

CENTRE FOR DISTANCE AND ONLINE EDUCATION

MCA - I SEMESTER

SELF LEARNING MATERIALS (SLM)

Sl. No.	Subject Code	Name of the Subject
1.	MAD 6188	Mathematical Foundation for Computer Applications
2.	CAD 6121	Computer Organization and Operating System
3.	CAD 6122	Database Management Systems
4.	CAD 6123	Computer Networks
5.	CAD 6124	Data Structures and Algorithms using C/C++
6.	CAD 6125	Object Oriented Software Engineering
7.	CAD 6126	Data Structures and Algorithms Laboratory using C/C++
8.	CAD 6127	Programming in C and C++ Laboratory
9.	CAD 6128	DBMS Laboratory

MAD 6188 Mathematical Foundation for Computer Applications

UNIT - I

Lesson 1

CONTENTS

Learning Objectives

This lesson is intended to

- Know the importance of Number System for computing
- Understand the conversions in Number System

Learning Outcomes

At the end of studying this lesson, you should be able to:

- Implement the knowledge of number system in designing
- Infer the need of conversions

Overview

- 1.1 Number System
 - 1.1.1 Introduction
 - 1.1.2 Application to Computer Science
 - 1.1.3 Scope of Number System
- 1.2 Decimal Number System
- 1.3 Binary Number System
 - 1.3.1 Addition
 - 1.3.2 Subtraction
 - 1.3.3 Multiplication
- 1.4 Hexadecimal Number System
- 1.5 Octal Number System
- 1.6 Conversions in Number System

Summary

Keywords

Self-Assessment Questions

Further Reading

MAD 6188 Mathematical Foundation for Computer Applications

Lesson 2

CONTENTS

Learning Objectives

This lesson is intended to

- Identify the combinatorial problems
- Enumerate the possible solutions

Learning Outcomes

At the end of studying this lesson, you should be able to

- Articulate Combinatorics
- Interpret the knowledge to find the possible solution
- Apply the concepts in Optimization

Overview

- 1.1 Combinatorics
 - 1.1.1 Introduction
 - 1.1.2 Case Study
- 1.2 Permutation & Combination
 - 1.2.1 With Repetition
 - 1.2.2 Without Repetition
 - 1.2.3 Properties
- 1.3 Mathematical Induction
- 1.4 Pigeon Hole Principle

Summary

Keywords

Self-Assessment Questions

Further Reading

MAD 6188 Mathematical Foundation for Computer Applications

UNIT - II

Lesson 3

CONTENTS

Learning Objectives

This lesson is intended to:

- Highlight and relate the various concepts of mathematical logic
- Formulate and solve the logical statements

Learning Outcomes

At the end of studying this lesson, you should be able to

- Infer theoretically logical statements
- Interpret the knowledge in validating the arguments

Overview

1.1	Mathematical Logic
1.1.1	Negation
1.1.2	Conjunction
1.1.3	Disjunction
1.1.4	Conditional
1.1.5	Biconditional
1.2	Propositions
1.2.1	Framing Statements
1.2.2	Well Formed Formulae
1.2.2.1	Equivalence Law
1.3	Testing the validity of an argument
1.3.1	Tautology
1.3.2	Contradiction
1.3.3	Equivalence
1.4	Normal Forms (Decision Problems)
1.4.1	Disjunctive Normal Form (DNF)
1.4.2	Conjunctive Normal Form (CNF)
1.4.3	Principal Disjunctive Normal Form (PDNF)
1.4.4	Principal Conjunctive Normal Forms (PCNF)

Summary

Keywords

Self-Assessment Questions

Further Reading

MAD 6188 Mathematical Foundation for Computer Applications

Lesson 4

Learning Objectives

This lesson is intended to:

- Familiarize the concepts in Inference Theory
- Explain the various motivational theories and its applications

Learning Outcomes

At the end of studying this lesson, you should be able to

- Identify the importance of Predicate Calculus
- Develop the knowledge of quantifying the arguments.

Overview

1.1	Inference Theory
1.1.1	Rules of Inference
1.1.2	Statement Proofs
1.2	Predicate Calculus
1.2.1	Statement Functions, Variable and Quantifiers
1.2.2	Free and Bound Variables
1.2.3	Quantifiers
1.3	Theory of Inference for Predicate Calculus
1.4	Solving Quantifier Statements

Summary

Keywords

Self-Assessment Questions

Further Reading

MAD 6188 Mathematical Foundation for Computer Applications

UNIT - III

Lesson 5

CONTENTS

Learning Objectives

This lesson is intended to:

- Impart the knowledge on Matrices
- Get familiarize with basic operations in Matrices

Learning Outcomes

At the end of studying this lesson, you should be able to

- Formulate the problems in Matrix expression
- Understand the Basic Concepts in Matrices

Overview

1.1	Matrices
1.1.1	Classification of Matrices
1.1.2	Operations in Matrices
1.2	Applications of Matrices
1.2.1	Case Studies
1.2.2	Framing Problems

Summary

Keywords

Self-Assessment Questions

Further Reading

MAD 6188 Mathematical Foundation for Computer Applications

Lesson 6

CONTENTS

Learning Objectives

This lesson is intended to:

- Impart the knowledge on Characteristic Equation
- Solve the problems in Eigen Values

Learning Outcomes

At the end of studying this lesson, you should be able to

- Realise the need of solving Eigen Values and Eigen Vectors

Overview

1.1	Characteristic Equation
1.1.1	Framing
1.1.2	Solving
1.2	Eigen Values and Eigen Vectors
1.2.1	Applications
1.2.2	Symmetric Matrices
1.2.2.1	Non Repeated Eigen Values
1.2.2.2	Repeated Eigen Value
1.2.3	Non Symmetric Eigen Values
1.2.3.1	Non Repeated Eigen Values
1.2.3.2	Repeated Eigen Value

Summary

Keywords

Self-Assessment Questions

Further Reading

MAD 6188 Mathematical Foundation for Computer Applications

UNIT - IV

Lesson 7

CONTENTS

Learning Objectives

This lesson is intended to:

- Get familiarize with the concept of Set Theory
- Widen the knowledge on Basic concepts in Set Theory

Learning Outcomes

At the end of studying this lesson, you should be able to

- Identify the set operations
- Implement the basic laws in real time problems

Overview

1.1	Set Theory
1.1.1	Notations
1.1.2	Types of Sets
1.2	Set Operations
1.2.1	Intersection of Sets
1.2.2	Union of Sets
1.2.3	Disjoint Sets
1.2.4	Difference of Sets
1.2.5	Universal Set and its Complementation
1.3	Venn Diagram
1.3.1	Basic Results
1.3.2	De- Morgan's Law
1.3.3	Principal of Inclusion & Exclusion

Summary

Keywords

Self-Assessment Questions

Further Reading

MAD 6188 Mathematical Foundation for Computer Applications

Lesson 8

CONTENTS

Learning Objectives

This lesson is intended to:

- Highlight the concepts of Relations
- Formulate and relate the concepts of relations

Learning Outcomes

At the end of studying this lesson, you should be able to

- Analyse the properties of relation
- Visualize the Partial Order Relation

Overview

1.1	Relations
1.1.1	Representation
1.1.2	Types of Relation
1.1.3	Properties
1.2	Equivalence Relation
1.3	Partial Order Relation
1.3.1	Totally Ordered Set
1.3.2	Cartesian Product
1.3.3	Hasse Diagram

Summary

Keywords

Self-Assessment Questions

Further Reading

MAD 6188 Mathematical Foundation for Computer Applications

UNIT - V

Lesson 9

CONTENTS

Learning Objectives

This lesson is intended to:

- To give insight of basic concepts in Graph Theory
- Apply the knowledge in optimization

Learning Outcomes

At the end of studying this lesson, you should be able to

- Illustrate the concepts graphically
- Optimize the results

Overview

1.1	Basics of Graph Theory
1.1.1	Introduction
1.1.2	Types of Graphs
1.1.3	Degree of Vertices
1.1.4	Basic Theorems
1.2	Path and Circuits
1.2.1	Walk
1.2.2	Distance of a graph
1.2.3	Shortest Path Problem
1.3	Eulerian Graph
1.4	Hamiltonian Graph

Summary

Keywords

Self-Assessment Questions

Further Reading

MAD 6188 Mathematical Foundation for Computer Applications

Lesson 10

CONTENTS

Learning Objectives

This lesson is intended to:

- Sketch the representation of trees and its notations
- Apply the knowledge in algorithms

Learning Outcomes

At the end of studying this lesson, you should be able to

- List various types of trees
- Correlate the results with real time problems

Overview

1.1	Trees
1.1.1	Definition
1.1.2	Applications
1.2	Rooted Tree
1.2.1	Parent, Child, Sibling and Leaf
1.2.2	Binary Tree
1.3	Spanning Tree
1.3.1	Kruskal's Algorithm
1.4	Cut Sets
1.4.1	Fundamental Cut Sets

Summary

Keywords

Self-Assessment Questions

Further Reading

CAD 6121 - Computer Organization and Operating System

UNIT I

Lesson 1

CONTENTS

Learning Objectives

This lesson is intended to

- Identify the instruction sets and operations of processor.
- Illustrate the structure, function and characteristics of computer systems.

Learning Outcomes

At the end of studying this lesson, you should be able to:

- Demonstrate instruction execution cycle.

Overview

- 1.1 Introduction To Computer Organization
 - 1.1.1 Functional Units of a Digital Computer
 - 1.1.2 Von Neumann Architecture
- 1.2 Instruction Set Architecture (ISA)
 - 1.2.1 Memory Location
 - 1.2.2 Address and Operation
 - 1.2.3 Instruction and Instruction Sequencing
- 1.3 Addressing Modes
- 1.4 Instruction Execution

Summary

Keywords

Self-Assessment Questions

Further Reading

CAD 6121 - Computer Organization and Operating System

Lesson 2

CONTENTS

Learning Objectives

This lesson is intended to

- To learn Controls, Pipelining and Hazards ideas.

Learning Outcomes

At the end of studying this lesson, you should have

- Gained knowledge on Pipelining and Hazards concepts

Overview

- 1.1 Building a Data Path
- 1.2 Designing a Control Unit
 - 1.2.1 Hardwired Control
 - 1.2.2 Micro programmed Control
- 1.3 Pipelining
- 1.4 Data Hazard
- 1.5 Control Hazards

Summary

Keywords

Self-Assessment Questions

Further Reading

CAD 6121 - Computer Organization and Operating System

UNIT II

Lesson 3

CONTENTS

Learning Objectives

This lesson is intended to:

- To learn memory management.
- Discuss different types of memories and their properties.

Learning Outcomes

At the end of studying this lesson, you should be

- Categories various memory types according to their properties.
- Describe the principles of memory management.

Overview

- 1.1 Memory Concepts and Hierarchy
- 1.2 Memory Management
- 1.3 Cache Memories
 - 1.3.1 Mapping and Replacement Techniques
 - 1.3.2 Virtual Memory
- 1.4 DMA

Summary

Keywords

Self-Assessment Questions

Further Reading

CAD 6121 - Computer Organization and Operating System

Lesson 4

Learning Objectives

This lesson is intended to:

- Introduce basics of Parallel Computer Architecture.

Learning Outcomes

At the end of studying this lesson, you should be able to

- Explain how interrupts are used to implement I/O control and data transfers.

Overview

- 1.1 Input/Output
- 1.2 Accessing I/O
 - 1.2.1 Parallel and Serial Interface
 - 1.2.2 Interrupt I/O
- 1.1.4 Perceptual Errors
- 1.3 Interconnection Standards
 - 1.3.1 USB
 - 1.3.2 SATA

Summary

Keywords

Self-Assessment Questions

Further Reading

CAD 6121 - Computer Organization and Operating System

UNIT III

Lesson 5

CONTENTS

Learning Objectives

This lesson is intended to:

- Recognize the concepts and principles of operating systems.

Learning Outcomes

At the end of studying this lesson, you should be able to

- Identify basic components of operating system.
- Understands the different services provided by Operating System at different level.

Overview

1.1	Role of an Operating System
1.1.1	Types of Operating System
1.1.2	Major OS Components
1.2	Operating System Operations
1.3	Operating System Services
1.4	System calls
1.4.1	System Programs

Summary

Keywords

Self-Assessment Questions

Further

Reading

CAD 6121 - Computer Organization and Operating System

Lesson 6

CONTENTS

Learning Objectives

This lesson is intended to:

- Impart on process and scheduling techniques.

Learning Outcomes

At the end of studying this lesson, you should be able to

- Know more about Process and communication concepts.

Overview

- | | |
|-----|-----------------------------|
| 1.1 | Operating System Structure |
| 1.2 | Process Concept |
| 1.3 | Process Scheduling |
| 1.4 | Operations on Processes |
| 1.5 | Inter process Communication |

Summary

Keywords

Self-Assessment Questions

Further Reading

CAD 6121 - Computer Organization and Operating System

UNIT IV

Lesson 7

CONTENTS

Learning Objectives

This lesson is intended to:

- To learn different process scheduling algorithms and techniques to achieve better performance of a computer system.

Learning Outcomes

At the end of studying this lesson, you should be able to

- Simulation of CPU Scheduling Algorithms. (FCFS, RR, SJF).

Overview

- 1.1 Basic Concepts of Scheduling
- 1.2 Scheduling Criteria
 - 1.2.1 Scheduling Algorithms
 - 1.2.2 First Come First Serve
 - 1.2.3 Shortest Job First
 - 1.2.4 Round Robin
 - 1.2.5 Critical Section Problem

Summary

Keywords

Self-Assessment Questions

Further Reading

CAD 6121 - Computer Organization and Operating System

Lesson 8

CONTENTS

Learning Objectives

This lesson is intended to:

- Study the concepts of Semaphores and Monitors.

Learning Outcomes

At the end of studying this lesson, you should be able to

- Know to apply Semaphores and Monitors concepts.

Overview

- | | |
|-----|--|
| 1.1 | Semaphores |
| 1.2 | Monitors |
| 1.3 | Dining Philosophers Solutions Using Monitors |
| 1.4 | Implementation of Monitor Using Semaphores |

Summary

Keywords

Self-Assessment Questions

Further Reading

CAD 6121 - Computer Organization and Operating System

UNIT V

Lesson 9

CONTENTS

Learning Objectives

This lesson is intended to:

- To know virtual memory concepts.
- To make aware of different types of Operating System and their services.

Learning Outcomes

At the end of studying this lesson, you should be able to

- Learn different memory management techniques like paging, segmentation and demand paging etc.
- Apply the various methods in memory allocation and page replacement algorithm.

Overview

1.1	Swapping
1.2	Contiguous Memory Allocation
1.3	Paging
1.4	Segmentation
1.5	Virtual Memory
1.6	Demand Paging
1.7	Copy-On-Write

Summary

Keywords

Self-Assessment Questions

Further Reading

CAD 6121 - Computer Organization and Operating System

Lesson 10

CONTENTS

Learning Objectives

This lesson is intended to:

- Explore the techniques for managing files.

Learning Outcomes

At the end of studying this lesson, you should be able to

- Exposure to some details of major OS concepts

Overview

- | | |
|-------|--|
| 1.1 | File system Interface |
| 1.2 | The Concept of a File |
| 1.2.1 | Access Methods |
| 1.2.2 | Directory Structure |
| 1.2.3 | File System Mounting |
| 1.2.4 | File Sharing |
| 1.2.5 | Protection |
| 1.3 | File System Implementation |
| 1.4 | Case study of Linux and Window operating systems |

Summary

Keywords

Self-Assessment Questions

Further Reading

CAD 6122 Database Management Systems

Unit - I

Lesson 1

CONTENTS

Learning Objectives

This lesson is intended to

- Provide an introduction on database and its operations.

Learning Outcomes

At the end of studying this lesson, you should be able to:

- List the importance of DBMS and differentiate how DBMS is better than traditional file processing systems.

Overview

- 1.1 Introduction to DBMS
 - 1.1.1 View of Data
 - 1.1.2 Data Models
 - 1.1.3 Database Languages
 - 1.1.4 Database system structure
 - 1.1.5 Database Systems Applications
 - 1.1.6 Need for database
- 1.2 History of Database Systems
 - Advantages of DBMS over file processing systems

Summary

Keywords

Self-Assessment Questions

Further Reading

CAD 6122 Database Management Systems

Lesson 2

CONTENTS

Learning Objectives

This lesson is intended to

- Provide an introduction on database and its operations.

Learning Outcomes

At the end of studying this lesson, you should be able to:

- List the importance of DBMS and differentiate how DBMS is better than traditional file processing systems.

Overview

- 1.1 Transaction Management
 - 1.1.1 Introduction to transaction
 - 1.1.2 properties of transaction and life cycle of transaction
- 1.2 Entity Relationship Model
 - 1.2.1 Component of ER Diagram
 - 1.2.2 Entity, Attribute, Relationship
 - 1.2.3 Notation of ER diagram
 - 1.2.4 Mapping Constraints, Keys
 - 1.2.5 Generalization
 - 1.2.6 Specialization
 - 1.2.7 Aggregation

Summary

Keywords

Self-Assessment Questions

Further Reading

CAD 6122 Database Management Systems

Unit - II

Lesson 3

CONTENTS

Learning Objectives

This lesson is intended to:

- Explain the fundamentals of relational systems including data models, database architectures and database manipulations.

Learning Outcomes

At the end of studying this lesson, you should be

- Illustrate the difference between a relational database and anon-relational (NOSQL) database

Overview

- 1.1 Relational Databases Sql
 - 1.1.1 Basic Structure
 - 1.1.2 Relational Algebra & various operations
 - 1.1.3 Relational and Tuple calculus
- 1.2 Complex Queries
- 1.3 Joined Queries
 - 1.3.1 Natural Join
 - 1.3.2 Outer Join
 - 1.3.3 Equi Join
- 1.4 DDL
- 1.5 Embedded SQL
- 1.5 Dynamic SQL
- 1.6 Query by Example, Integrity and Security of searching

Summary

Keywords

Self-Assessment Questions

Further Reading

CAD 6122 Database Management Systems

Lesson 4

Learning Objectives

This lesson is intended to:

- Explain the fundamentals of relational systems including data models, database architectures and database manipulations.

Learning Outcomes

At the end of studying this lesson, you should be

- Illustrate the difference between a relational database and anon-relational (NOSQL) database

Overview

- | | |
|-------|---|
| 1.1 | DDL |
| 1.2 | Embedded SQL |
| 1.3 | Dynamic SQL |
| 1.4 | Query by Example, Integrity and Security of searching |
| 1.5 | Relational Database Design |
| 1.5.1 | Define relations/attributes |
| 1.5.2 | Define relationships |
| 1.5.3 | Normalization |
| 1.5.4 | Define primary keys |
| 1.6 | Relational Databases Sql |

Summary

Keywords

Self-Assessment Questions

Further Reading

CAD 6122 Database Management Systems

Unit - III

Lesson 5

CONTENTS

Learning Objectives

This lesson is intended to:

- Train the students to construct simple and moderately advanced database queries using structured query language and apply normalization techniques.

Learning Outcomes

At the end of studying this lesson, you should be able to

- Construct and normalize conceptual data models, analyze the basic structure of database and recognize the different views of the database.

Overview

- | | |
|-------|---|
| 1.1 | NORMALIZATION |
| 1.1.1 | Functional Dependency & Inference rule |
| 1.2 | Types of Normal forms |
| 1.2.1 | First normal forms |
| 1.2.2 | Second normal forms |
| 1.2.3 | Third normal forms |
| 1.2.4 | Boyce - Codd normal form |
| 1.2.5 | Higher Normal Forms Multi valued dependencies |
| 1.2.6 | Fourth normal form |
| 1.3 | Join dependencies and Fifth normal form |

Summary

Keywords

Self-Assessment Questions

Further Reading

CAD 6122 Database Management Systems

Lesson 6

This lesson is intended to:

- Train the students to construct simple and moderately advanced database queries using structured query language and apply normalization techniques.

Learning Outcomes

At the end of studying this lesson, you should be able to

- Construct and normalize conceptual data models, analyze the basic structure of database and recognize the different views of the database.

Overview

- | | |
|-------|----------------------------|
| 1.1 | QUERY EVALUATION Structure |
| 1.2 | Query Processing |
| 1.2.1 | Parsing and translation |
| 1.2.2 | Optimization |
| 1.2.3 | Evaluation |
| 1.3 | Query Evaluation Plan |
| 1.4 | Operation views |

Summary

Keywords

Self-Assessment Questions

Further Reading

CAD 6122 Database Management Systems

Unit - IV

Lesson 7

CONTENTS

Learning Objectives

This lesson is intended to:

- Educate the concept of database storage & file structure.

Learning Outcomes

At the end of studying this lesson, you should be able to

- Describe the concepts of data storage and indexing, query evaluations and optimization techniques.

Overview

1.1	DATA STORAGE
1.1.1	Types of Storage
1.1.2	File Structure
1.2	RAID
1.2.1	Definition
1.2.2	Levels
1.3	File Organization
1.3.1	Types of file organization:
1.3.2	Sequential file organization
1.3.3	Heap file organization
1.3.4	Hash file organization
1.3.5	B+ file organization
1.4	Organization of Records in Files

SummaryKeywords

Self-Assessment Questions

Further Reading

CAD 6122 Database Management Systems

Lesson 8

CONTENTS

Learning Objectives

This lesson is intended to:

- Educate the concept of database storage & file structure.

Learning Outcomes

At the end of studying this lesson, you should be able to

- Describe the concepts of data storage and indexing, query evaluations and optimization techniques.

Overview

1.1	Indexing
1.1.1	Index Structure
1.1.2	Indexing methods
1.2	B+tree Index Files
1.2.1	Insertion
1.2.2	Deletion
1.3	Hashing
1.3.1	Static Hashing
1.3.2	Dynamic Hashing

Summary

Keywords

Self-Assessment Questions

Further Reading

CAD 6122 Database Management Systems

Unit - V

Lesson 9

CONTENTS

Learning Objectives

This lesson is intended to:

- Explore the concept of transaction management and origins of No SQL databases and the characteristics that distinguish them from traditional relational database management systems.

Learning Outcomes

At the end of studying this lesson, you should be able to

- Handle transaction management queries in SQL in real time scenario

Overview

- | | |
|-------|---------------------------------------|
| 1.1 | TRANSACTION MANAGEMENT |
| 1.1.1 | Transaction Concept |
| 1.2 | Static Implementation |
| 1.3 | Concurrency Control |
| 1.3.1 | Protocols |
| 1.3.2 | Deadlock Handling |
| 1.3.3 | Recovery Systems |
| 1.3.4 | Recovery with Concurrent Transactions |
| 1.4 | Shadow Paging |
| 1.5 | Buffer Management |
| 1.5.1 | Buffer Replacement Strategies |
| 1.5.2 | Database Buffer |

Summary

Keywords

Self-Assessment Questions

Further Reading

CAD 6122 Database Management Systems

Lesson 10

CONTENTS

Learning Objectives

This lesson is intended to:

- Explore the concept of transaction management and origins of No SQL databases and the characteristics that distinguish them from traditional relational database management systems.

Learning Outcomes

At the end of studying this lesson, you should be able to

- Handle transaction management queries in SQL in real time scenario

Overview

- | | |
|-------|---|
| 1.1 | Case Studies |
| 1.2 | Oracle, Microsoft SQL Server |
| 1.3 | NoSQL |
| 1.3.1 | Characteristics |
| 1.3.2 | Major types of NoSQL databases |
| 1.5 | NoSQL Database-as-a-Service for Web and mobile applications |

Summary

Keywords

Self-Assessment Questions

Further Reading

CAD 6123 - Computer Networks

UNIT- I

Lesson 1

CONTENTS

Learning Objectives

This lesson is intended to

- Explore the expectations from a computer network
- Understand the layered tasks involved in data communication
- Identify the different hardware components needed to build a network.

Learning Outcomes

At the end of studying this lesson, you should be able to:

- Explain how a computer network fulfils the requirements of different work group.
- Discuss various tasks involved in computer communication.
- Demonstrate the Evolution of different Network Devices.

Overview

1.1	Building a Network
1.1.1	Introduction to computer networks
1.1.2	Requirements
1.1.2.1	Scalability
1.1.2.2	Cost Effective Resource Sharing
1.1.2.3	Support for common services
1.1.2.4	Manageability
1.2	Network Architecture
1.2.1	OSI Model
1.2.2	Internet Architecture
1.3	Direct Link Networks
1.3.1	Hardware Building Blocks
1.3.1.1	Hosts
1.3.1.2	NICs and Repeaters
1.3.1.3	Bridges and Switches
1.3.1.4	Routers and cloud

CAD 6123 - Computer Networks

Summary

- We explored how the computer network satisfies the expectations of various workgroups like application programmer, network designer and network operator.
- We discussed the computer network architecture through OSI and TCP/IP Model.
- We learned the evolution of different network devices on the basis of the needs.

Keywords

ISO, OSI, Internet, TCP/IP, Host, Hub, Switch, Router

Self-Assessment Questions:

Further Reading

Web Pages:

- <http://www.ietf.org/rfc.html> - RFC documents related to TCP, UDP and IP
- <http://www.ietf.org/>: information about the IETF, its working groups, standards, etc.
- <http://dblp.uni-trier.de/db/index.html>: a searchable bibliography of computer science research papers

Books:

- Holzmann and Pehrson's *The Early History of Data Networks*
- *Realizing the Information Future: The Internet and Beyond*, Computer Science and Telecommunications Board of the National Research Council

CAD 6123 - Computer Networks

Lesson 2

CONTENTS

Learning Objectives

This lesson is intended to

- Introduce you about the various experiments conducted in Hawthorne Plant
- Highlight the outcomes of the experiment conducted in Hawthorne studies

Learning Outcomes

At the end of studying this lesson, you should have

- Gained the insights about the Hawthorne studies
- Learnt the limitations and outcome of the Hawthorne Studies

Overview

- 1.1 Framing
 - 1.1.1 Byte oriented protocols
 - 1.1.2 Bit Oriented protocols
 - 1.1.3 Clock Driven Protocols
- 1.2 Error Detection
 - 1.2.1 Two dimensional parity check
 - 1.2.2 Checksum
 - 1.2.3 Cyclic Redundancy Check
- 1.3 Reliable Transmission
 - 1.3.1 Stop-And-Wait
 - 1.3.2 Sliding Window

Summary

Keywords

Self-Assessment Questions

Further Reading

UNIT - II

Lesson 3

CONTENTS

Learning Objectives

This lesson is intended to:

- Introduce you the LAN Architecture
- Highlight the different LANs

Learning Outcomes

At the end of studying this lesson, you should be

- Able to understand MAC and LLC control of LAN
- Identify the different LANs and their merits and demerits

Overview

- 1.1 LAN Architecture
 - 1.1.1 MAC and LLC Control
- 1.2 LAN Technology
 - 1.2.1 Bus/Tree LANs
 - 1.2.2 Ring LANs
 - 1.2.3 Star LANs
 - 1.2.4 Wireless LANs

Summary

- We have discussed the MAC and LLC layers' functionality of LAN
- We have explored different LANs and their merits and demerits.

Keywords

LAN, MAC, LLC , Topology, wireless

Self-Assessment Questions

Further Reading

CAD 6123 - Computer Networks

Lesson 4

Learning Objectives

This lesson is intended to:

- Introduce the two popular LAN Technologies
- Highlight the various latest LAN Technologies

Learning Outcomes

At the end of studying this lesson, you should be able to

- Analyse the Ethernet and Token Rings Technologies
- Know the facilities provided by latest LAN Technologies

1.1 Ethernet

1.1.1 MAC

1.2 Token Rings

1.2.1 MAC

1.3 Latest Technologies

1.3.1 WiFi

1.3.2 Bluetooth

1.3.3 Cellular Technology

Summary

- We have discussed the mostly used LAN technologies.
- We have explored the latest LAN Technologies.

Keywords

Ethernet, IEEE, Token Ring, WiFi, Bluetooth, Cellular

Self-Assessment Questions

Further Reading

CAD 6123 - Computer Networks

UNIT - III

Lesson 5

CONTENTS

Learning Objectives

This lesson is intended to:

- Explain the functions of switches, bridges and routers
- Discuss Internet Protocol (IP) for interconnecting networks

Learning Outcomes

At the end of studying this lesson, you should be able to

- Demonstrate the switching and routing
- Discuss about the different network layer protocols

Overview

- 1.1 Switching and Bridging
 - 1.1.1 Datagrams
 - 1.1.2 Virtual circuit switching
 - 1.1.3 Source Routing
 - 1.1.4 Bridges and LAN switches
- 1.2 Basic Internetworking
 - 1.2.1 Service Model
 - 1.2.2 Global Addresses
 - 1.2.3 Subnetting
 - 1.2.4 Classless Addressing
 - 1.2.5 Address Translation
 - 1.2.6 Host configuration
 - 1.2.7 Error reporting

Summary

Keywords

Self-Assessment Questions

Further Reading

CAD 6123 - Computer Networks

Lesson 6

CONTENTS

Learning Objectives

This lesson is intended to:

- Explain the different intra domain routing protocols
- Discuss the different internet routing protocols

Learning Outcomes

At the end of studying this lesson, you should be able to

- Know the importance of routing protocols
- Demonstrate how the different routing protocols create the routing table and the merits and demerits of them.

Overview

1.1	Routing
1.1.1	Distance Vector
1.1.2	Link States
1.2	Internet Routing Protocols
1.2.1	The Global internet – Multicast
1.2.2	Multiprotocol Label switching –
1.2.3	Routing among Mobile devices

Summary

Keywords

Self-Assessment Questions

Further Reading

UNIT- IV

Lesson 7

CONTENTS

Learning Objectives

This lesson is intended to:

- Get familiarize with the connectionless and connection oriented protocols
- Know how the end to end flow control is done

Learning Outcomes

At the end of studying this lesson, you should be able to

- Discuss the simplicity of UDP and its needs
- Explain the how the TCP protocol provides a connection oriented service

Overview

1.1	UDP
1.1.1	Segment Format
1.2	TCP
1.2.1	connection establishment and termination
1.2.2	Sliding window
1.2.3	Triggering transmission

Summary

Keywords

Self-Assessment Questions

Further Reading

CAD 6123 - Computer Networks

Lesson 8

CONTENTS

Learning Objectives

This lesson is intended to:

- Explain the various congestion control and avoidance mechanisms.
- Discuss how congestion is controlled by TCP

Learning Outcomes

At the end of studying this lesson, you should be able to

- Discuss various ways of controlling and avoiding congestion
- Demonstrate the TCP congestion control mechanism.

Overview

- 1.1 TCP Congestion control
 - 1.1.1 Slow start
 - 1.1.2 Multiplicative decrease
 - 1.1.3 Additive Increase
- 1.2 Congestion Avoidance Mechanisms
 - DECbit – RED
 - Source Based congestion Avoidance

Summary

Keywords

Self-Assessment Questions

Further Reading

CAD 6123 - Computer Networks

UNIT - V

Lesson 9

CONTENTS

Learning Objectives

This lesson is intended to:

- Highlight the different compression techniques
- Explain the two types of cryptographic algorithms

Learning Outcomes

At the end of studying this lesson, you should be able to

- Discuss how different types of data are compressed.
- Explain the merits and demerits of RSA and DES algorithms

Overview

- 1.1 Presentation formatting
 - 1.1.1 Data compression- Taxonomy, Examples, Markup languages
- 1.2 Compression Techniques
 - 1.2.1 Lossless compression
 - 1.2.2 Image compression
 - 1.2.3 Video compression
 - 1.2.4 Audio compression
- 1.3 Cryptographic Algorithms
 - 1.3.1 RSA
 - 1.3.2 DES

Summary

Keywords

Self-Assessment Questions

CAD 6123 - Computer Networks

Further Reading

Lesson 10

CONTENTS

Learning Objectives

This lesson is intended to:

- To give insights about various network services
- Highlight the importance of Software Defined Networks

Learning Outcomes

At the end of studying this lesson, you should be able to

- Discuss the different services provided by network
- Explain the need of software defined networks

Overview

- 1.1 Network Services
 - 1.1.1 DNS
 - 1.1.2 Email
 - 1.1.3 HTTP
 - 1.1.4 SNMP
- 1.2 Software Defined Networking
 - 1.2.1 Introduction to Software Defined Networking(SDN)
 - 1.2.2 NFV
 - 1.2.3 SDN Fundamentals

Summary

Keywords

Self-Assessment Questions

Further Reading

CAD 6124 Data Structures and Algorithms using C/C++

UNIT - I

Lesson 1

CONTENTS

Learning Objectives

This lesson is intended to

- Learn the classification of data structure
- Understand the concepts memory allocation

Learning Outcomes

At the end of studying this lesson, you should be able to:

- Summarize different categories of data structure
- Enlist the significance of dynamic memory management

Overview

- 1.1 Introduction to Data Structures
 - 1.1.1 Classification
- 1.2 Dynamic Memory Allocation
 - 1.2.1 Accessing the address of a variable
 - 1.2.2 Declaring and initializing pointers
- 1.3 Memory allocation Functions
 - 1.3.1 malloc, calloc, free, realloc

Summary

Keywords

Self-Assessment Questions

Further Reading

CAD 6124 Data Structures and Algorithms using C/C++

Lesson 2

CONTENTS

Learning Objectives

This lesson is intended to

- Familiarize the operations of Stack and Queue
- Understand prefix, infix, and postfix expression formats.
- Learn different types of Queue

Learning Outcomes

At the end of studying this lesson, you should be able to

- Use stacks to convert expressions from infix to postfix.
- Implement stack and queue operations

Overview

- 1.1 Stack
 - 1.1.1 Operations on stack
 - 1.1.2 Infix, prefix and postfix notation
 - 1.1.3 Conversion from infix to postfix
- 1.2 Queue
 - 1.2.1 Types of Queue
 - 1.2.2 Operations on Queue

Summary

Keywords

Self-Assessment Questions

Further Reading

CAD 6124 Data Structures and Algorithms using C/C++

UNIT - II

Lesson 3

CONTENTS

Learning Objectives

This lesson is intended to:

- Learn the concepts of Linked List
- Introduce to different types of Linked List

Learning Outcomes

At the end of studying this lesson, you should be

- Able to represent and understand the pros and cons of Linked List
- Identify the appropriate Linked List to be used

Overview

- | | |
|-------|---|
| 1.1 | Components of Linked List |
| 1.1.1 | Representation of Linked List |
| 1.1.2 | Advantages and disadvantages of Linked List |
| 1.2 | Types of Linked List |
| 1.2.1 | Singly Linked List |
| 1.2.2 | Double Linked List |
| 1.2.3 | Circular Linked List |

Summary

Keywords

Self-Assessment Questions

Further Reading

CAD 6124 Data Structures and Algorithms using C/C++

Lesson 4

Learning Objectives

This lesson is intended to:

- Familiarize the operations on Singly Linked List

Learning Outcomes

At the end of studying this lesson, you should be able to

- Modify the Linked List
- Have knowledge on Data Structures basic operations like insert, delete, search, update and traversal

Overview

1.1	Operations on Singly Linked List
1.1.1	Creation
1.1.2	Insertion
1.1.3	Deletion
1.1.4	Search and Display

Summary

Keywords

Self-Assessment Questions

Further Reading

CAD 6124 Data Structures and Algorithms using C/C++

UNIT - III

Lesson 5

CONTENTS

Learning Objectives

This lesson is intended to:

- Learn the concepts of searching and sorting

Learning Outcomes

At the end of studying this lesson, you should be able to

- Summarize searching and sorting methods
- Appropriately choose the searching algorithm for an application

Overview

1.1	Searching
1.1.1	Linear Search Method
1.1.2	Binary Search Method
1.2	Sorting
1.2.1	Bubble Sort

Summary

Keywords

Self-Assessment Questions

Further Reading

CAD 6124 Data Structures and Algorithms using C/C++

Lesson 6

CONTENTS

Learning Objectives

This lesson is intended to:

- Learn about different sorting algorithms

Learning Outcomes

At the end of studying this lesson, you should be able to

- Appropriately choose the sorting algorithm for an application
- Develop ability to implement different sorting methods

Overview

1.1	Sorting
1.1.1	Insertion Sort
1.1.2	Quick Sort
1.1.3	Merge Sort

Summary

Keywords

Self-Assessment Questions

Further Reading

CAD 6124 Data Structures and Algorithms using C/C++

UNIT - IV

Lesson 7

CONTENTS

Learning Objectives

This lesson is intended to:

- Get familiarize with the concept of organization structure
- Identify the differences between organization culture and climate and its role in functioning of organization

Learning Outcomes

At the end of studying this lesson, you should be able to

- Identify the determinants of organization structure
- Demonstrate different methods for traversing trees

Overview

1.1	Tree
1.1.1	Binary Tree
1.1.2	Complete Binary Tree
1.1.3	Heap Tree Terminology
1.1.4	Array representation of tree
1.1.5	Creation of binary tree
1.1.6	Traversal of Binary Tree

Summary

Keywords

Self-Assessment Questions

Further Reading

CAD 6124 Data Structures and Algorithms using C/C++

Lesson 8

CONTENTS

Learning Objectives

This lesson is intended to:

- Represent data using graph data structure
- Learn graph traversals

Learning Outcomes

At the end of studying this lesson, you should be able to

- Able to define the basic concepts of graphs, directed graphs, and weighted graphs.
- Implement the algorithms to construct breadth first search and depth first search spanning trees of a connected graph.
- Appropriately choose the algorithm to find the minimum weight spanning tree

Overview

1.1	Graphs
1.1.1	Terminologies
1.1.2	Breadth first traversal
1.1.3	Depth first search
1.1.4	Shortest path algorithms
1.2	Minimum Spanning Tree
1.2.1	Prim's Algorithm
1.2.2	Kruskal's Algorithm

Summary

Keywords

Self-Assessment Questions

Further Reading

CAD 6124 Data Structures and Algorithms using C/C++

UNIT - V

Lesson 9

CONTENTS

Learning Objectives

This lesson is intended to:

- Demonstrate familiarity with major algorithms and data structure

Learning Outcomes

At the end of studying this lesson, you should be able to

- Synthesize divide and conquer algorithm and analyse it
- know a variety of dynamic-programming algorithms, how to apply them via both memorization and tables, and recognize when a dynamic-programming approach might yield a good solution to a problem

Overview

1.1	Algorithm Design Technique
1.1.1	Greedy Algorithm
1.1.2	Divide and Conquer
1.2	Dynamic Programming
1.2.1	Backtracking
1.2.2	Branch and Bound

Summary

Keywords

Self-Assessment Questions

Further Reading

CAD 6124 Data Structures and Algorithms using C/C++

Lesson 10

CONTENTS

Learning Objectives

This lesson is intended to:

- Provide solid foundations to deal with variety of computational problems
- Why analysing a problem and its complexity is important
- Understanding the concepts of time and space complexity, worst case, averagecase and best case complexities and the big-O notation

Learning Outcomes

At the end of studying this lesson, you should be able to

- Apply knowledge of computing and mathematics to algorithm design
- Analyze the asymptotic performance of algorithms.
- Analyze worst-case running times of algorithms using asymptotic analysis.

Overview

1.1	Introduction to algorithm analysis
1.1.1	Asymptotic Notations
1.1.2	Properties of asymptotic notations
1.2	Mathematical analysis
1.2.1	Recursive algorithm
1.2.2	Non-recursive algorithm
1.3	Time and Space complexity

Summary

Keywords

Self-Assessment Questions

Further Reading

CAD 6125 Object Oriented Software Engineering

UNIT - I

Lesson 1

CONTENTS

Learning Objectives

This lesson is intended to

- Provide basic concepts of software engineering and software life cycle
- Give an insight into the concepts of modeling and notations of the different UML diagrams

Learning Outcomes

At the end of studying this lesson, you should be able to:

- Know the importance & implications of organizational behaviour
- Explain the role of Scientific Management in organizational behaviour

Overview

- 1.1 Software engineering concepts
 - 1.1.1 Function and Requirements
 - 1.1.2 Non-functional Requirements
 - 1.1.3 Completeness, Consistency, Clarity and Correctness
 - 1.1.4 Realism, Verifiability and Traceability
 - 1.1.5 Greenfield Engineering, Reengineering
 - 1.1.6 Greenfield Engineering, Reengineering, and Interface Engineering
- 1.2 Software Engineering development activities
- 1.3 Software life cycle models
 - 1.3.1 Waterfall model
 - 1.3.2 RAD Model
 - 1.3.3 Spiral Model
 - 1.3.4 V-Model
 - 1.3.5 Agile Model

Summary

Keywords

Self-Assessment Questions

Further Reading

CAD 6125 Object Oriented Software Engineering

Lesson 2

CONTENTS

Learning Objectives

This lesson is intended to

- Provide basic concepts of software engineering and software life cycle
- Give an insight into the concepts of modeling and notations of the different UML diagrams

At the end of studying this lesson, you should have

- Compare the different software life cycle models and select the appropriate model for a real time project
- Analyze different UML concepts and illustrate the UML design for real-time Project

Overview

- 1.1 Standards for developing life cycle models
 - 1.1.1 IEEE 1074: Standard For Developing Life Cycle Process
 - 1.1.2 Process and activities
 - 1.1.3 Life Cycle modelling
 - 1.1.4 Project Management
- 1.2 Modelling with UML.
 - 1.2.1 Introduction
 - 1.2.2 An Overview of UML
 - 1.2.3 Modelling Concepts
 - 1.2.4 A Deeper View into UML

Summary

Keywords

Self-Assessment Questions

Further Reading

CAD 6125 Object Oriented Software Engineering

UNIT - II

Lesson 3

CONTENTS

Learning Objectives

This lesson is intended to:

Explore the techniques for requirement gathering design and specification

Learning Outcomes

At the end of studying this lesson, you should be

- Identify the software requirement specification and formulate project planning in real time scenario.

Overview

- 1.1 Introduction
 - 1.1.1 Overview of requirements elicitation
- 1.2 Requirement elicitation concepts
 - 1.2.1 Functional Requirements
 - 1.2.2 Non Functional Requirements
 - 1.2.3 Completeness, Consistency, Clarity, and Correctness
 - 1.2.4 Realism, Verifiability, and Traceability
 - 1.2.5 Greenfield Engineering, Reengineering, and Interface Engineering
- 1.3 Requirement elicitation activities
 - 1.3.1 Identifying Actors
 - 1.3.2 Identifying Scenarios
 - 1.3.3 Identifying Use Cases
 - 1.3.4 Refining Use Cases
 - 1.3.5 Identifying Relationships among Actors and Use Cases
- 1.4 Managing requirement elicitation
 - 1.4.1 Negotiating Specifications with Clients: Joint Application Design
 - 1.4.2 Maintaining Traceability
 - 1.4.3 Documenting Requirements Elicitation

Summary

Keywords

Self-Assessment Questions

Further Reading

CAD 6125 Object Oriented Software Engineering

Lesson 4

Learning Objectives

This lesson is intended to:

Explore the techniques for requirement gathering design and specification

Learning Outcomes

At the end of studying this lesson, you should be able to

- Identify the software requirement specification and formulate project planning in real time scenario.

Overview

- 1.1 Managing requirement elicitation
 - 1.1.1 Negotiating Specifications with Clients: Joint Application Design
 - 1.1.2 Maintaining Traceability
 - 1.1.3 Documenting Requirements Elicitation
- 1.2 Software Requirements Specification
- 1.3 Software project planning
 - 1.3.1 Scope
 - 1.3.2 Resources
- 1.4 Software Estimation
 - 1.4.1 Empirical Estimation Models

Summary

Keywords

Self-Assessment Questions

Further Reading

CAD 6125 Object Oriented Software Engineering

UNIT - III

Lesson 5

CONTENTS

Learning Objectives

This lesson is intended to:

- Give an insight into the concepts of modeling and notations of the different UML diagrams.

Learning Outcomes

At the end of studying this lesson, you should be able to

- Analyze different UML concepts and illustrate the UML design for real-time project.

Overview

- 1.1 UML Modelling
 - 1.1.1 Analysis Modelling
 - 1.1.2 Data Modelling
 - 1.1.3 Functional Modelling & Information Flow
 - 1.1.4 Behavioural Modelling
- 1.2 Analysis
 - 1.2.1 Structured Analysis
 - 1.2.2 Object Oriented Analysis
 - 1.2.3 Domain Analysis

Summary

Keywords

Self-Assessment Questions

Further Reading

CAD 6125 Object Oriented Software Engineering

Lesson 6

CONTENTS

Learning Objectives

This lesson is intended to:

- Give an insight into the concepts of modeling and notations of the different UML diagrams.

Learning Outcomes

At the end of studying this lesson, you should be able to

- Analyze different UML concepts and illustrate the UML design for real-time project.

Overview

- 1.1 Object oriented Analysis process
 - 1.1.1 Analysis Object Models and Dynamic Models
 - 1.1.2 Entity, Boundary, and Control Objects
 - 1.1.3 Generalization and Specialization
- 1.2 Activities
 - 1.2.1 Identifying Entity Objects
 - 1.2.2 Identifying Boundary Objects
 - 1.2.3 Identifying Control Objects
 - 1.2.4 Mapping Use Cases to Objects with Sequence Diagrams
 - 1.2.5 Identifying associations and aggregations
- 1.3 Object Relationship Model
- 1.4 Object Behaviour Model
- 1.5 Design modelling with UML

Summary

Keywords

Self-Assessment Questions

Further Reading

CAD 6125 Object Oriented Software Engineering

UNIT - IV

Lesson 7

CONTENTS

Learning Objectives

This lesson is intended to:

Explain the strategies behind designing a project and track progress.

Learning Outcomes

At the end of studying this lesson, you should be able to

Execute the object-oriented and software reusability concepts.

Overview

- 1.1 Overview of object oriented design
 - 1.1.1 Design Concepts & Principles
 - 1.1.2 Subsystems and Classes
 - 1.1.3 Services and Subsystem Interface
 - 1.1.4 Coupling and Cohesion
 - 1.1.5 Layers and Partitions
 - 1.1.6 Architectural Styles
- 1.2 Design Process
- 1.3 Modular Design
- 1.4 Design Effective Modularity

Summary

Keywords

Self-Assessment Questions

Further Reading

CAD 6125 Object Oriented Software Engineering

Lesson 8

CONTENTS

Learning Objectives

This lesson is intended to:

Explain the strategies behind designing a project and track progress.

Learning Outcomes

At the end of studying this lesson, you should be able to

Execute the object-oriented and software reusability concepts.

Overview

- 1.1 Reuse concepts
 - 1.1.1 Application Objects and Solution Objects
 - 1.1.2 Specification Inheritance and Implementation Inheritance
Delegation
 - 1.1.3 The Liskov Substitution Principle
 - 1.1.4 Delegation and inheritance in Design Patterns
- 1.2 Reuse Activities
 - 1.2.1 Selecting Design Patterns and Components
 - 1.2.2 Encapsulating Data Stores with the Bridge Pattern
 - 1.2.3 Encapsulating Legacy Components with the Adapter Pattern
 - 1.2.4 Encapsulating Context with the Strategy Pattern
 - 1.2.5 Heuristics for Selecting Design Patterns
- 1.3 Managing reuse
- 1.4 Overview of interface specification
- 1.5 Interface specification concepts
 - Class Implementor, Class Extender, and Class User
 - Types, Signatures, and Visibility
 - Contracts: Invariants, Preconditions, and Post conditions
 - Object Constraint Language
 - OCL Collections: Sets, Bags, and Sequences
 - OCL Quantifiers: for All and exists
- 1.6 Interface specification activities
 - 1.6.1 Identifying Missing Attributes and Operations
 - 1.6.2 Specifying Types, Signatures, and Visibility
 - 1.6.3 Specifying Pre- and Post conditions

Summary

Keywords

Self-Assessment Questions

Further Reading

CAD 6125 Object Oriented Software Engineering

UNIT - V

Lesson 9

CONTENTS

Learning Objectives

This lesson is intended to:

Provide knowledge on software configuration management.

Learning Outcomes

At the end of studying this lesson, you should be able to

- Implement and test software configuration management techniques in Software engineering environment.

Overview

- 1.1 Overview of mapping
- 1.2 Mapping models to Code
- 1.3 Mapping Object Model to Database Schema
- 1.4 Overview of testing
- 1.5 Testing concepts
 - 1.5.1 Faults, Erroneous States, and Failures
 - 1.5.2 Test Cases
 - 1.5.3 Test Stubs and Drivers
 - 1.5.4 Corrections

Summary

Keywords

Self-Assessment Questions

Further Reading

CAD 6125 Object Oriented Software Engineering

Lesson 10

CONTENTS

Learning Objectives

This lesson is intended to:

- Provide knowledge on software configuration management.

Learning Outcomes

At the end of studying this lesson, you should be able to

- Implement and test software configuration management techniques in software engineering environment.

Overview

- 1.1 Testing activities
 - 1.1.1 Component Inspection
 - 1.1.2 Usability Testing
 - 1.1.2 Unit Testing
 - 1.1.4 Integration Testing
 - 1.1.5 System Testing
- 1.2 Managing testing
- 1.3 Managing and controlling Changes
- 1.4 Managing and controlling versions
 - Types of maintenance
 - Maintenance log and defect reports
 - Reverse and re-engineering

Summary

Keywords

Self-Assessment Questions

Further Reading

CAD 6126 Data Structures and Algorithms using C/C++ Laboratory

CAD 6126 - DATA STRUCTURES AND ALGORITHMS USING C/C++ LABORATORY

OBJECTIVES:

The objective of this course is to

- Explain various sorting and searching algorithms.
- Explore linear and non-linear data structures
- Design and implement algorithms for searching and sorting
- Design and implement operations on stacks, queues, and linked lists
- Introduce the Binary Search Tree implementation.

CAD 6126 Data Structures and Algorithms using C/C++ Laboratory

LIST OF PROGRAMS

1. Write a C program to create a Stack and do the following operations using arrays and linked lists (i) Push (ii)Pop
2. Create a Queue and do the following operations using arrays and linked lists
i) Add (ii) Remove
3. Write a C program to implement doubly linked list
4. Write a C program to sort a list of N elements of integer type using quick sort Algorithm
5. Write a C program to sort a list of N elements using Bubble sort Technique
6. Write a C program to search for an element in an array using Binary search
7. Write a C++ program to implement insertion sort method to sort a given list of integers in descending order.
8. Write a C++ program to implement selection sort method to sort a given list of integers in descending order.
9. Write a C++ program to Create a binary search tree and do the following traversals
i) In-order (ii) Pre order (iii) Post order .
10. Perform the following operations in a given graph (i)Depth first search (ii)Breadth first search
11. Find the shortest path in a given graph using Dijkstra algorithm.
12. Apply the divide and Conquer technique to arrange a set of numbers
13. Construct optimal binary search trees using dynamic programming method of problem solving.
14. Implement knapsack problem using backtracking
15. Find the solution of traveling salesperson problem using branch and bound Technique.

CAD 6126 Data Structures and Algorithms using C/C++ Laboratory

OUTCOMES:

On completion of this course, students will be able to

- Apply various data structure such as stacks, queues, trees , linked list and graphs to solve various computing problems .
- Choose and implement efficient data structures and apply them to solve problems.
- Implement and analyze various searching techniques and sorting techniques
- Write programs that use arrays, records, linked structures, stacks, queues, trees, and graphs
- Develop program that implements kruskal's algorithm, prims, binary search, all types of sorting, greedy algorithm and backtracking technique.

CAD 6127 Programming in C And C++ Laboratory

Course Title	:	PROGRAMMING IN C and C++ LABORATORY
Course Code	:	CAD 6127
Course Faculty	:	Dr. P. Amudhavalli
Theory / Practical	:	Practical
Semester	:	I
Academic Year	:	2021-2022
Department	:	Computer Applications
No. of Credits	:	1
Course Learning Objectives	:	<ul style="list-style-type: none">• Describe the basic concepts of C constructs.• Provide knowledge on strings, pointers, functions, structures.• Explain the necessity of Object-Oriented Programming over Traditional programming.• Illustrate concepts of Object-Oriented programming language.• Demonstrate the use of file programming.
Course Pre-Requisites	:	Basic Knowledge of Programming in OOP.

CAD 6127 Programming in C And C++ Laboratory

S. No	Topic	Reference/ Source
1.	Programs using I/O statements and expressions.	T1 & T2
2.	Programs using decision-making constructs.	T1 & T2
3.	Programs using looping statements (also demonstrate the use of break and continue statements).	T1 & T2
4.	Programs using single dimensional and multi-dimensional arrays.	T1 & T2
5.	Programs using string handling functions.	T1 & T2
6.	Programs using functions and recursive functions.	T1 & T3
7.	Demonstrate the use of structure and Union	T1 & T3
8.	Demonstrate the use of Pointers.	T1 & T3
9.	Demonstrate the use of file handling.	T1 & T3
10.	Simple Programs using Data Types, Input/output statements and Arithmetic Operators, Conditional statements and different loops	T4 & T5
11.	Programs using structures and functions	T4 & T5
12.	Programs using classes, objects and scope resolution operator	T4 & T5
13.	Programs using Constructors and destructors.	T4 & T5
14.	Demonstration of array of object.	T4 & T5
15.	Demonstration using this->pointer.	T4 & T5
16.	Application Programs using Simple, Multiple, Multilevel, Hierarchical and Hybrid Inheritance.	T4 & T5
17.	Demonstration of Virtual function, Friend function and Static function.	T4 & T5
18.	Programs to implement function overloading.	T4 & T5
19.	Programs using operator overloading for Binary, Unary and relational operators.	T4 & T5
20.	Demonstration of pointers to base class and derived class member functions.	T4 & T5
21.	Programs using Function and Class template	T4 & T5
22.	Program to access a record using file handling.	T4 & T5

Course material and References

- T1. Reema Thareja, Computer Fundamentals and Programming in C, Oxford Press,2012.
- T2. Programming in C , Pradip Dey, Manas Ghosh, 2nd edition Oxford UniversityPress,2013.
- T3. Programming in ANSI C, E. Balaguruswamy, 5th Edition, McGrawHill, 2010.T4. B. Trivedi, "Programming with ANSI C++", Oxford University Press, 2007.
- T5. Bjanne Stroustrup, The C++ Programming Language, 4th Edition, Addison Wesley,2013.

Expected outcome of the course:

- Develop C programs for simple applications making use of basic constructs, arrays and strings.
- Develop C programs involving functions, recursion, pointers, and structures.
- Develop C++ programs using Class, Objects, array of object, function overloading, operator overloading.
- Develop C++ programs using the concepts of Object-Oriented Programming features.
- Design applications using sequential and random-access file processing.

UNIT - I

Lesson 1

CONTENTS

Learning Objectives

This topic is intended to

- Learn how to create tables which are fundamental storage blocks of data.
- Learn how to place constraints on data that is entered on tables to ensure data integrity.

Learning Outcomes

At the end of studying this lab, you should be able to:

- Apply iterative programming at database level.
- Write programming blocks with conditional structure, assignment structure, loop structure, etc.

Overview

- 1.1 Execute a single line and group functions for a table.

Summary

Keywords

Self-Assessment Questions

Further Reading

CAD 6128 DBMS Laboratory

Lesson 2

CONTENTS

Learning Objectives

This topic is intended to

- Learn how to add, change and remove data from tables.
- Learn how to select a subset of the data you want to see from the collection of tables and data.

Learning Outcomes

At the end of studying this lesson, you should have

- Apply iterative programming at database level.
- Write programming blocks with conditional structure, assignment structure, loop structure, etc.

Overview

- 1.1 Execute DCL and TCL Commands.

Summary

Further Reading

Keywords

Self-Assessment Questions

UNIT - II

Lesson 3

CONTENTS

Learning Objectives

This Topic is intended to:

- Learn how to add, change and remove data from tables.
- Learn how to select a subset of the data you want to see from the collection of tables and data.

Learning Outcomes

At the end of studying this lesson, you should be

- Use exception Handling, Transaction oriented programs, Stored procedures, functions, packages, etc.
- Implement cursors which would allow row wise access of data.

Overview

Create and manipulate various DB objects for a table.

Summary

Keywords

Self-Assessment Questions

Further Reading

Lesson 4

Learning Objectives

This Topic is intended to:

- Learn how to add, change and remove data from tables.
- Learn how to select a subset of the data you want to see from the collection of tables and data.

Learning Outcomes

At the end of studying this lesson, you should be able to

- Use exception Handling, Transaction oriented programs, Stored procedures, functions, packages, etc.
- Implement cursors which would allow row wise access of data.

Overview

1.1 Create views, partitions and locks for a particular DB.

Summary

Keywords

Self-Assessment Questions

Further Reading

UNIT - III

Lesson 5

CONTENTS

Learning Objectives

This lesson is intended to:

- Learn how to PL/SQL supports programmers to catch such conditions using EXCEPTION block.

Learning Outcomes

At the end of studying this lesson, you should be able to

- Use exception Handling, Transaction oriented programs, Stored procedures, functions, packages, etc.

Overview

Write PL/SQL procedure for an application using exception handling.

Summary

Keywords

Self-Assessment Questions

Further Reading

CAD 6128 DBMS Laboratory

Lesson 6

CONTENTS

Learning Objectives

This Topic is intended to:

- Learn how to PL/SQL Procedure for an application using cursors.

Learning Outcomes

At the end of studying this lesson, you should be able to

- Implement cursors which would allow row wise access of data.

Overview

1.1 Write PL/SQL procedure for an application using cursors.

Summary

Keywords

Self-Assessment Questions

Further Reading

UNIT - IV

Lesson 7

CONTENTS

Learning Objectives

This Topic is intended to:

- Learn how to use the functions to prepare the reports.

Learning Outcomes

At the end of studying this lesson, you should be able to

- Use the functions for report generation for applications.

Overview

Write a DBMS program to prepare reports for an application using functions.

Summary

Keywords

Self-Assessment Questions

Further Reading

Lesson 8

CONTENTS

Learning Objectives

This Topic is intended to:

- Learn how to combine table and use functions, triggers, views and partitions.

Learning Outcomes

At the end of studying this lesson, you should be able to

- Use triggers which would allow you define pre and post actions when something change in the database tables

Overview

- 1.1 Write a PL/SQL block for transaction operations of a typical application using triggers.

Summary

Keywords

Self-Assessment Questions

Further Reading

UNIT - V

Lesson 9

CONTENTS

Learning Objectives

This lesson is intended to:

- Learn how to do PL/SQL block for transaction operations of a typical application using package.

Learning Outcomes

At the end of studying this lesson, you should be able to

- Use PL/SQL block for transaction operations of a typical application using package Overview

Write a PL/SQL block for transaction operations of a typical application using package.

Summary

Keywords

Self-Assessment Questions

Further Reading

Lesson 10

CONTENTS

Learning Objectives

This lesson is intended to:

- Learn to develop an application using any front end and back end tool
(make use of ER diagram and DFD).

Learning Outcomes

At the end of studying this lesson, you should be able to

- Use ER diagram and DFD to developing the front end and Back end tool.

Overview

- 1.1 Design and develop an application using any front end and back end tool(make use of ER diagram and DFD).

Summary

Keywords

Self-Assessment Questions

Further Reading