

B.C.A. (Honours) & B.C.A. (Honours with Research)
(Semester - 1 and Semester - 2)
Saurashtra University
To be effective from June – 2023

BCA (Semester – 2)

Sr. No.	Type of Course	Course Title	Credit
1	MAJOR	CS-08: Data Structure Using C Language	4
2	MAJOR	CS-09: Web Programming	4
3	MINOR	CS-10: SAD, Software Quality Assurance & Testing	4
4	MDC	CS-11: Practical Based on Data Structure Using C Language & Web Programming	4
5	AEC	CS-12: Modern Indian Language	2
6	SEC	CS-13: Computer Organization & Architecture	2
7	VAC	CS-14: Environmental Science: Understanding the Earth's Ecosystems and Sustainability	2
Total Credit of Semester - 2			22

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CS-08: DATA STRUCTURE USING C LANGUAGE		
<p>Objectives:</p> <ul style="list-style-type: none"> • To provide the knowledge of basic data structures and their implementations. • To understand importance of data structures in context of writing efficient programs. • To develop skills to apply appropriate data structures in problemsolving <p>Prerequisites:</p> <ul style="list-style-type: none"> • Computer Programming Knowledge • Fundamental knowledge of C Programming 		
Sr. No.	Topic	Detail
1	Algorithm Analysis	<ul style="list-style-type: none"> • The analysis of algorithm. • Time and space complexities. • Asymptotic notation. • Classes of algorithm. • Big-Oh Notation • Big-Omega Notation
	File Handling	<ul style="list-style-type: none"> • Concept of data files • File handling • Use of file handling functions fopen, fclose, fprintf, fscanf, getw, putw, fseek, ftell, rewind, freopen, remove, rename, feof, ferror • I/O operations • Command line arguments
2	Sorting and Searching	<ul style="list-style-type: none"> • Bubble sorting • Insertion sorting • Quick sorting • Bucket sorting • Merge sorting • Selection sorting • Shell sorting • Basic searching technique: Index searching, Sequential searching, Binary searching
3	Introduction To data Structure	Primitive and simple structures Linear and nonlinear structures file organization.
	Elementary Data Structure	<ul style="list-style-type: none"> • Stack <ul style="list-style-type: none"> ○ Definition ○ Operations on stack

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		<ul style="list-style-type: none"> ○ Implementation of stacks using arrays <ul style="list-style-type: none"> ▪ Function to insert an element into the stack ▪ Function to delete an element from the stack ▪ Function to display the items ○ Recursion and stacks ○ Evaluation of expressions using stacks <ul style="list-style-type: none"> ▪ Postfix expressions ▪ Prefix expression ● Queue <ul style="list-style-type: none"> ○ Introduction ○ Array implementation of queues ○ Function to insert an element into the queue ○ Function to delete an element from the queue ● Circular queue <ul style="list-style-type: none"> ○ Function to insert an element into the queue ○ Function for deletion from circular queue ○ Circular queue with array implementation ● Deques ● Priority queues
4	Linked List & Implementation	<ul style="list-style-type: none"> ● Applications of the linked lists ● Types of Linked Lists <ul style="list-style-type: none"> ○ Singly Linked List ○ Doubly linked list ○ Header Linked List ○ Circular Linked List ● Implementation using Singly Linked List, Doubly Linked List and Circular Singly Linked List <ul style="list-style-type: none"> ○ Insertion of a node at the beginning ○ Insertion of a node at the end ○ Insertion of a node after a specified node ○ Traversing the entire linked list ○ Deletion of a node from linked list ○ Updating of a specific node ● Implementation of merging of two Singly Linked List ● Implementation of reversing of Singly Linked List
5	Tree	<ul style="list-style-type: none"> ● Objectives ● Properties of a tree ● Binary trees <ul style="list-style-type: none"> ○ Properties of binary trees ○ Implementation ○ Traversals of a binary tree

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		<ul style="list-style-type: none"> ▪ In order traversal ▪ Post order traversal ▪ Preorder traversal • Binary search trees (bst) <ul style="list-style-type: none"> ○ Insertion in bst ○ Deletion of a node ○ Search for a key in bst • Height balanced tree • B-tree Algorithm <ul style="list-style-type: none"> ○ Insertion, Deletion
	Graph	<ul style="list-style-type: none"> • Adjacency matrix and adjacency lists • Graph traversal <ul style="list-style-type: none"> ○ Depth First Search (DFS) ○ Implementation ○ Breadth First Search (BFS) ○ Implementation • Shortest path problem • Minimal spanning tree

Seminar - 5 Lectures

Expert Talk - 5 Lectures

Test - 5 Lectures

Total Lectures 60 + 15 = 75

Reference Books:

1. Data Structure through C/C++ Author : Tennaunbuam.
2. Let us C Author : Kanitkar.
3. Pointer in C Author : Kanitkar.
4. Data and File Structure Author : Trembley & Sorrenson.

Course Outcome:

- Able to Understand basic data structures and their implementations.
- Able to Understand importance of data structures in context of writing efficient programs.
- Able to Develop skills to apply appropriate data structures in problem solving
- Able to Explore tree and graph data structure

Additional Topics to be taught during the semester – 2 (Not to be asked in examination):

- Case studies of data structure

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CS-09: WEB PROGRAMMING

Objectives:

- To create dynamic website / web based applications using PHP - MySQL Database.
- Able to develop website with the use of jQuery, AJAX and JSON.
- To become familiar with OOPs concept.

Prerequisites: Basic knowledge of Programming

Unit No.	Topic	Detail
1	PHP Basic	<ul style="list-style-type: none"> • Introduction to PHP • PHP configuration in IIS & Apache Web server • Understanding of PHP.INI file • Understanding of PHP .htaccess file • PHP Variable • Static & global variable • GET & POST method • PHP Operator • Conditional Structure & Looping Structure • Array • User Defined Functions: <ul style="list-style-type: none"> ▪ argument function ▪ default argument ▪ variable function ▪ return function • Variable Length Argument Function <ul style="list-style-type: none"> ▪ func_num_args ▪ func_get_arg, func_get_args • Built in Functions <ul style="list-style-type: none"> - Variable Functions - String Function - Math Function - Date Function - Array Function - Miscellaneous Function - File handling Function
2	Handling Form, Session Tracking & PHP Components	<ul style="list-style-type: none"> • Handling form with GET & POST • Cookies • Session • Server variable • PHP Components

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		<ul style="list-style-type: none"> - PHP GD Library - PHP Regular expression - Uploading file - Sending mail
	AJAX & JSON	<ul style="list-style-type: none"> • What is AJAX? • PHP with AJAX • MySql with AJAX • What is JQuery AJAX • JQuery AJAX with PHP • Introduction to JSON <ul style="list-style-type: none"> ○ Installation & Configuration ○ Resource Types ○ JsonSerializerizable ○ JSON Functions: json_decode, json_encode
3	Introduction of SQL	<ul style="list-style-type: none"> • Working with MySQL using PhpMyAdmin • SQL DML Statement (Insert, Update, Select, Delete) Command • PHP-MySQLi Connectivity • PHP-MySQLi Functions <ul style="list-style-type: none"> • mysqli_connect, mysqli_close, mysqli_error, mysqli_errno, mysqli_select_db, mysqli_query, mysqli_fetch_array, mysqli_num_Rows, mysqli_affected_Rows, mysqli_fetch_assoc, mysqli_fetch_field, mysqli_fetch_object, mysqli_fetch_row, mysqli_insert_id, mysqli_num_fields, mysqli_data_seek
4	jQuery	<ul style="list-style-type: none"> ☒ What is jQuery? ☒ jQuery Syntax ☒ jQuery Selector <ul style="list-style-type: none"> - Element Selector - Class Selector - id Selector ☒ jQuery Events: Click, dbclick, keypress, keydown, keyup, submit, change, focus, blur, load, resize, scroll, unhide ☒ jQuery Effects: hide show, fade, slide ☒ jQuery Methods: css, height, width, innerWidth, innerHeight, outerWidth, outerHeight, html, text, append, prepend, after, before, addClass, removeClass, toggleClass, remove, empty
5	OOP	<ul style="list-style-type: none"> • Concept of OOP <ul style="list-style-type: none"> ○ Class ○ Object ○ Property ○ Visibility

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		<ul style="list-style-type: none"> ○ Constructor, Destructor ○ Inheritance ○ Scope Resolution Operator (::) ○ Autoloading Classes ○ Class Constants ● Mysql Database handling with oop (insert, update, select, delete)
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Seminar - 5 Lectures

Expert Talk - 5 Lectures

Test - 5 Lectures

Total Lectures: 60+15=75

Reference Books:

1. Modern PHP: New Features and Good Practices by Josh Lockhart (ORELLY)
2. PHP Cookbook: Solutions & Examples for PHP Programmers by David Sklar and Adam Trachtenberg (ORELLY)
3. Programming PHP by Kevin Tatroe and Peter MacIntyre ORELLY)
4. PHP for the Web: Visual QuickStart Guide (4th Edition) by Larry Ullman (Peachpit Press)

Course Outcome:

- Able to Understand Creation of dynamic website / web-based applications using PHP - MySQL Database.
- Able to Understand development of website with the use of jQuery, AJAX and JSON.
- Able to Understand practical and real-life examples of OOP.

Additional Topics (Not to be asked in examination):

Student should be aware of followings

- Case Study
- Uses and Advantages of CMS
- Wordpress [Introduction & Installation]
- Joomla [Introduction & Installation]
- Magento [Introduction & Installation]

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CS – 10: SAD, Software Quality Assurance and Testing

Objectives:

- To Understand and explore concept of System Analysis
- To Understand concept of System Development Life Cycle
- To Understand Quality Assurance
- To Understand concept of Software Testing
- To explore the concept of Project Tracking and Scheduling
- To Understand the concept of Quality Control and Testing
- To Understand the software models and Automated Testing
- To Understand the UML Diagram
- To Understand the concept of CAD Project Management

Prerequisites:

- Problem-Solving Skills
- Basic concepts of Database
- Basic knowledge of Software Development Fundamentals

Unit No.	Topics	Details
1	System Analysis & Design, Software Engineering & Concept of Quality Assurance	<ul style="list-style-type: none"> ☐ Definitions: System, Subsystem, Business System, Information System (Definitions only) ☐ Systems Analyst (Role: Information Analyst, Systems Designer & Programmer Analyst) ☐ SDLC <ul style="list-style-type: none"> • Fact – finding techniques (Interview, Questionnaire, Record review and observation) ☐ Tools for Documenting Procedures and Decisions Decision Trees and Decision Tables ☐ Data Flow analysis Tool DFD (context and zero level) and Data Dictionary ☐ Software Engineering (Brief introduction) ☐ Introduction to QA ☐ Quality Control (QC) ☐ Difference between QA and Q ☐ Quality Assurance activities

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2	Basics of Software Testing, Types of Software Testing, Verification and Validation	<ul style="list-style-type: none"> • Introduction to software Testing • Software faults and failures <ul style="list-style-type: none"> • Bug/Error/Defect/Faults/Failures • Testing Artifacts <ul style="list-style-type: none"> • Test case • Test Script • Test Plan • Test Harness • Test Suite • Static Testing <ul style="list-style-type: none"> • Informal Review • Walthrough • Technical Review • Inspection • Dynamic Testing • Test levels <ul style="list-style-type: none"> • Unit Testing • Integration Testing • System Testing • Acceptance Testing <p>Techniques of software Testing</p> <ul style="list-style-type: none"> • Black Box Testing <ul style="list-style-type: none"> • Equivalence Partitioning • Boundary Data Analysis • Decision Table Testing • State Transition Testing • White Box Testing <ul style="list-style-type: none"> • Statement testing and coverage • Decision testing and coverage • Grey Box Testing • Nonfunctional Testing <ul style="list-style-type: none"> • Performance Testing • Stress Testing • Load Testing • Usability Testing • Security Testing
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3	Software Development Life Cycle Models and Automated Testing	<ul style="list-style-type: none"> • Waterfall Model • Iterative Model • V-Model • Spiral Model • Big Bang Model • Prototyping Model • Introduction to Automated Testing <ul style="list-style-type: none"> • Concept of Freeware, Shareware, licensed tools • Theory and Practical Case-Study of Testing Tools <ul style="list-style-type: none"> • Selenium • Neoload • Junit • Nunit • Acunetix • ZAP
4	Project Economics, Project scheduling and Tracking	<ul style="list-style-type: none"> • Concepts of Project Management • Project Costing based on metrics • Empirical Project Estimation Techniques. • Decomposition Techniques. • Algorithmic methods. • Automated Estimation Tools • Concepts of project scheduling and tracking • Effort estimation techniques • Task network and scheduling methods • Timeline chart • Pert Chart • Monitoring and control progress • Graphical Reporting Tools

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5	CAD Project Management Tool UML	<ul style="list-style-type: none"> • MS – VISIO for designing & Documentation • MS – Project for controlling and Project Management • UML designing and skill based tools Overview of <ul style="list-style-type: none"> ◆ Class Diagram ◆ Use Case Diagram ◆ Activity Diagram
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Student seminar - 5 Lectures.
 Expert Talk - 5 Lectures
 Students Test - 5 Lectures.
TOTAL LECTURES 60+15=75

Reference Books

1. Analysis & Design of Information System - James A. Senn.
2. Pankaj Jalote, "Software Engineering – A Precise Approach", Wiley India
3. UML Distilled by Martin Fowler, Pearson Edition, 3rd Edition
4. Fundamentals of Software Engineering – RajibMall (PHP)
5. Software Engineering – A Practitioner’s Approach – Pressman
6. UML – A Beginner’s Guide –Jasson Roff – TMH
7. Roger Pressman , "Software Engineering"
8. http://en.wikipedia.org/wiki/Software_testing
9. <http://www.onestoptesting.com/>
10. <http://www.opensourcetesting.org/functional.php>

Course Outcome

- Able to Understand and explore concept of System Analysis
- Able to Understand concept of System Development Life Cycle
- Able to Understand Quality Assurance
- Able to Understand concept of Software Testing
- Able to Explore the concept of Project Tracking and Scheduling
- Able to Understand the concept of Quality Control and Testing
- Able to Understand the software models and Automated Testing
- Able to Understand the UML Diagram
- Able to Understand the concept of CAD Project Management

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CS-11 Practical based on CS-08 and CS-09	
<p>CCE- Continuous and comprehensive Evaluation as follow</p> <ul style="list-style-type: none"> • The continuous Comprehensive Evaluation (CCE) for each subject will be conducted by the teacher of that subject. The teacher will decide how the evaluation will be done. Usually CCE includes things like class participation, case studies and presentation, assignments, tutorials, small test (announced or surprised), quizzes and attendance or a mix of these. • Students must submit their work for internal evaluation on time to time. • Another part of CCE is the mid-term exam, which is compulsory for all students. This exam will be conducted internally by the college. 	50 Marks
<p>SEE – Semester End Examination as per the following</p> <ul style="list-style-type: none"> • Practical Exam is conducted by college using approved examiners (3 Hours duration) • Students must prepare a practical notebook/book for the final practical examination. (The practical book serves as a record of all practical work, observations, procedures and results performed during the semester in lab. It is essential for evaluation during the final practical examination) 	50 Marks

CS-11: Practical Based on Data Structure Using C Language & Web Programming	Total Marks - 100	
Topics	CCE	SEE
Data Structure using C language	25	25
Web Programming	25	25

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CS-12: MODERN INDIAN LANGUAGE		
<p>Objective:</p> <ul style="list-style-type: none"> • To enable students to develop basic proficiency in reading, writing, speaking and listening in the target language. • To introduce students to the script or writing system used in the language. <p>Prerequisites:</p> <ul style="list-style-type: none"> • Knowledge of communication and interpersonal skills • Interest to develop the language proficiency 		
Unit No.	Topic	Details
1	Language Practice	<ul style="list-style-type: none"> • Role-playing exercises • Group Discussion and presentation • Language games and activities
2	Language Proficiency	<ul style="list-style-type: none"> • Reading comprehension and speed • Speaking and Listening skills • Technical and academic vocabulary
3	Activities	<ul style="list-style-type: none"> • Creating <ul style="list-style-type: none"> ○ Short-Story ○ Poem ○ Dialog

Course Outcome:

- Students will develop basic communication skills in the target language, including reading, writing, speaking and listening.
- Students will develop an appreciation for the language and its cultural significance.

Reference Books:

- Language Practice By Michael Vince – Published By macmillan
- The Handbook of Advanced Proficiency in Second Language Acquisition – Editors: Alessandra G. Benati, Paul A. Malovrth – Published By Willey

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CS-13: COMPUTER ORGANIZATION AND ARCHITECTURE		
<p>Objectives:</p> <ul style="list-style-type: none"> • Understand how logic circuits and boolean algebra forms as the basics of digital computer. • Demonstrate the building up of Sequential and Combinational logic from basic gates <p>Prerequisites:</p> <ul style="list-style-type: none"> • General Knowledge of Computer 		
Unit No.	Topic	Detail
1	Digital Logic Circuits	<ul style="list-style-type: none"> • Logic Gates <ul style="list-style-type: none"> ▪ AND,OR,NOT,NAND,NOR,XOR, Exclusive NOR gates • Boolean Algebra <ul style="list-style-type: none"> ▪ Boolean algebra? ▪ Boolean variable and Boolean function (Analog and Digital Signals) ▪ Truth table ▪ Postulates ▪ Theorem related to postulates ▪ Simplified Boolean function using postulates and draw logical diagram of simplified function ▪ Simplified Boolean function using Karnaugh map method with DON'T CARE condition • Sequential And Combinational Circuits <ul style="list-style-type: none"> ▪ Clock pulses ▪ Combinational circuit, sequential circuit and adder • Flip Flops <ul style="list-style-type: none"> ▪ SR, Clocked SR, D, JK, JK – Master Slave, T • Universal Gate
2	Central Processing Unit	<ul style="list-style-type: none"> • Introduction Of CPU • Major component of CPU • General Register Organization <ul style="list-style-type: none"> ▪ control word ▪ Accumulator Register • Stack Organization <ul style="list-style-type: none"> ▪ Register stack ▪ Memory stack ▪ Polish notation and reverse polish notation

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		<ul style="list-style-type: none">● Arithmetic And Logic Unit<ul style="list-style-type: none">▪ Block diagram of ALU● Interrupts
3	Input-Output Organization	<ul style="list-style-type: none">● Memory buses● Block diagram and function● Data Bus, Address Bus and Control lines● Input Output Buses● Concept of input output interface● Input Out Processor (IOP)● Direct Memory Access● DMA controller

Student seminar - 5 Lectures

Expert Talk - 5 Lectures

Students Test - 5 Lectures

Total Lectures 60 + 15 = 75

Reference Books:

1. Computer System Architecture – By Morris Mano (PHI).
2. Digital Logic And Computer Design – By Morris Mano.
3. Digital Computer Electronics – By Malvino And Leach.

Course Outcome:

- Able to Understand logic circuits and boolean algebra forms as the basics of digital computer.
- Able to Explore the building up of Sequential and Combinational logic from basic gates
- Able to explore digital components
- Able to Understand data representation

Hands On (Not to be asked in examination):

- Instruction Formats - Simulator Base Program

Additional Topics to be taught during the semester-2 (Not to be asked in examination):

Following tools should be used to train students.

- Simulator 8051
- Using Trainer kit

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CS-14: Environmental Science: Understanding the Earth's Ecosystems and Sustainability

Objective:

- The primary objective is to introduce students to the fundamental concepts of Environmental Science, including ecosystems, biodiversity, natural resources, pollution, climate change, and sustainability.
- The course aims to raise awareness about pressing environmental challenges faced globally and locally, such as air and water pollution, deforestation, habitat destruction, and climate change.
- Students will become familiar with environmental laws, regulations, and policies at local, national, and international levels, which govern environmental protection and conservation efforts.

Prerequisites:

- A fundamental understanding of basic science subjects.

Unit No.	Topic	Details
1	Introduction to Environment Science	<ul style="list-style-type: none"> • Definition • Environmental Issues and Challenges • Principles and Scope • Concepts of Ecology and Ecosystem
2	Environmental Pollution	<ul style="list-style-type: none"> • Types of Pollution (air, water, soil, noise, etc.) • Sources and impact of pollution • Mitigation and control measures
3	Climate Change and Global Warming	<ul style="list-style-type: none"> • Greenhouse effect and its implications • Causes and consequences of climate change • Sustainable practices to combat global warming

Course Outcome:

- Students will demonstrate a solid understanding of environmental concepts.
- Students will develop an increased awareness of pressing environmental issues facing the planet today and recognize the interconnections between human activities and the environment.

Reference Books:

- “Environmental Science” by G. Tyler Miller and Scott Spoolman
- Environmental Impact assessment – L W Canter – McGraw Hill

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BCA-2	
CS-08: Data Structure Using C Language	
Minimum following exercise should be performed by the students during the semester	
1.	Write a C program to count the number of steps taken to perform linear search.
2.	Compare time complexity of linear vs binary search using a program.
3.	Show space used by dynamic array vs static array.
4.	Write a function with $O(n^2)$ time complexity and print execution count.
5.	Illustrate a function with both best-case and worst-case scenarios.
6.	Write a C program to create a text file named student.txt. The program should ask the user to enter a student's name and marks, then write that data into the file using fprintf(). Finally, close the file using fclose().
7.	Write a C program to read the student details (name and marks) stored in the student.txt file using fscanf() and display them on the screen.
8.	Write a C program to open a file named sample.txt, move the file pointer to the 5th byte using fseek(), and display the file pointer position using ftell(). Also, read the character at that position.
9.	Write a C program that performs the following tasks step-by-step.
a.	Create a binary file numbers.dat and write 5 integers into it.
b.	Read and display the integers from the file and detect the end of the file.
c.	Move the file pointer to the end of the file and display its position.
d.	Reset the file pointer to the beginning of the file.
e.	Create a log file log.txt to record the total number of integers.
f.	Read and display the contents of the log file.
g.	Redirect the input stream to read from the log file.
h.	Check if any file error occurred during file operations.
i.	Rename the binary file to backup.dat.
j.	Delete the log.txt file.
10.	Write a C program that accepts details of n students (roll number, name, and marks), stores them in a file, and then reads and displays the records from the file.
11.	Write a C program that accepts two integers from the command line and displays their sum.
12.	Write a C program that takes a filename as a command line argument and displays the total number of characters in that file.
13.	Write a C program that accepts multiple command line arguments and displays the length of each argument.
14.	Write a C program that accepts a number as a command line argument and checks whether the number is prime or not.
15.	Write a C program that accepts any number of command line arguments and displays how many were provided (excluding the program name).
16.	Write a C program to sort an array of integers using the Bubble Sort technique.
17.	Write a C program to sort an array of strings using Bubble Sort.
18.	Write a C program to sort an integer array using Insertion Sort.
19.	Sort an array of strings using Insertion Sort in C.
20.	Write a C program to implement Quick Sort on integers.
21.	Write a C program to implement Quick Sort on strings.
22.	Write a C program to sort positive integers using Bucket Sort.
23.	Write a C program to sort integer arrays using Merge Sort.
24.	Write a C program to sort integers using Selection Sort.

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25.	Write a C program to sort integers using Shell Sort.
26.	Write a C program to implement Index Searching on a sorted integer array using a simple index table.
27.	Write a C program to perform Index Searching on a sorted list of strings using index positions.
28.	Write a C program to search an integer element using Sequential Search.
29.	Write a C program to perform Linear Search to find a string in a list of strings.
30.	Write a C program to implement Binary Search on a sorted integer array.
31.	Write a C program to implement Binary Search on a sorted string array.
32.	Write a menu-driven C program to perform various stack operations using arrays: Push, Pop, Peek, Display. Demonstrate stack overflow and underflow conditions also.
33.	Write a menu-driven C program to implement queue operations (enqueue, dequeue, peek, display) using arrays. Demonstrate queue overflow and underflow conditions also. Check whether the queue is full or empty also.
34.	Write a C program to implement a circular queue using arrays.
35.	Write a C program to implement a double-ended queue (deque) using arrays.
36.	Write a C program to implement a priority queue using arrays.
37.	Write a C program to create and display a singly linked list.
38.	Write a C program to insert a node at the beginning of a singly linked list.
39.	Write a C program to insert a node at the end of a singly linked list.
40.	Write a C program to insert a node after a specified node in a singly linked list.
41.	Write a C program to traverse and display all nodes of a singly linked list.
42.	Write a C program to delete a node from a singly linked list.
43.	Write a C program to update the data of a specific node in a singly linked list.
44.	Write a C program to merge two singly linked lists into a single linked list.
45.	Write a C program to reverse a singly linked list.
46.	Write a C program to create and display a doubly linked list.
47.	Write a C program to insert a node at the beginning of a doubly linked list.
48.	Write a C program to insert a node at the end of a doubly linked list.
49.	Write a C program to insert a node after a specified node in a doubly linked list.
50.	Write a C program to traverse and display all nodes of a doubly linked list in both forward and reverse order.
51.	Write a C program to delete a node from a doubly linked list.
52.	Write a C program to update the data of a specific node in a doubly linked list.
53.	Write a C program to create and display a circular linked list.
54.	Write a C program to insert a node at the beginning of a circular singly linked list.
55.	Write a C program to insert a node at the end of a circular singly linked list.
56.	Write a C program to insert a node after a specified node in a circular singly linked list.
57.	Write a C program to traverse and display all nodes of a circular singly linked list.
58.	Write a C program to delete a node from a circular singly linked list.
59.	Write a C program to update the data of a specific node in a circular singly linked list.
60.	Write a C program to create and display a header linked list.
61.	Write a C program to merge two singly linked lists into a single linked list.
62.	Write a C program to reverse a singly linked list.
63.	Write a C program to implement a binary tree and perform basic node insertion
64.	Write a C program to perform Inorder traversal of a binary tree.
65.	Write a C program to perform Preorder traversal of a binary tree.
66.	Write a C program to perform Postorder traversal of a binary tree.

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67.	Write a practical C program to perform DFS traversal on a graph and display the traversal order.
68.	Write a practical C program to perform BFS traversal on a graph and display the traversal order.

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BCA-2	
CS-09 Web Programming	
Minimum following exercise should be performed by the students during the semester	
PHP Practicals	
(1)	Create a simple PHP page to display “Hello, World!”
(2)	Display current date and time using PHP date() function
(3)	Create a calculator using HTML and PHP
(4)	Form handling: Accept name, email, and display it using PHP
(5)	Validate a form (email, name) with PHP
(6)	Create a login system using PHP (without database)
(7)	Use sessions to store and display user information
(8)	Use cookies to store a username and greet user on reload
(9)	Create a PHP script to upload files to the server
(10)	Create and use user-defined PHP functions
(11)	Demonstrate string functions in PHP (like strlen(), str_replace())
(12)	Create an associative array and loop through it
(13)	Read and write files using fopen(), fwrite()
(14)	Use include and require statements for modular PHP
(15)	Use isset() and empty() to check variables
(16)	Create a simple contact form and send data to email
(17)	Build a feedback form and store data in a text file
(18)	20. Create a dynamic menu with PHP arrays
AJAX Practicals	
(1)	Load data from server without refreshing the page
(2)	Submit a form using AJAX and display result
(3)	Validate email availability using AJAX (with dummy PHP)
(4)	Create live search using AJAX
(5)	Load dropdown options based on selection (e.g., country → state)
(6)	Fetch data from a JSON file using AJAX
(7)	Load external content (like text file) into a div
(8)	Create an autocomplete textbox using AJAX
(9)	AJAX polling: show server time every few seconds
(10)	Submit login form via AJAX and show success/error
(11)	Use AJAX to add items to a cart without refreshing
(12)	Display database records using AJAX and PHP
(13)	Update part of a page using XMLHttpRequest
(14)	Use jQuery \$.ajax() method to fetch PHP output
(15)	AJAX-based feedback form with real-time validation
(16)	Create a to-do list using AJAX and PHP
(17)	AJAX-based image upload preview
(18)	Show loader while AJAX call is in progress
(19)	Handle AJAX errors (404, timeout)
(20)	AJAX with XML: Load and display XML data
MySQL Practicals	
(1)	Create a MySQL database and table using PHPMyAdmin
(2)	Insert, update, delete records using SQL queries
(3)	Connect PHP to MySQL database
(4)	Display all records from a table using PHP

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(5)	Create a login system using MySQL and PHP
(6)	Search records in a table from user input
(7)	Sort records in ascending/descending order
(8)	Display limited records with pagination
(9)	Use aggregate functions (COUNT(), SUM())
(10)	Prevent SQL Injection using prepared statements
(11)	Build a simple blog with title, content, and MySQL
(12)	Implement a registration form with PHP + MySQL
(13)	Create a product listing with category filter
(14)	Create a MySQL backup and import it
(15)	Display top 5 recent posts using SQL LIMIT
(16)	Use PHP to update records via MySQL
jQuery Practicals	
(1)	Change content and style of an element on click
(2)	Create a hide/show toggle button
(3)	Fade in/out effect on image or text
(4)	Slide up/down menu effect
(5)	Form validation using jQuery (required fields)
(6)	Animate an element's position or size
(7)	Create tabs using jQuery
(8)	jQuery event handling (click, dblclick, keyup)
(9)	Load content via AJAX using jQuery load()
(10)	Create a dropdown dependent menu (city based on state)
(11)	jQuery image slider
(12)	jQuery modal popup
(13)	Toggle class on button click
(14)	Scroll to top button using jQuery
(15)	jQuery accordion
(16)	Create a to-do list with jQuery
(17)	Drag and drop items using jQuery UI
(18)	jQuery hover effect for image zoom
(19)	jQuery input character counter
(20)	jQuery autocomplete using AJAX and PHP
OOP in PHP Practicals	
(1)	Create a simple PHP class and object – Define a class `Car`, create object and call a method.
(2)	Define class with constructor and destructor – Show how constructor initializes object and destructor cleans up.
(3)	Use of access modifiers (public, private, protected) – Create class members with different visibility and access them.
(4)	Use of getter and setter methods – Implement encapsulation using `getName()` and `setName()`.
(5)	Create a class with multiple methods – E.g., `BankAccount` with deposit, withdraw, checkBalance.
(6)	Demonstrate inheritance with parent and child classes – Class `Animal` with subclass `Dog` overriding a method.
(7)	Use `final` keyword to prevent method override – Create a final method in a base class.

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(8)	Create and use abstract classes – Abstract class `Shape`, derived classes `Circle`, `Rectangle`.
(9)	Use interfaces to define behavior – Interface `Movable`, implemented by class `Car` and `Bike`.
(10)	Demonstrate constructor overloading using default parameters – Create flexible constructors in a class.
(11)	Create a static method and property – Show how to use class-wide data like `count` of instances.
(12)	Demonstrate method overriding and `parent::` keyword – Call parent class method from child using `parent::`.
(13)	Implement traits to share functionality across classes – Use PHP traits to add common methods in multiple classes.
(14)	Use namespaces to organize code – Create two classes with the same name in different namespaces.
(15)	Create a class with constants and use them – E.g., `const STATUS_ACTIVE = 1;`.
(16)	Implement dependency injection in PHP classes – Pass database or logger object through constructor.
(17)	Create a simple autoloader using `spl_autoload_register()` – Auto-include classes from folder structure.
(18)	Create and handle exceptions using try-catch block – Throw custom exceptions in classes like `InvalidAgeException`.
(19)	Implement CRUD operations with OOP – Create `User` class with `addUser()`, `deleteUser()`, etc., using MySQL.
(20)	Create a complete mini project using OOP – e.g., Library Management or Student Management System using OOP, MySQL, and PHP.