:

T1. Discrete Mathematical Structures , Bernard Kolman, Robert Busby, Sharon C. Ross, Pearson Education Inc., New Delhi. / Prentice Hall of India (PHI) Pvt. Ltd., New Delhi, Sixth Edition, 2009.
Chapters 2(2.1 – 2.4), 4(4.1 – 4.5, 4.7, 4.8), 6(6.1 – 6.3), 8(8.2), 9(9.1 – 9.5), 11(11.1, 11.2).

T2. Discrete Mathematics for Computer Scientists and Mathematicians by Joe L. Mott, Abraham Kandel and Theodore P. Baker, Prentice-Halia of India Private Limited, New Delhi, Second Edition, 2000.
Chapters 2(2.2 – 2.5), 3(3.1 – 3.6).

T3. Introduction to Graph Theory, Douglas B. West, Prentice-Hall of India Pvt. Ltd., New Delhi, Second Edition, 2003.
Chapters: 1-Sections: 1.1 (up to and including 1.1.40), 1.2 (Up to and including 1.2.27), 1.3(Up to and including 1.3.6), 2-Sections: 2.1 (Up to and including 2.1.13), 2.3(2.3.1-2.3.8), 4- Sections: 4.1 (4.1.1, 4.1.2, 4.1.7 to 4.1.11), 4.3(Upto Including 4.3.11), 5 – Section: 5.1 (Up to including 5.1.21), 6: Section 6.1 (Up to and including 6.1.13, 6.1.21 to 6.1.24), 7 – Section 7.2 (7.2(Upto Including 7.2.19)).

Reference Books

R1. Discrete Mathematics and Its Applications With Combinatorics and Graph Theory, Kenneth H. Rosen, Tata McGrawHill Education Private Limited, New Delhi, Seventh Edition, Third Reprint, 2012.

R2. Elements of Discrete Mathematics, C. L. Liu and D. Mohaptra, Tata McGraw Hill Education, New Delhi, Third Edition, 2008.

R3. Discrete and Combinatorial Mathematics, Ralph P. Grimaldi, Pearon Education, New Delhi, Fifth Edition, 2005.

R4. Discrete Mathematics, Norman L. Biggs, Oxford University Press, Second Edditon, Tenth Impression, 2010..

R5. Discrete Mathematics and Applications, Thomas Koshy, Second Edition, Elsevier Publication (India), New Delhi.

R6. A First look at Graph Theory, John Clark and Derek Allan Holton, Prentice Hall.

R7. Mathematical Structure for Computer Science, A modern treatment to Discrete Mathematics, J.L. Gersting, W. H. Freeman and Macmillan (India), Fifth / Sixth Edition (Asian Student Editions), 2008.

R8. Discrete Mathematical Structures, D. S. Malik and M. K. Sen, CENGAGE Learning India Pvt. Ltd., New Delhi, First Edition, 2005.

R9. Discrete Mathematics, Richard Johnsonbaugh, Pearson Education Inc., New Delhi, Seventh Edition, 2010.

R10. Discrete Mathematics with Proof, Eric Gossett, Wiley India, Second Edition, Second Edition, 2010 (Reprint).

Course Outcomes

Upon successful completion of this course, students will:

1. Construct mathematical arguments using logical connectives and quantifiers.
2. Verify the correctness of an argument using propositional and predicate logic and truth tables.
3. Demonstrate the ability to solve problems using counting techniques and combinatorics.
4. Solve problems involving recurrence relations and generating functions.
5. Use graphs and trees as tools to visualize and simplify situations.
6. Perform operations on algebraic structures such as semi groups, monoides, and groups.
7. Apply group to rectify codes in a data transmission problem.
8. Construct proofs using direct proof, proof by contraposition, proof by contradiction, proof by cases, and mathematical induction.

COURSE CODE: CS20132 **REF NO: To be filled by CD office**

OBJECT ORIENTED PROGRAMMING USING JAVA

Credits: 03 **Teaching Scheme: -** Theory 3 Hrs/Week

Prerequisites:

1. Computer Programming

Objectives:

1. To get a clear understanding of Object Oriented Programming constructs.
2. To be able to get necessary skills to write Java Programs.
3. To familiarize with the concepts of multithreaded applications.
4. To get a clear understanding of various Network Drivers Applets and Swing applications.
5. To get exposure of Virtual machines and design patterns.

Course Details:

UNIT 1: Title- Introduction: (7 Hrs)

U1.1.

Introduction to Object Oriented Programming, Introduction to Java and Java programming environments, Fundamental Programming Structure: Data Types, variable, Typecasting, Operators and their precedence, Introduction to Arrays

Control Flow: Java's Selection statements (if, switch), Jump Statements (break, continue, return), Java Loop Control Structures (while, do-while, for, Nested loops).

Classes and Object: Concept of Objects and Classes, Using Exiting Classes building your own classes, constructors in Java (Default, parameterized), Constructor overloading, static, final, this keyword.

U1.2. Self Study: Control structures, Programs on class and object.

UNIT 2: Title:- Inheritance, Packages & Interface (7 Hrs)

U2.1.

Inheritance: Inner class**,** Super class, Super class constructors, Method overriding, Polymorphism, Dynamic method Dispatch, Abstract Classes, Using final with inheritance.

Packages & Interfaces: Introduction to packages, Need of using packages and methods for importing packages, Access Protection, Interface, Implementing Interfaces, variables in Interfaces, mechanism of extending interfaces.

U2.2. Self Study: The Object Class, programs regarding interfaces.

UNIT 3: Title:- Exception, Collection, Thread and Utility (7 Hrs)

U3.1.

Exception: What is an Exception and its fundamentals, Exception vs error, Types of Exception: Checked and Unchecked exceptions, Exception handling mechanisms: try, catch, throw, throws and finally, Handling of Multiple catch, throw , throws, finally, Java's Built in exceptions, user defined exception.

Collection Framework: CollectionInterface (List, set, queue), Collection class (Linked Hashset, Stack ,LinkedList, Arraylist)

Thread: Overview of Threads, Java Thread Model, Thread Priorities, Creating a thread, Creating Multiple threads, Extending thread class, Synchronization Using isAlive ( ) and join ( ), wait () & notify ( ).

Utility: Simple type wrappers, Runtime memory management, object (using clone () and the cloneable Interface), Thread, Java util

U3.2. Self Study: Implementation of Runnable interface, Programs on exception handling and Multithreading.

UNIT 4: Title:-AWT, I/O, Applet, Swing and Networking programming (7 Hrs)

U4.1.

AWT: AWT Classes window fundamentals, component, container, panel, Window, Frame, Canvas, Creating a frame window in an Applet , working with Graphics, Control Fundamentals , Layout managers, Handling Events by Extending AWT components.
Core java API package, reflection.

Java I/O: Classes & Interfaces, Stream classes, Byte streams, Character streams, Serialization.

Applets: Basics, Architecture, Skeleton, The HTML APPLET Tag, Passing Parameters to Applets.

Java I/O: Classes & Interfaces, Stream classes, Byte streams, Character streams, Serialization.

Swing: Overview, Swing controls, Event Classes, Event Listener Interfaces, Adapter classes.

Network Programming: TCP/IP, Sockets, URL, Creating server and client, Communication between server and client, Retrieving files.

U4.2. Self Study: String, Java Input/output stream classes. Remote method Invocation (RMI), UDP

UNIT 5: Title – Java Virtual machine, Design pattern (7 Hrs)

U5.1.

Native Method: Overview, creating and integrating native method to Java.

Java Virtual Machine: Organization of JVM, Garbage collector, Interpreter and JIT.

Java Persistent API: **JPA architecture, Entity managers, Persistence Operations.**
Design Patterns: **Overview, Different types of design patterns.**
U5.2. Self Study: **Java Profile, Data Access Object Pattern, Service Locator and Transfer Object pattern.**

Text Books:

T1. Java The Complete Reference, Herbert Schildt, TMH, 5th Edition, Mcgraw Hill Education, 7th Edition, ISBN 9780070636774.

T2. Introduction to Java Programming: Liang, Pearson Education, 7th Edition.

Reference Books:

R1. Balguruswamy, Programming with JAVA, TMH.

R2. Programming with Java: Bhave&. Patekar, Pearson Education.

R3. Big Java: Horstman, Willey India, 2nd Edition.

R4. Java Programming Advanced Topics: Wigglesworth, Cengage Learning.

R5. Java How to Program: H.M. Deitel& Paul J. Deitel, PHI, 8th Edition.

R6. Core Java (TM) Volume-1- Fundamentals, Gary Cornell, Cay S. Horstmann, Pearson, 8th edition, ISBM-9788131719459

Course Outcomes:

Upon completion of the course, graduates will be able to-

1. Identify classes, methods, and libraries of object-oriented programming using Java.
2. Design and implement a class based on attributes and behaviour of objects.
3. Design exception handling, threads, and utilities for problem solving using Java.
4. Analyze and design Java programs using advanced features such as AWT, Applet, Swing and Socket.
5. Design and implementation of different design patterns using Java.

COURSE CODE: CS20132 **REF NO: To be filled by CD office**

THIRD SEMESTER IT 2018-19 (PATTERN C-17)

OBJECT ORIENTED PROGRAMMING USING JAVA TUTORIAL

Credits: 01 **Teaching Scheme: -** Tutorial 01Hrs/Week

Prerequisites:

1. Computer Programming

Objectives:

1. To be able to get necessary skills to write Java Programs.
2. To get a clear understanding of Object Oriented Programming constructs.
3. To familiarize with the concepts of multithreaded applications.
4. To get a clear understanding of exception handling mechanism.
5. To get a clear understanding of various Applets and Swing applications.
6. To get a clear understanding of Network programming.
7. To get exposure to design patterns.

Course Details:

List ofContents

Tutorial No.1: Exercises on Java's Selection statements (if, switch), Jump Statements (break, continue, return), Java Loop Control Structures (while, do-while, for, Nested loops).

Tutorial No. 2: Writing programs on classes and objects.

Tutorial No. 3: Writing program on types of constructor and constructor overloading.

Tutorial No.4: Writing program to demonstrate concepts of inheritance.

Tutorial No.5: Writing programs on Method overriding, Polymorphism, Dynamic method Dispatch,

Tutorial No.6: Writing programs on packages and methods for importing packages.

Tutorial No.7: Programs on Interface, implementing Interfaces, mechanism of extending interfaces and abstract classes.

Tutorial No.8: Exercises on Exception handling mechanisms: try, catch, throw, throws and finally, Handling of Multiple catch and creating your own exception class.

Tutorial No.9: Working on Collection Framework (Collection Interface (List, set, queue), Collection class (Linked Hash set, Stack, Linked List, Array list)).

Tutorial No.10: Writing program on creating a thread, creating multiple threads, thread Synchronization and solving producer consumer problem.

Tutorial No.11: Programs with different AWT and SWING controls.

Tutorial No.12: Writing programs on handle events occurred by different components.

Tutorial No.13: Writing programs on different layout managers.

Tutorial No.14: Writing programs on creating server and client, communication between server and client.

Tutorial No.15: Working with different types of design patterns.

Text Books:

T1. Java The Complete Reference, Herbert Schildt, TMH, 5th Edition.

T2. Introduction to Java Programming: Liang, Pearson Education, 7th Edition.

Reference Books:

R1. Balguruswamy, Programming with JAVA, TMH.

R2. Programming with Java: Bhave&. Patekar, Pearson Education.

R3. Big Java: Horstman, Willey India, 2nd Edition.

R4. Java Programming Advanced Topics: Wigglesworth, Cengage Learning.

R5. Java How to Program: H.M. Deitel& Paul J. Deitel, PHI, 8th Edition.

Course Outcomes:

Upon completion of the course, graduates will be able to-

6. Identify classes, methods, and libraries of object-oriented programming using Java.
7. Design and implement a class based on attributes and behavior of objects.
8. Design exception handling, threads, and utilities for problem solving using Java.
9. Analyze and design Java programs using advanced features such as AWT, Applet, Swing and Socket.
10. Design and implementation of different design patterns using Java.

COURSE CODE: CS20131 **REF NO: To be filled by CD office**

DATA STRUCTURES

Credits: 03 **Teaching Scheme:** Theory 03Hrs/Week

Prerequisites:

2. Computer Programming

Objectives:

1. To introduce the major principles and techniques involved in design and implementation of different linear and non-linear data structures using high level programming languages.
2. To introduce basic operations involved in the linear and non-linear data structures in different environment (static and dynamic).
3. To understand different searching and sorting algorithms.

Course Details:

UNIT 1: Title: Introduction to Data structure: (7 Hrs)

U1.1. Introduction, Abstract data types with example (Types: Primitive, Non primitive, Linear, Nonlinear, Static, Dynamic Data structures). Stack: Fundamentals of stack, representation using array, Applications of stack: Recursion, Expression conversions and evaluations etc., Queue: Fundamentals of queue, representation using array, Circular queues, Double ended queues concepts and operations, Applications of queue to solve problems.

U1.2. Self Study: 3-Tuple representation of Sparse matrix, Sparse Matrix: Addition and Fast transpose, Priority Queue.

UNIT 2: Title: Introduction to Linked lists: (7 Hrs)

U2.1 Single linked lists: operations and implementation. Double linked list: operations and implementations. Circular list: concepts and implementation, Applications: Stack & Queue implementation using linked list, Polynomial Manipulation using linked list.

U2.2. Self Study: Dynamic storage management-garbage collection and compaction.

UNIT 3: Title: Trees (7 Hrs)

U3.1 Basic terminology, representation using array and linked list, Tree Traversals: Recursive and Non recursive, Operations on binary tree: Finding Height, Leaf nodes, counting no of nodes etc., Construction of binary tree from traversals, Binary Search trees (BST): Insertion, deletion of a node from BST, Height Balanced Tree (AVL): Rotations on AVL tree, M-way search trees: B trees, B+ tree

U3.2. Self Study: Optimal Binary Search Tree (OBST), Threaded Binary tree (TBT): Creation and traversals on TBT**,** Red-Black Trees, and Expressiontree.

UNIT 4: Title: Graph (7 Hrs)

U4.1 Graphs: Graph terminology, Representation of graphs, Path matrix, Warshall's algorithm (shortest path algorithm). Traversals: BFS (breadth first search), DFS (depth first search), Shortest Paths: Single Source all destinations (Dijkstra's Algorithm).

U4.2. Self Study : Prim's Algorithm, Bellman's Ford Algorithm (all source shortest path)

Unit 5: Title: Sorting & Searching (7 Hrs)

U5.1 Searching techniques – Linear and Binary search methods (recursive and non-recursive).Sorting techniques –Quick sort, Selection Sort, Heaps: Max Heap, Min Heap, Heap Sort . Hashing – Different hash functions, Collision resolution techniques.

U5.2. Self Study:, Bubble Sort, Insertion Sort, Radix sort, Merge sort, Topological Sort

Text books:

1. "Data Structure- A Pseudo code approach with C" by Gilberg and Forouzan, Thomson publication.
2. "Data structure in C" by Tanenbaum, PHI publication / Pearson publication.

Reference Books:

1. "Fundamental of Data Structure"– (Schaums Series) Tata-McGraw-Hill.
2. "Fundamentals of data structure in C"– Horowitz, Sahani & Freed, Computer Science Press.
3. "Data Structure Through C: A Practical Approach" by G. S. Baluja, DhanpatRai Publications.
4. "Data Structures & Algorithms; Concepts, Techniques & Algorithms " by Pai, Tata McGraw Hill.
5. "Data Structures Using C", Reema Thareja, Oxford University Press

Course Outcomes:

Upon completion of the course, graduates will be able to –

1. Analyze and design of linear data structure such as Queue and Stack for solving problems.
2. Analyze and design of linear data structure such as Linked List for solving problems.
3. Analyze and design of non-linear data structure such as Tree for solving problems.
4. Analyze and design of non-linear data structure such as Graph for solving problems.
5. Use different sorting and searching mechanisms by analyzing suitability.

DATA STRUCTURE – LABORATORY

Course Code: CS20331 **REF NO: To be filled by CD office**

Credits: 02 **Teaching Scheme:** Laboratory 02Hrs/Week

Prerequisites:

1. Computer Programming

Objectives: The objectives of this laboratory course are:

1. To demonstrate familiarity with major algorithms and data structures.
2. Choosing an appropriate data structure and algorithm design method for a specific application.
3. Implementing searching and sorting techniques.

Course Details:

1. Study of Array as a data structure.
2. Study of Stack and Queue as an ADT.
3. Study of Concept of Linked List.
4. Study of Concept of Tree Data Structure and its traversal.
5. Study of Graph Data Structure.
6. Study of Different Searching and Sorting techniques.

List of Sample Programs:

Experiment No. 1

1. Design a menu driven program in C to implement different operations on array.

Experiment No. 2

1. Implement different operations on two dimensional arrays using C code.
2. Write a program in C to implement the three tuple representation of a Sparse Matrix.

Experiment No. 3

1. Write a program in C to implement stack performing Push, Pop and Peep operations.
2. Write a program in C to implement different operations on queue using array.

Experiment No. 4

Write a program in C that uses Stack operations to perform the following:

i) Convert infix expression to postfix expression
ii) Evaluate the postfix expression.

Experiment No. 5

Write a C program that uses functions to perform the following operations on Single linked list:

i) Creation ii) Insertion iii) Deletion iv) Traversal v) Reversing a single linked list.

Experiment No. 6

Write a C program that uses functions to perform the following operations on Double linked list:

i) Creation ii) Insertion iii) Deletion iv) Traversal in both ways.

Experiment No. 7

Write a C program that uses functions to perform the following operations on Binary Search Tree:
i) Creation ii) Insertion iii) Deletion
ii) iv)Traversal of B.S.T (In-order, Pre-order and Post-order)

Experiment No. 8.

Write a program in C to implement Linear, Binary search using both recursive and non-recursive functions.

Experiment No. 9

Implementation of Bubble sort, Insertion sort, Selection sort algorithms using programming in C.

Experiment No. 10

Implementation of Quick Sort and Merge Sort algorithms using programming in C.

List of Experiments which can be given as lab assignment to the students.

1. Write a program in C to implement double ended queue using array.
2. Write a program in C to implement circular linked list.
3. Implement BFS and DFS traversals on Graph using programming in C.
4. Implementation of Heap Sort using C code.

Text books:

1. "Data Structure- A Pseudo code approach with C" by Gilberg and Forouzan, Thomson publication.
2. "Data structure in C" by Tanenbaum, PHI publication / Pearson publication.

3. ”Data Structures & Algorithms; Concepts, Techniques & Algorithms ” by Pai, Tata McGraw Hill.
4. “Data Structures Using C”, Reema Thareja, Oxford University Press

Reference Books:

1. “Fundamental of Data Structure”– (Schaums Series) Tata-McGraw-Hill.
2. “Fundamentals of data structure in C”– Horowitz, Sahani & Freed, Computer Science Press.
3. “Data Structure Through C: A Practical Approach” by G. S. Baluja, Dhanpat Rai Publications.

Course Outcomes:

Upon completion of the course, graduates will be able to –

1. Implementation of linear data structure for solving problems.
2. Implementation of non-linear data structure for solving problems
3. Use different sorting and searching mechanisms by analyzing suitability.
4. Develop C programming using data structure techniques.

COURSE CODE: CS20135 **REF NO:** To be filled by CD office

DATA COMMUNICATION & COMPUTER NETWORKS

Credits: 03 **Teaching Scheme:** Theory 3 Hrs/Week

Prerequisites:

1. Computer Programming
2. Fundamentals of Computers

Objectives:

1. To understand the fundamental principles of Data communication and Computer Networking.
2. To get an exposure on standard OSI and TCP/IP layers and protocols.

Unit-1: Title: Data Communication Fundamentals [8 Hrs]

U1.1 Overview of Data Communications, Fundamentals of Network, Network Topologies, Services, Standardization, Reference Models: OSI Model, TCP/IP Model.

Physical Layer: Analog and Digital Signals, Data Rate Limits, Transmission Impairment, More about signals.

Digital Transmission: Line coding, Sampling, Transmission modes.

U1.2 Self Study: Block Coding

Unit-2: Title: Modulation and Switching Techniques [8 Hrs]

U2.1 Analog Transmission: Modulation of Digital Data, Modulation of Analog signals. Multiplexing: FDM, WDM, TDM, Transmission Media: Guided Media, Unguided Media, Circuit Switching and Packet Switching.

U2.2 Self Study: Telephone Network

Unit-3: Title: Data Link Layer [8 Hrs]

U3.1 Error Detection and Correction: Types of Errors, Detection, Error Correction.
Data Link Control and Protocols: Flow and Error Control, Stop-and-wait ARQ, Go-Back-N ARQ, Selective Repeat ARQ, HDLC, PPP.
Multiple Accesses: Random Access, Controlled Access, Channelization.
Local area Network: Standard Ethernet, Wireless LANs: IEEE 802.11.

U3.2 Self Study: Bluetooth, Virtual circuits: Frame Relay and ATM.

Unit-4: Title: Network and Transport Layer: [6 Hrs]

U4.1 Host to Host Delivery: Internetworking, Addressing and Routing, Network Layer Protocols: ARP, IPV4, ICMP, IPV6, Transport Layer: Process to Process Delivery: UDP, TCP, Congestion Control. Routing Protocols: AODV, DSDV, DSR

U4.2 Self Study: Quality of service.

Unit-5: Title: Application Layer: [6 Hrs]

U5.1 Client Server Model, Socket Interface, Domain Name System (DNS): Electronic Mail (SMTP), File Transfer (FTP), POP, Remote Logging, HTTP and WWW.

U5.2 Self Study: Network Security, Authentication, Cryptography, Digital Signatures and Certificates, Firewalls.

Text Books:

T1. Data Communications and Networking: Behrouz A. Forouzan, Tata McGraw-Hill, 4th Edition.
T2. Computer Networks: A. S. Tannenbum, D. Wetherall, Prentice Hall, Imprint of Pearson 5th Edition.

Reference Books:

R1. Data and Computer Communications: William Stallings, Prentice Hall, Imprint of Pearson, 9th Edition
R2. Data Communication and Computer Networks: Ajit Pal, PHI Learning Pvt. Ltd
R3. Data communication & Computer Networks: Gupta, Prentice Hall of India
R4. Network for Computer Scientists & Engineers: Zheng, Oxford University Press
R5. Data Communications and Networking: White, Cengage Learning

Outcomes

Students will be able to:

1. Identify data communications system components, network topologies, and protocols.
2. Analyze different features of analog and digital transmission.
3. Analyze the working principles and protocols of data link layer.
4. Identify and differentiate working principles and protocols of network and transport layer.
5. Identify and implement different types of application in application layer.

COURSE CODE: CS20335 **REF NO:** To be filled by CD office

DATA COMMUNICATION & COMPUTER NETWORKS - LABORATORY

Credits: 02 **Teaching Scheme:** Laboratory 02Hrs/Week

Prerequisites:

1. Computer Programming
2. Fundamentals of Computers

Objectives:

1. To understand the fundamental principles of Data communication and Computer Networking.
2. To create different topology network
3. To simulate network structures using simulation software

List of Experiments:

Experiment No. 1

- To study the different types of cables such as CAT5 etc. and networking devices such as switches, and routers which are used for data communication.

Experiment No. 2 (NS2/NS3)

- Introduction to TCL and NS2: write the some programs in TCL; create the node, links, and different queues for network. To give the color, shape, connection, traffic to the network.
- To create a topology where two nodes are present (n0 and n1). Node n0 sends data to Node n1 in both TCP and UDP environment. Calculate the throughput with the simulation time, bandwidth and delay.

Experiment No. 3 (NS2/NS3/Toolkit)

- To create a topology where three nodes are present (n0, n1 and n2). Node n0 sends data to Node n2 in TCP environment whereas the node n1 send data in UDP environment. Calculate the throughput with the simulation time, bandwidth and delay for both the environment.

- **To Create a Topology :**

This network consists of 5 nodes (C1, R1, C2, R2 and S1). The duplex link between C1 and R1 has 2 Mbps of bandwidth and 50ms of delay. The duplex link between R1 and S1 has 100Kbps of bandwidth and 100 ms of delay. The duplex link between C2 and R2 has 100Kbps bandwidth and 50ms delay. The duplex link between R2 and S1 has 100Kbps bandwidth and 100ms of delay. Each link between nodes uses a Drop Tail queue. Find out the throughput, packet loss, PDR with simulation time, bandwidth and delay.

Experiment No. 4 (NS2/NS3/Toolkit)

- **To Create a Star Topology.**

That topology consists of 7 nodes (C1, C2, C3, Hub, S1, S2, and S3). The duplex link between C1, C2 and C3 to Hub has 2 Mbps of bandwidth and 50 ms of delay. The duplex link between Hub to S1, S2 and S3 has 2 Mbps of bandwidth and 50 ms of delay. Find out the throughput, packet loss, PDR with simulation time, bandwidth and delay.

- **To Create a Mesh topology (NS2/NS3/Toolkit)**

The topology consists of 5 nodes. To give the label, shape, color to the link and size of the queue. Find out the throughput, packet loss, PDR with simulation time, bandwidth and delay.

Experiment No. 5

- Simulation of Token Ring.
- Simulation of Token bus.

Experiment No. 6

- Simulation of Stop and Wait protocol.
- Simulation of Stop and Wait protocol with BER.
- Simulation of Sliding Window Go Back N protocol
- Simulation of Sliding Window Go Back N protocol with BER.
- Simulation of Sliding Window Selective Repeat protocol.
- Simulation of Sliding Window Selective Repeat protocol with BER.

Experiment No. 7

- Simulation of ALOHA protocol.
- Simulation of Carrier Sense Multiple Access (CSMA) protocol
- Simulation of Carrier Sense Multiple Access / Collision Detection (CSMA/CD) protocol.

- Simulation of Carrier Sense Multiple Access / Collision Avoidance (CSMA/CA) protocol

Experiment No. 8

- Simulation of Distance Vector Routing Protocol.

Experiment No. 8

- Simulation of Link State Routing Protocol.

Experiment No. 10

- Some programming techniques in socket programming

Text Books:

T1. Introduction to Network Simulator NS2, Issariyakul, Teerawat, Hossain, Ekram , Springer, ISBN 978-1-4614-1406-3
T2. Benchmark Electronic System Manual

Reference Books:

R1. http://www.isi.edu/nsnam/ns/

Course Outcomes:

After taking this course the graduate students will be able to:

1. Identify different guided and unguided media.
2. Analyze and implement different computer network topologies.
3. Design and implementation of network and transport layer protocols using simulation software.
4. Analyze and implement data communication using socket programming.

COURSE CODE: EC21101 **REF NO:** To be filled by CD office

Analog Electronics Circuit

Credits: 02 **Teaching Scheme: -** Theory 03 Hrs/Week

Prerequisites: Introduction to Electronics Engineering, Physics

Co-requisites: Network Theory

Post-requisites: Mixed signal circuits

Objective:

- The capability to design and construct circuits, take measurements of circuit behavior and performance, compare with predicted circuit models and explain discrepancies.
- To prepare the students for advanced courses in Communication system Circuit Design.

Course Details:

Unit I

Frequency Response of Amplifiers (07 Hrs)

U1.3. BJT and MOSFET amplifiers: Low frequency, mid-frequency and high frequency small signal analysis and frequency response, Square wave testing, multi-stage amplifiers (two stages RC coupled, Darlington, Cascode, Differential)

U1.4. Multistage amplifiers (more than two stages) and current mirror.

Unit II

Feedback Amplifiers and Oscillators (07 Hrs)

U2.1. Feedback and Oscillators: Feedback Concepts, Advantages of negative feedback, Four Basic Feedback Topologies, Practical Feedback Circuits, Basic Principle of Sinusoidal Oscillator, Wien-Bridge, RC Phase Shift and Crystal Oscillator Circuits.

U2.2. LC oscillators (Hartley and Colpitts).

Unit III

Power Amplifiers (06 Hrs)

U3.1. Power Amplifier: Classifications, Class-A and Class-B Amplifier Circuits, Transfer Characteristics, Power Dissipation and Conversion Efficiency of Power Amplifiers. Introduction to class-AB and class-C.

U3.2. Complementary symmetric push pull power amplifier, Regulated power supply.

Unit IV

MOS Capacitor **(06 Hrs)**

U4.1. MOS capacitor: The MOS structure, Energy band diagrams, Flat band condition and flat band voltage, Surface accumulation, surface depletion, threshold condition ad threshold voltage, MOS C-V characteristics.

U4.2. Q_{inv} in MOSFET.

Unit V

MOS Transistor **(06 Hrs)**

U5.1. MOS Transistor: Introduction to MOSFET, complementary MOS (CMOS) technology, V-I characteristics, surface mobilities, body effect and steep retrograde doping, pinch-off voltage.

U5.2. High mobility FETs, JFET and MOSFET.

Text Books:

T1. "Electronic Devices and Circuit Theory", Robert L. Boylestad and Louis Nashelsky, Pearson Education, 10th Edition, 2009.
T2. "Semiconductor Physics and Devices", Donald A. Neamen and Dhrubes Biswas, Tata McGraw - Hill Education Pvt. Ltd, 4th Edition, 2012.

Reference Books

R1. "Microelectronic Circuits", Adel S. Sedra and Kenneth C. Smith, Oxford University Press, 6th Edition, 2013.
R2. "Integrated Electronics: Analog and Digital Circuit", Jacob Millman, Christos Halkias and Chetan D Parikh, Mcgraw Hill Education, 2nd Edition, 2011.
R3. "CMOS digital integrated circuits", Sung-Mo Kang and Y. Leblebici, Tata McGraw - Hill Education, 3rd Edition, 2008.
R4. "Electronic Devices and Circuits", David A. Bell, oxford university press, 5th Edition, 2008.

Course Outcomes:

CO1: To understand the frequency response and Gain - bandwidth relationship for amplifier design.

CO2: To understand the effect of feedback and to analyze and design Oscillators and power amplifiers.

CO3: To understand MOS transistor as a switch and its capacitance.

CO4: Read voluntarily to enhance the knowledge in Analog Electronics circuit..

COURSE CODE: EC21101 **REF NO:** To be filled by CD office

Analog Electronics Circuit (Tutorial)

Credits: 01 **Teaching Scheme:** - Theory 01 Hrs/Week

Prerequisites: Introduction to Electronics Engineering, Physics

Co-requisites: Network Theory

Post-requisites: Mixed signal circuits

Objective:

- The capability to design and construct circuits, take measurements of circuit behavior and performance, compare with predicted circuit models and explain discrepancies.
- To prepare the students for advanced courses in Communication system Circuit Design.

Course Details:

List of Contents

Tutorial No. 1: Problem related to frequency response of BJT and FET.

Tutorial No. 2: Problem related to multistage amplifiers.

Tutorial No. 3: Problem related to feedback amplifiers.

Tutorial No. 4: Problem related to oscillators.

Tutorial No. 5: Problem related to power amplifiers. ,

Tutorial No. 6: Problem related to MOS capacitor fundamentals.

Tutorial No. 7: Problem related to MOS capacitor applications.

Tutorial No. 8: Problem related to MOS transistor fundamentals.

Tutorial No. 9: Problem related to MOS transistor applications.

Tutorial No. 10: Problem related to self study.

Text Books:

T1. "Electronic Devices and Circuit Theory", Robert L. Boylestad and Louis Nashelsky,

Pearson Education, 10th Edition, 2009.

T2. "Semiconductor Physics and Devices", Donald A. Neamen and Dhrubes Biswas, Tata McGraw - Hill Education Pvt. Ltd, 4th Edition, 2012.

Reference Books

R1. "Microelectronic Circuits", Adel S. Sedra and Kenneth C. Smith, Oxford University Press, 6th Edition, 2013.

R2. "Integrated Electronics: Analog and Digital Circuit", Jacob Millman, Christos Halkias and Chetan D Parikh, Mcgraw Hill Education, 2nd Edition, 2011.

R3. "CMOS digital integrated circuits", Sung-Mo Kang and Y. Leblebici, Tata McGraw - Hill Education, 3rd Edition, 2008.

R4. "Electronic Devices and Circuits", David A. Bell, oxford university press, 5th Edition, 2008.

Note: At least one Text Book and one Reference Book must be from Foreign Author/Foreign Publisher

Course Outcomes:

CO1: To understand the frequency response and Gain - bandwidth relationship for amplifier design.

CO2: To understand the effect of feedback and to analyze and design Oscillators and power amplifiers.

CO3: To understand MOS transistor as a switch and its capacitance.

CO4: Read voluntarily to enhance the knowledge in Analog Electronics circuit.

COURSE CODE: EC21301 **REF NO:** To be filled by CD office

Analog Electronics Circuit Lab

Credits: 01 **Teaching Scheme: -** Laboratory 02 Hrs/Week

Prerequisites: Physics Lab.

Co-requisite: Network Theory Lab

Post-requisite: Analog communication Lab

Objective: to provide an overview of the principles, operation and application of the analog building blocks like diodes, BJT, FET, OPAMP etc for performing various functions.

Course Details:

List of Practicals: (*Any* 10**)**

Experiment No. 1: Implementation of clipper and clamper circuits using diode.

Experiment No. 2: Design, assemble and test of BJT common emitter voltage divider circuit- D.C and A.C performance: voltage gain, input impedance and output impedance.

Experiment No. 3: Design, assemble and test of BJT emitter follower- D.C and A.C performance: voltage gain, input impedance and output impedance.

Experiment No. 4: Design, assemble and test of MOSFET common-source amplifiers- D.C and A.C performance: voltage gain, input impedance and output impedance.

Experiment No. 5: Frequency response of a common emitter amplifier: low frequency, high frequency and mid-frequency amplifiers.

Experiment No. 6: Square wave testing of an amplifier.

Experiment No. 7: R-C phase shift oscillator/Wien-Bridge Oscillator using/Crystal Oscillator.

Experiment No. 8: Class A and Class B power amplifier.

Experiment No. 9: Differential amplifier circuits: D.C bias and A.C operation without and with current source.

Experiment No.10: Study of Darlington connection and current mirror circuits.

Experiment No.11: Application of OPAMP (Inverting, non-inverting, integrator and differentiator).

Experiment No.12: Implementation of different filter circuits

Text Books:

T1. "Electronic Devices and Circuit Theory", Robert L. Boylestad and Louis Nashelsky, Pearson Education, 10th Edition, 2009.

T2. "Semiconductor Physics and Devices", Donald A. Neamen and Dhrubes Biswas, Tata McGraw - Hill Education Pvt. Ltd, 4th Edition, 2012.

Reference Books

R1. "Microelectronic Circuits", Adel S. Sedra and Kenneth C. Smith, Oxford University Press, 6th Edition, 2013.

R2. "Integrated Electronics: Analog and Digital Circuit", Jacob Millman, Christos Halkias and Chetan D Parikh, Mcgraw Hill Education, 2nd Edition, 2011.

R3. "CMOS digital integrated circuits", Sung-Mo Kang and Y. Leblebici, Tata McGraw - Hill Education, 3rd Edition, 2008.

R4. "Electronic Devices and Circuits", David A. Bell, oxford university press, 5th Edition, 2008.

Course Outcomes:

CO1: Acquire a basic knowledge in solid state electronics including diodes, BJT and MOSFET.

CO2: Locate the characteristics of semiconductor devices and illustrate the frequency response of different amplifiers**.**

CO3: Learn to design different types of filters and apply the same to oscillators and amplifiers.

CO4: Practice the experimental skills to solve analog electronics circuit problems.

COURSE CODE: IT24353 **REF NO: _____**

Web Technology Lab

Credits: 1 **Teaching Scheme: -** Laboratory 2 Hrs/Week

Prerequisites:

1. Computer Programming

Objectives:

1. To introduce the basic techniques involved in designing web pages.
2. To introduce client side scripting with Javascript.
3. To know the advantages and use of CSS.
4. To use CGI/Perl.
5. To use XML.

List of Practicals:

Experiment No. 1. Download, Install and Configure apache http server for windows and linux. Design HTML web pages demonstrating the use of various text formatting tags and media file embedding tags

Experiment No. 2. Demonstrate the use of HTML5 elements like video, audio, canvas etc.

Experiment No. 3. Design HTML pages using tables and frames.

Experiment No. 4. Get acquainted with the use of Javascript objects like Window, Screen, Location, Document, History, Frame, Navigator etc.

Experiment No. 5. Demonstrate the use of event handling in javascript.

Experiment No. 6. Design HTML form embedding javascript code for client side validation.

Experiment No. 7. Get acquainted with JQuery JavaScript library.

Experiment No. 8. Use different style properties in inline, embedded and external style sheets.

Experiment No. 9. Get acquainted with creation, display and parsing of XML documents.

Experiment No. 10. Demonstrate the use of CGI/Perl.

Text Books:

T1. HTML 5 Black Book: Covers CSS3, Javasvript, XML, XHTML, AJAX, PHP and jQuery, (with cd), by Kogent Learning Solutions Inc., Dreamtech press

T2. Web Enabled Commercial Application Development Using HTML, JavaScript, DHTML and PHP, BPB Publication, 4th Edition, Ivan Bayross
T3. Web Technologies, Uttam K Roy, Oxford

Course Outcomes:

Upon completion of the course, graduates will be able to –

- Understand the new features available in HTML5
- Build interactive web pages using java script.
- Differentiate between webpage structure and style
- Develop web pages with CGI/Perl
- Use XML document