THIRD SEMESTER IT 2015-16

COURSE CODE: CS20101 **REF NO: To be filled by CD office**

DATA STRUCTURE

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

Prerequisites:

1. Computer Programming
2. Knowledge of Computer fundamentals

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 analyze the complexity of different searching and sorting algorithms.

Course Details:

UNIT 1: 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: 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: 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: 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).

U4.2. **Self Study**: Topological Sort, Shortest Paths and Transitive Closures: Single Source all destinations (Dijkstra's Algorithm).

UNIT 5: Sorting & Searching **(7 Hrs)**

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

U5.2. **Self Study:** Selection Sort, Radix sort, Merge 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 different linear data structure for solving problems.
2. Analyze and design of different non-linear data structure for solving problems.
3. Use different sorting and searching mechanisms by analyzing suitability.
4. Apply C programming techniques for data structures.

COURSE CODE: CS20201 **REF NO: To be filled by CD office**

Data Structure Tutorial

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

Prerequisites:

1. Computer Programming
2. Knowledge of computer fundamentals

Objectives:

1. Understanding the basics design and fundamentals of various linear and non-linear data structures.
2. Understanding the creation of basic data structures and their implementations.
3. To perform different operations on linear and non-linear data structures, in both static and dynamic environments.
4. Analyzing and comparing the performance of different sorting and searching algorithms.

Course Details:

List ofContents

Tutorial No.1: Classification of data structures and examples. Abstract data types with examples.

Tutorial No. 2: Basic operations on stacks and queues.

Tutorial No. 3: Overview of linked lists and its different types. ,

Tutorial No.4: Application of linked lists (Polynomial Addition). Implementation of Stack and Queue using linked list.

Tutorial No.5: Tree fundamentals: terminology and traversal. Constructing binary trees from traversal sequences. Operations on BST.

Tutorial No.6: Understanding Height Balanced Trees (AVL), B-Trees and B+ Trees**.**

Tutorial No.7: Graph data structure: terminologies and representation. Warshall's Shortest Path Algorithm with examples.

Tutorial No.8: Graph Traversals: BFS and DFS techniques.

TutorialNo. 9 : Overview of searching and sorting techniques: Binary search, Quick sort and Heap sort.

Tutorial No.10: Fundamentals of Hashing and different hash functions. Collision resolution techniques.

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 different linear data structure for solving problems.
2. Analyze and design of different non-linear data structure for solving problems.
3. Use different sorting and searching mechanisms by analyzing suitability.
4. Apply C programming techniques for data structures.

COURSE CODE: CS20301 **REF NO: To be filled by CD office**

DATA STRUCTURES - LABORATORY

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

Prerequisites:

1. Basic knowledge to handle a computer system.
2. Basic knowledge of Linux and Windows Operating System.
3. Fundamental knowledge about flow chart and algorithm.
4. Knowledge in Programming in C language.

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. Compare and analyse the performance of different algorithms.
4. 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: CS20102 **REF NO: To be filled by CD office**

OBJECT ORIENTED PROGRAMMING

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:

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

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

Reference Books:

1. Balguruswamy, Programming with JAVA, TMH.

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

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

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

5. 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-

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: MA21007 **REF NO: To be filled by CD office**

DISCRETE MATHEMATICS AND GRAPH THEORY

Credits: 03 **Teaching Scheme: -** Theory 03Hrs/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: (08Hrs)

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**: Mathematical Statements, Logic and Problem Solving.

UNIT 2: Combinatorics: (08Hrs)

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: The Binomial and Multinomial Theorems.

UNIT 3: Graph Theory: (08Hrs)

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: Introductory Concepts involving Directed Graphs.

UNIT 4: **(08Hrs)**

U4.1. Trees and Networks:
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]**

U4.2. Self Study: Enumeration of Spanning Trees.

UNIT 5: Algebraic Structures and Applications: **(08Hrs)**

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 : 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.

TextBooks:

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(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(Up to Including 7.2.19)).

ReferenceBooks

R1. Discrete Mathematics and Its Applications WithCombinatorics 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 combinatory.
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: CS20105 **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: 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: 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: 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: 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.

U4.2 Self Study: Quality of service.

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

U5.1 Client Server Model, Socket Interface, Domain Name System (DNS): Electronic Mail (SMTP), File Transfer (FTP).

U5.2 Self Study: Remote Logging, HTTP and WWW.

Text Books:

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

Reference Books

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

Outcome
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:CS30105/CS20105 **REF NO**: To be filled by CD office

DATA COMMUNICATION & COMPUTER NETWORKS - TUTORIAL

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

Prerequisites:

1. Semiconductor Device & Circuits
2. Digital Electronics Circuits
3. 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.

Course Details:

List oftopics for tutorial exercises

Tutorial No.1: Data communication and different network topologies.

Tutorial No. 2: OSI model and different types of signaling structure.

Tutorial No.3: Different switching structure.

Tutorial No.4: Error detection and correction techniques and solving some problems.

Tutorial No.5: Flow control and error control mechanism.

Tutorial No.6: Different types of addressing.

Tutorial No.7: IP addressing classification, sub-netting and super-netting.

Tutorial No.8: Congestion control logic.

TutorialNo. 9: Different types of application layer protocol.

Tutorial No.10: DNS, Remote logging, HTTP and SNMP.

Text Books:

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

Reference Books:

1. Data and Computer Communications: William Stallings, Prentice Hall, Imprint of Pearson, 9th Edition.
2. Data communication & Computer Networks: Gupta, Prentice Hall of India.
3. Network for Computer Scientists & Engineers: Zheng, Oxford University Press.
4. Data Communications and Networking: White, Cengage Learning.

Course Outcome:

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: CS20305 **REF NO:** To be filled by CD office

DATA COMMUNICATION & COMPUTER NETWORKS - LABORATORY

Credits: 01 **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 about the different types of cables which are used for data communication such as crossover cable, straight through cable.

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

- Verification of Token Ring.
- Verification of Token bus.

Experiment No. 6

- Verification of Stop and Wait protocol.
- Verification of Stop and Wait protocol with BER.

Experiment No. 7

- Verification of Sliding Window Go Back N protocol
- Verification of Sliding Window Go Back N protocol with BER.

Experiment No. 8

- Verification of Sliding Window Selective Repeat protocol.
- Verification of Sliding Window Selective Repeat protocol with BER.

Experiment No. 9

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

protocol.

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

Experiment No. 10

- Verification of Distance Vector Routing Protocol.
- Verification of Link State Routing Protocol.
- Some programming techniques in socket programming

Text Books:

- Benchmark Electronic System Manual
- http://www.isi.edu/nsnam/ns/

Course Outcome:

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**

SEMICONDUCTOR DEVICES AND CIRCUITS

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

Prerequisites: Physics +2 Level

Course Outcomes:

CO1: Apply fundamentals of signals to analyze the signal in DSP and Communication Engineering.

CO2: Apply concepts of semiconductor materials and the mechanism of current flow in semi-conductors, Diode operation and switching characteristics, Operation of BJT designing different electronics circuits.

CO3: Apply the basic concept of MOS FET, Biasing of MOSFET to analysis and design of basic transistor amplifier FET circuits.

CO4: Test and Analyze the behavior of BJT/FET in low and high frequency regions by performing frequency analysis of BJT and FET.

CO5: Implement the principle of Feedback Amplifiers and Oscillator to design different oscillator and amplifier circuits of desired frequency and gain.

CO6: Implement knowledge of power amplifier in the area of signal processing, and communication.

Course Details:

Unit 1

Semiconductor Diodes **(08Hrs)**

U1.3. Semiconductor Devices:Energy bands in intrinsic and extrinsic silicon, Carrier transport: Diffusion current, Drift current, Mobility and resistivity, Generation and recombination of carriers; Poisson and continuity equations, P-N junction, Zener diode, Photo diode. Simple Diode Circuits: Clipping, Clamping and Rectifier circuits, Application of Zener diode.

U1.4. Varactor diode, Tunnel diode, Schottky diode, LED.

Unit 2

Bipolar Junction Transistors (08Hrs)

U2.1. Bipolar Junction Transistors (BJTs): Construction and operation, BJT configurations (CE, CB, CC), Concept of amplification, DC biasing, Operating point and concept of stability, Small signal analysis using h-parameter model. Introduction to hybrid-π model.

U2.2. Ebers-Moll model of transistors, Early effect, Thermal runaway of BJT, Photo transistor, Power transistor.

Unit 3

Metal Oxide Semiconductor Field Effect Transistor (08Hrs)

U3.1. MOSFET: Construction, operation and handling, Classification, I-V characteristics, MOSFET configurations (CS, CG, CD), MOSFET parameters and small signal modeling, Concept of biasing.

U3.2. JFET (Construction and operation), Difference between JFET and MOSFET.

Unit 4

Frequency Response of Amplifiers (08Hrs)

U4.1. 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).

U4.2. Multistage amplifiers (more than two stages) and current mirror.

Unit 5

Feedback Amplifiers, Oscillators and Power Amplifier (08Hrs)

U5.1. Feedback and Oscillators: Feedback Concepts, Advantages of negative feedback, Four Basic Feedback Topologies, Practical Feedback Circuits (Voltage series), Basic Principle of Sinusoidal Oscillator, Wien-Bridge, RC Phase Shift and Crystal Oscillator Circuits.

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.

U5.2. LC oscillators (Hartley and Colpitts), Complementary symmetry push pull power amplifier.

Text Books:

T1. "Electronic Devices and Circuits", Anil K. Maini and VarshaAgrawal, Wiley India Pvt Ltd, 1st Edition, 2009.

T2. "Electronic Devices and Circuit Theory", Robert L. Boylestad and Louis Nashelsky, Pearson Education, 10th Edition, 2009.

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. "Electronics Principles", Albert Malvino and David J. Bates, Tata McGraw - Hill Education, 7th Edition, 2006.

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

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

SEMICONDUCTOR DEVICES AND CIRCUITS LAB

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

Prerequisites: Physics Lab.

Course Outcomes:

CO1: Apply fundamental knowledge of hardware construction and operating principle of different electronics instruments like CRO, Function Generator to generate and measure different signal parameters like frequency, amplitude, phase etc.

CO2: Apply knowledge on characteristics of semiconductor devices like diodes and BJT to design, implement and test circuits using diodes and BJTs.

CO3: Design amplifier by analyzing the basic transistor amplifier circuits and Frequency response of a common-emitter amplifier: (low frequency, high frequency and mid frequency response).

CO4: Implement square wave generator and analyze the frequency response to design and develop communication circuits**.**

CO5: Apply fundamental knowledge of oscillators & feedback amplifier to design waveform generators.

Course Details:

List ofPracticals: (*Any*10**)**

Experiment No. 1: Study of electronic components, operation and use of Oscilloscope and function generator to measure different parameters of a given waveform.

Experiment No.2: V-I characteristics of semiconductor diode and determining its DC and AC resistance.

Experiment No.3: Implementation of half-wave and full-wave rectifier circuits without and with capacitor filter and measurement of their ripple

factor values.

Experiment No. 4: 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.5: Design, assemble and test of BJT emitter follower- D.C and A.C performance: voltage gain, input impedance and output impedance.

Experiment No.6: Design, assemble and test of MOSFET common-source amplifiers- D.C and A.C performance: voltage gain, input impedance and output impedance.

Experiment No.7: Frequency response of a common emitter amplifier: low frequency, high frequency and mid-frequency amplifiers.

Experiment No.8: Square wave testing of an amplifier.

Experiment No.9: R-C phase shift oscillator/Wien-Bridge Oscillator using/Crystal Oscillator.

Experiment No.10: Class A and Class B power amplifier.

Experiment No.11: Differential amplifier circuits: D.C bias and A.C operation without and with current source.

Experiment No.12: Study of Darlington connection and current mirror circuits.

TextBooks:

T1. "Electronic Devices and Circuits", Anil K. Maini and VarshaAgrawal, Wiley India Pvt Ltd, 1st Edition, 2009.

T2. "Integrated Electronics: Analog and Digital Circuit", Jacob Millman, Christos Halkias and Chetan D Parikh, Mcgraw Hill Education, 2nd Edition, 2011.

ReferenceBooks

R1. "Electronic Instrumentation", H. S. Kalsi,Mcgraw Hill Education, 3rd Edition, 2010.

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

COURSE CODE: IT24351 **REF NO: To be filled by CD office**

LINUX OPERATING SYSTEM ADMINISTRATION

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

Prerequisites:

1. Basic knowledge about architecture and functions of operating system.
2. Basic knowledge of process and file management.
3. Basic knowledge of networking concepts.

Objectives: The objectives of this laboratory course are:

1. To provide students with a fundamental working principle of Linux environment.
2. To know how file system is used in Linux operating system.
3. To have knowledge of file sharing and network configuration in Linux environment.
4. To have knowledge on how to write scripts for system automation.

Course Details:

1. Introduction
Introducing Linux, Distributions, file system Hierarchy, devices and drives, booting process, boot loaders, disk partition, controlling and managing services, repository configuration

2. Basics and Components
Kernel, XFree86, Sawfish, Gnome, GNOME Basics, Evolution - the default e-mail client in Fedora Mozilla - Web browser, XScreensaver, How user preferences are stored in your home directory, Updating your system with up2date / yum, How to restart X11: Ctrl-Alt-Backspace

3. Linux shell, Text editors
The command-line (shells, tab completion, cd, ls,file management: cd, df, find, locate,nano, the text editor that replaces pico, man pages - the help system, ssh - secure text-based connectivity to other machines. Demonstrate X-Forwarding, Handling compressed archives with zip and tar, GNU screen - The ability to resume command-line sessions from anywhere

4. Network configuration, Installingsoftwares
User administration of Linux, Network Configuring, Using SSH for network communications, Using VNC for remote management, Network Authentication, Installing new software with yum (if Fedora) or YaST (if SUSE), Installing new software with rpm, Patches & updates

5. User Management
Adding users, groups, su - the obsoleted way to become the root user, sudo - the modern way to run processes as another user, Changing users' passwords with the passwd command, Printing with CUPS.

6. Web based system Adminisration, network Configuration

Installing webmin for easy web based systems administration, Network Configuring, Using SSH for network communications, Using VNC for remote management, Network Authentication, Patches & updates

7. System Configuration, NFS, FTP server setup

System Configuration Files, Perform System Management, X configuration server, Setting up an NFS server, Setting up an FTP server, The Samba Server: networking with Windows system,

8. DHCP, DNS, Proxy, Mail server set up

Configuring a DHCP server, Configuring a DNS server Configuring the Apache web server, Configuring the Squid web proxy cache, Using send mail server, Dovecot: an IMAP and POP server, Performance Tuning and system hardening

9. Maintenance, Troubleshooting and Security

SE LINUX/ APParmor, Basic Service Security, Log Management and NTP, BIND and DNS Security, Network Authentication: RPC, NIS and Kerberos, Apache security(SSL), KVM / xe, Bash Scripting

10. Command line Interface, System Automation

Introduction to BASH Command Line Interface (CLI) Error Handling, Debugging & Redirection of scripts, Control Structure, Loop, Variable & String, Conditional Statement Regular Expressions

Automate Task Using Bash Script, Security patches, Logging & Monitoring using script.

Text books:

1. "Linux System Administration ", by Tom Adelstein, Bill Lubanovic.
2. "Essential System Administration " ,by Æleen Frisch

Reference Books:

1. "Linux &Unix System Administration", by O' Reilly Media
2. "The Practice of System and Network Administration", by Thomas Limoncelli, Christina Hogan, Strata Chalup

Course Outcomes:

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

1. Identify the role and responsibilities of a Linux system administrator.
2. Install and configure the Linux operating system.
3. Analyze resource use and security of a computer running Linux.
4. Make effective use of Linux utilities and scripting languages.
5. Design TCP/IP network services on a Linux system.
6. Develop scripts to automate tasks such as maintenance etc.