

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



B.SC. (I.T.) (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



CS-08: DATA STRUCTURE USING C LANGUAGE

Objectives:

- 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 problem solving

Prerequisites:

- 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



		<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	<p align="center">Linked List & Implementation</p>	<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	<p align="center">Tree</p>	<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, dblclick, keypress, keydown, keyup, submit, change, focus, blur, load, resize, scroll, unload • 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]



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 • 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 Data Structure Using C Language & Web Programming	Total Marks - 100	
	CCE	SEE
Topics		
Data Structure using C language	25	25
Web Programming	25	25

Note:

- Each session is of 3 hours for the purpose of practical Examination.
- Practical examination may be arranged before or after theory exam.

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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



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



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