SARDAR PATEL UNIVERSITY, BALAGHAT

School of Engineering and Technology

Syllabus

Course: Diploma **Semester: III**

Branch: Computer Science and Engineering **w.e.f. Academic Session: 2024-25**

DCSE301 Computer Architecture

Course Objectives:

1. To introduce the fundamental principles of computer architecture, including the functional components of computers and their interactions.
2. To introduce Pipelining Concepts and Parallel Processing techniques for improving the performance of a Processor.
3. To familiarize students with I/O devices, storage systems, and techniques to optimize data transfer between peripherals and memory.

Unit I: Introduction:

Digital Computers: Introduction, Block diagram of Digital Computer, Definition of Computer Organization, Computer Design and Computer Architecture. Register Transfer Language and Micro operations: Register Transfer language, Register Transfer, Bus and memory transfers, Arithmetic Micro operations, logic micro operations, shift micro operations, Arithmetic logic shift unit. Basic Computer Organization and Design: Instruction codes, Computer Registers Computer instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input – Output and Interrupt

Unit II: Micro-Programmed Control:

Control memory, Address sequencing, micro program example, design of control unit. Central Processing Unit: General Register Organization, Instruction Formats, Addressing modes, Data Transfer and Manipulation, Program Control.

Unit III: Data Representation:

Data types, Complements, Fixed Point Representation, Floating Point Representation. Computer Arithmetic: Addition and subtraction, multiplication Algorithms, Division Algorithms, Floating – point Arithmetic operations. Decimal Arithmetic Unit, Decimal Arithmetic operations.

Unit IV: Input-Output Organization:

Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt Direct memory Access. Memory Organization: Memory Hierarchy, Main Memory, Auxiliary memory, Associate Memory, Cache Memory.

Unit V: Reduced Instruction Set Computer:

CISC Characteristics, RISC Characteristics. Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Vector Processing, Array Processor. Multi Processors: Characteristics of Multiprocessors, Interconnection Structures, Interprocessor Arbitration, Interprocessor Communication and Synchronization, Cache Coherence.

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Text Books:

1. Computer System Architecture – M. Moris Mano, Third Edition, Pearson/PHI.

Reference Books:

1. Computer Organization – Car Hamacher, ZvonksVranesic, SafeaZaky, V Edition, McGraw Hill.
2. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson/PHI.

Course Outcome:

At the end of the course, students should be able to:

1. Demonstrate knowledge of basic components of computer systems such as CPU, memory, and I/O devices, and their functionalities.
2. Identify and explain the various instruction types, addressing modes, and formats used in the design of a computer's instruction set architecture (ISA).
3. Explain the principles and advantages of pipelining, parallelism, and other techniques used to enhance processor speed and performance.

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DCSE302 Operating System

Course Objectives:

1. To provide a comprehensive understanding of the fundamental concepts and principles of operating systems including their structure and functionalities.
2. To explain the principles of process management, including process scheduling, synchronization, and inter-process communication.
3. To study file system organization, management and access methods along with data storage Principles.
4. To discuss Operating System security concepts and protection mechanisms to ensure system integrity and user Data Security.

Unit I: Introduction to Operating System:

Basics of Operating System, its functions, Objectives and Types of Operating Systems, Introduction of Time Sharing, Real Time, Parallel and Distributed Multiprocessor embedded Operating System. Structure of Operating System: System components, Operating System services, System calls and Programs, System Structure.

Unit II: Process Management:

Concepts of Processes: Process state (state diagram), Process Scheduling & Process control block (PCB), Operation on Processes, Threads multiprocessor scheduler. Process Scheduling & Algorithms- Basic Concepts, Scheduling criteria, Scheduling Algorithms- FCFS, SJF, Priority, RR, Multiple queues, Multiple processor Scheduling, Real time Scheduling. Deadlocks: Basic Concept of deadlock, deadlock detection, deadlock prevention, deadlock avoidance, recovery from deadlock & Banker's algorithm.

Unit III: Memory Management:

Concept of Memory Management - Logical vs Physical address, Cache Memory, Swapping, Allocation Techniques (Contiguous and Non-contiguous), Fragmentation & Compaction. Concepts of Paging and Segmentation: Paged Segmentation & Segmented Paging. Concepts of Virtual Memory: Demand Paging, Page Fault, Page replacement and its Algorithms, Allocation of frames, Thrashing.

Unit IV: File Management:

File System interface: File Concepts, Types of Files, Access Methods, Directory Structure, File System Mounting, Protection. File System Implementation: File System Structure, Allocation Methods (Contiguous, Non Contiguous, Index Allocations).

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Unit V: Device Management:

Free space Management (Fragmentation & Compaction), Directory implementation, File-sharing, recovery, Network File System (NFS). Input Output System: I/O Hardware & Interface, Kernel I/O Sub System, I/O request streams. Disk Management: Disk Structure, Disk Scheduling and its algorithms, RAID Technology.

Reference Books:

1. Bach M.J., Design of the UNIX Operating System, PHI
2. Milankovic, Operating Systems, TMH.
3. Ray Dunkan Advance Dos Programming, BPB.
4. Donovons & Mendric, Operating Systems, TMH.
5. William stalling Operating System, Pearson edu.

Course Outcome:

At the end of the course, students should be able to:

1. Explain key operating system concepts, including process, thread, and memory management.
2. Demonstrate the ability to create and manage processes, including scheduling and synchronization in a multi-tasking environment.
3. Design and implement basic file systems, demonstrating knowledge of file storage, retrieval, and organization.
4. Analyze and implement security measures and protection mechanisms within an operating system.

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DCSE303 Data Structures using 'C'

Course Objectives:

1. To introduce the basic concepts of data structures and algorithms, emphasizing their importance in computer science and software development.
2. To develop practical skills in implementing various data structures (e.g., arrays, linked lists, stacks, queues, trees, graphs) using C.
3. To enhance problem-solving skills through algorithm design and analysis, including searching, sorting, and optimization techniques

Unit I: Introduction to Data Structures:

Concept and need of Data Structures, Abstract Data Type, Types of Data Structures: Linear DS, Non-Linear Data Structure. Algorithm Complexity: Time, Space. Operations on Data structures: Traversing, Searching, Insertion, Deletion, Sorting etc.

Unit II: Searching and Sorting:

Searching Algorithms: Sequential Search, Binary Search, Indexed Search, Sorting Algorithms: Insertion Sort, Selection Sort, Bubble Sort, Quick Sort, Merge Sort, Heap Sort, Radix Sort.

Unit III: Stacks and Queues:

Stack representation in memory using array, Stack Operations: PUSH, .POP. Stack Operations Conditions: Stack Full / Stack Overflow, Stack Empty / Stack Underflow. Conversion of Infix to Postfix Expression, Evaluation of Postfix Expression, Conversion of Infix to Prefix Expression, Evaluation of Prefix Expression, Recursion, Tower of Hanoi. Queue representation in memory using array, Types of Queues: Linear Queue, Circular Queue, Priority Queue. Queue Operations: INSERT, DELETE. Queue Operations Conditions: Queue Full, Queue Empty.

Unit IV: Linked List:

Introduction to Linked List Terminologies: Node, Address, Pointer, Information Field/ Data Field, Next Pointer, Null Pointer, Empty List. Types of Lists: Linear list, Circular list. Operations on a Singly Linked List: Traversing a Singly Linked List, Searching a key in Linked List, Inserting a new node in a Linked List, Deleting a node from a Linked List.

Unit V: Trees and Graphs:

Basics of Trees: Binary tree traversal methods, Preorder traversal, In-order traversal, Post-order traversal. Representation of trees and its applications: Binary tree. Threaded Binary Trees. Binary Search Tree, Heap Tree. Height Balanced (AVL) Tree, B-Trees. Basics of Graphs: Graph Representation: Adjacency matrix, Adjacency lists. Minimum Spanning Trees, Prim's Algorithm and Kruskal's Algorithm. Traversal Schemes: Depth First search, Breadth First Search. Shortest

Path Algorithm: Single Source Shortest Path.

Reference Books:

1. Sahani, Data structure & Algorithms, TMH.
2. Drozdek Adams, Data Structures and Algorithms in C++, Vikas Publishing House Pvt. Ltd.
3. Kunth D. E., Art of Computer Programming and Fundamentals of Algorithms, Vol.-I, Narosa.
4. Kunth, Art of computer programming, Vol.-III, Sorting searching.
5. Wirth Niklaus, Algorithm + Data = Program, PHI Learning
6. Drozdek Adams, Data structures & Algorithms in Java, Vikas.
7. Lipschutz, Data structure, Schaum out line series, TMH.
8. Kruse, Leung & Tondo, Data structure & Program design in C, PHI Learning
9. Kutti & Pandye, Data Structures in C++, PHI Learning
10. Thomas A Staudish, Data Structure Techniques.

Course Outcome:

At the end of the course, students should be able to:

1. Recognize and describe various data structures, their properties, and their applications.
2. Write efficient code to implement and manipulate basic data structures, ensuring data integrity and optimal performance.
3. Conduct complexity analysis to evaluate algorithm efficiency, applying Big O notation effectively.

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DCSE304 Object Oriented Programming using 'C++'

Course Objectives:

1. To introduce the core concepts of object-oriented programming (OOP), including classes, objects, inheritance, polymorphism, encapsulation, and abstraction.
2. To develop proficiency in a major OOP language (e.g., Java, Python, C++) through practical coding exercises and projects.
3. To enhance problem-solving abilities by applying OOP concepts to develop solutions for real-world problems.

Unit I: Principles of Object Oriented Programming:

POP versus OOP, Basic concepts of OOP, Object Oriented Languages, Applications of OOP, Tokens, Keywords, Variables, Constants, Basic Data Types, User Defined Data Types, Type Casting, Operators, Expressions. Control Structures: Decision Making Statements and Loops. Scope Resolution Operator, Memory Management Operators, Array, Strings and Structures in C++

Unit II: Classes and Objects:

Introduction, Specifying a Class, Access Specifiers, Defining Member Functions, Creating Objects, Memory Allocations for Objects. Static Data Members, Static Member Function, Friend Function. Array of Objects, Objects as Function Arguments. Concept of Constructors, Types of Constructors. Destructors.

Unit III: Extending Classes using Inheritance:

Introduction to Inheritance, Defining a Derived Class, Visibility Modes and Effects. Types of Inheritance, Virtual Base Class, Abstract Class, Constructors in Derived Class.

Unit IV: Pointers and Polymorphism in C++:

Concepts of Pointers: Pointer Declaration, Pointer Operator, Address Operator, Pointer Arithmetic. Method Overriding and Overloading, Static and Run Time Polymorphism.

Unit V: File Operations:

C++ Stream Classes, Classes for File Stream Operations. Opening Files, Closing Files, Reading from and Writing to Files. Detection of End of File, File Modes.

Reference Books:

1. Balgusamy,E. "Object Oriented Programming in C++", McGraw Hill Education.
2. James Martin, "Principles of Object Oriented Analysis and Design", Prentice Hall/PTR.
3. Peter Coad and Edward Yourdon, "Object Oriented Design", Prentice Hall/PTR.
4. Subburaj, R. "Object Oriented Programming in C++", Vikas Publication.

5. Schildt, H. "C++ The Complete Reference", McGraw Hill Professional.

Course Outcome:

At the end of the course, students should be able to:

1. Demonstrate a solid understanding of and ability to implement the fundamental concepts of object- oriented programming in code.
2. Design and develop functional software applications using an object-oriented programming language.
3. Identify and apply common design patterns to solve programming challenges and improve software architecture.

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DCSE305P Visual Basic Programming

Course Objectives:

1. To provide practical experience in developing Visual Basic (VB) applications
2. To build proficiency in using controls, forms, and event- driven programming
3. To enhance understanding of programming concepts like functions, error handling, arrays, collections, and file handling.
4. To develop problem-solving skills through exercises and mini-projects, including database interaction using ADO.NET
5. To familiarize students with Object-Oriented Programming (OOP) concepts such as classes, objects, and inheritance in VB.

Unit I: Introduction to Visual Basic Programming:

Writing and running a simple "Hello World!" program, Basic syntax, variables, and data types in VB, Implementing control flow statements: If...Then...Else, Select Case, For, While, Basic form design using controls like Label, TextBox, and Button.

Unit II: Working with Controls, Forms, and Events:

Designing forms with multiple controls (Label, Button, TextBox, ComboBox, ListBox), Handling control events like Click, Change, TextChanged, Working with RadioButton, CheckBox, and ComboBox for interactive input.

Unit III: Functions, Procedures, and Error Handling:

Writing functions and subroutines for modular programming, Passing parameters to functions (ByVal, ByRef), Error handling using Try...Catch...Finally for exception management.

Unit IV: Arrays, Collections, and File Handling:

Working with arrays: one-dimensional and two-dimensional arrays, Using collections (ArrayList, Dictionary) for dynamic data storage, Reading from and writing to files using StreamReader and StreamWriter.

Unit V: Object-Oriented Programming (OOP) and Database Connectivity:

Implementing classes and objects in Visual Basic, Understanding inheritance and polymorphism, Database connectivity using ADO.NET for CRUD operations.

Reference Books:

1. "Programming in Visual Basic .NET" by Julia Case Bradley and Anita C. Millspaugh
2. "Beginning Visual Basic" by Peter Wright
3. "Microsoft Visual Basic .NET Step by Step" by Michael Halvorson

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List of Experiments:

1. Create a program that takes user input and performs basic arithmetic operations.
2. Design a simple form to display user input in a message box.
3. Create a login form with TextBoxes for username and password.
4. Implement a simple calculator using Button controls for digit and operation input.
5. Design a form that updates a label based on user selection from RadioButtons or CheckBoxes.
6. Write functions to calculate the area of geometric shapes (circle, rectangle).
7. Create a program that handles division by zero using error handling.
8. Design a simple application with user input validation.
9. Implement a program that stores and sorts a list of numbers in an array.
10. Create a program that reads data from a text file and displays it in a ListBox.
11. Write a program to save user data to a file.
12. Create a class to represent a student with properties like name and age, and methods to get/set these values.
13. Implement a database connection to retrieve and display records in a DataGridView control.
14. Perform CRUD operations (Add, Edit, Delete) on a database record (e.g., student details).

Course Outcome:

At the end of the course, students should be able to:

1. Write and execute simple VB programs using appropriate syntax and data types.
2. Design and implement user interfaces with VB controls.
3. Create reusable functions and subroutines for modular programming.
4. Apply error handling techniques to manage runtime exceptions.
5. Work with arrays, collections, and files for data manipulation.
6. Implement object-oriented concepts like classes, objects, and inheritance in VB.

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DCSE306P Programming in 'C++'

Course Objectives:

1. To provide students with a strong foundation in programming concepts using C++
2. To develop problem-solving skills and logical thinking through hands-on programming practices
3. To familiarize students with essential data structures and algorithms and their implementation in C++
4. To enable students to design and implement software applications using C++

Unit I: Introduction to C++:

Basics of C++, OOP, Class, Object, Data Types, Structure, Static Members, Public/Global member,

C++ Function and Overloading: Creating functions with the same name but different parameters.

Unit II: Classes & Objects:

Specifying a Class, Creating Objects, Accessing Class members, Defining member function, Outside Member Functions as inline, Accessing Member Functions within the class, Static data member, Access Specifiers: Private, Protected and Public Members.

Unit III: Constructors & Destructors:

Introduction, Parameterized Constructors, Constructor Overloading, Constructors with Default Arguments, Copy Constructor ,Destructor, Order of Construction and Destruction, Static data members with Constructor and Destructors.

Unit IV: Polymorphism and Inheritance:

Definition, Over-loadable Operators, Unary Operator Overloading, Unary & Binary overloading, Rules for Operators Overloading.

Inheritance: Defining, Abstract classes, Single, Multilevel, Multiple, Hierarchical, Hybrid Inheritance, Constructor and Destructor in Derived Classes.

Unit V: Functions and File Handling:

Virtual Functions: Need for Virtual Functions, definition, Pure Virtual Functions, Abstract Classes, Rules for Virtual Functions.

File Handling: I/O Stream, Reading and Writing to files.

Exception Handling: Error handling, Try-catch blocks and error handling exceptions.

Reference Books:

1. "Let Us C++" by Yashavant Kanetkar
2. "Programming in C++" by D. Ravichandran

3. "Object-Oriented Programming with C++" by E. Balagurusamy
4. "C++ Programming: From Problem Analysis to Program Design" by D.S. Malik
5. "C++: The Complete Reference" by Herbert Schildt

Course Outcome:

At the end of the course, students should be able to:

1. Write, compile, and debug programs in C++ effectively.
2. Demonstrate a clear understanding of programming concepts such as Constructors, Destructors, functions etc.
3. Use and implement essential data structures and algorithms.
4. Design and develop software applications, applying best practices in coding and documentation.