Anekant Education Society's

TuljaramChaturchand College, Baramati

(Autonomous)

Three Year B.Sc. Degree Program in Computer Science

(Faculty of Science & Technology)

CBCS Syllabus (2019 Pattern)

S.Y. B.Sc.(Computer Science) Sem- III

For Department of Computer Science

Tuljaram Chaturchand College of Arts, Science & Commerce, Baramati

Class: F.Y.B.Sc. (Computer Science)			
Semester I		**Semester II**	
CSCO 1101	Basic Programming using C	CSCO 1201	Advanced Programming using C
CSCO1102	DBMS-I	CSCO 1202	DBMS-II
CSCO1103	Lab Course I : Basics of C	CSCO 1203	Lab Course I : Advanced C
CSCO1104	Lab Course II : DBMS I	CSCO1204	Lab Course II : DBMS II
Physical Education			

Class :S.Y.B.Sc. (Computer Science)			
Semester III		**Semester IV**	
CSCO 2301	Data Structures using C	CSCO2401	Object Oriented Concepts using Java
CSCO2302	Introduction to Web Technology	CSCO2402	Software Engineering
CSCO2303	Lab Course I : Based On CSCO2301	CSCO2403	Lab Course I: Based On 2401
CSCO2304	Lab Course II: based On CSCO2302	CSCO2404	Lab Course II : Based On CSCO2402 with Mini Project
Certificate Course I		Certificate Course II	
Environment Science (EVS) An Educational Trip conduct in IV semester			

Class: T.Y.B.Sc. (Computer Science)			
Semester V		**Semester VI**	
CSCO3501	System Programming &Operating System	CSCO3601	Advanced Operating System
CSCO 3502	Theoretical Computer Science	CSCO3602	Compiler Construction
CSCO3503	Computer Networks - I	CSCO3603	Computer Networks - II
CSCO3504	Web Development – I	CSCO3604	Web Development–II
CSCO3505	Advanced Programming in Java	CSCO3605	Advanced Java Technologies – Frameworks
CSCO3506	Object Oriented Software Engineering	CSCO3606	Software Metrics & Project Management
CSCO3507	Lab Course I: Based on CSCO3501	CSCO3607	Lab Course I: Based on CSCO3601
CSCO3508	Lab Course II: Based on CSCO3505	CSCO3608	Lab Course II: Based on CSCO3605 & Mini Project using JAVA
CSCO3509	Lab Course III: Based on CSCO3504	CSCO3609	Lab Course III: Based on CSCO3604 & Mini Project using PHP.
Certificate Course III		An Educational Trip conduct in this semester.	

S.Y.B.Sc.(Computer Science)

Semester-III

Credit Structure & Syllabus

(Academic Year 2020-2021, Autonomous)

Course Structure for S. Y. B. Sc. (Computer Science) Sem-III & IV

Subject: Computer Science

Sem	Paper Code	Title of Paper	No. of Credits	Exam	Marks
III	CSCO2301	Data Structure Using C	3	I / E	60 + 40
	CSCO2302	Introduction to Web Technology	3	I / E	60 + 40
	CSCO2303	Lab Course – I based On Data structure	2	I / E	60 + 40
	CSCO2304	Lab Course – II Based on Web Technology	Grade	I/E	60 +40
		Certificate Course I	2	---	----
IV	CSCO 2401	Object Oriented Concepts using Java	3	I / E	60 + 40
	CSCO2402	Software Engineering	3	I / E	60 + 40
	CSCO2403	Lab Course – I on CSCO2401	2	I / E	60 + 40
	CSCO2404	Lab Course– II CSCO2402 with S.E. Project.	Grade	I/E	60 + 40
		Certificate Course II	2	----	----
		Environment Science	2	----	----

Subject: Computer Science   **Paper Code :** CSCO2301
Title of Paper: Data Structure Using C   **Paper:** I
Credit: 3(4 Lectures/Week)   **No. of lectures:** 48

Prerequisites:
- Basic knowledge of algorithms and problem solving.
- Knowledge of C Programming Language.

Objective:
1. To learn the systematic way of solving problem
2. To understand the different methods of organizing large amount of data
3. To efficiently implement the different data structures
4. To efficiently implement solutions for specific problems

Learning Outcomes: CO1.Use well-organized data structures in solving various problems.

CO2. Differentiate the usage of various structures in problem solution.

CO3. Understand discrete structures such as sets, relations, and lattices.

CO4. Study the basic operations of Propositional logic and Boolean Algebra.

CO5. Analyse and study various proof techniques.

CO6. Understand basics of Graph theory and how it can be used to visualize and simplify problems.

CO7. To efficiently implement the different data structure

1. Introduction to data structures   **[2]**
    1.1 Concept
    1.2 Data type, Data object, ADT
    1.2.1 Data Type
    1.2.2 Data Object
    1.2.3 ADT -Definition, Operation, examples on rational number
    1.3 Need of Data Structure
    1.4 Types of Data Structure

2. Algorithm analysis   **[3]**
    2.1 Algorithm – definition, characteristics
    2.2 Space complexity, time complexity
    2.3 Asymptotic notation (Big O, Omega Ω, Theta Notation Θ)

3. Linear data structures   **[6]**
    3.1 Introduction to Arrays - array representation
    3.2 Sorting algorithms with efficiency - Bubble sort, Insertion sort, Merge sort, Quick Sort
    3.3 Searching techniques –Linear Search, Binary search

4. Linked List   **[8]**
    4.1 Introduction to Linked List
    4.2 Implementation of Linked List – Static & Dynamic representation,
    4.3 Types of Linked List
    4.4 Operations on Linked List - create, display, insert, delete, reverse, search, sort, concatenate &merge
    4.5 Applications of Linked List – polynomial manipulation
    4.6 Generalized linked list – Concept and Representation

5. Stacks   **[6]**
    5.1 Introduction
    5.2 Representation- Static & Dynamic

5.3 Operations – Create,Init,Push,Pop& Display

5.4 Application - infix to postfix, infix to prefix, Evaluation of Expression

5.5 Simulating recursion using stack

6. Queues [4]

6.1 Introduction

6.2 Representation - Static & Dynamic

6.3 Operations – Create,Init,Insert, Remove & Display

6.4 Circular queue, priority queue (with implementation)

6.5 Concept of doubly ended queue (Dequeue)

7. Trees [12]

7.1 Concept & Terminologies

7.2 Binary tree, binary search tree

7.3 Representation – Static and Dynamic

7.4 Operations on BST & Heap Tree – create, Insert, delete, traversals (preorder, inorder, postorder), counting leaf, non-leaf & total nodes ,nonrecursiveinorder traversal

7.5 Application - Heap sort

7.6 Height balanced tree- AVL trees- Rotations, AVL tree examples.

8. Graph [7]

8.1 Concept & terminologies

8.2 Graph Representation – Adjacency matrix, adjacency list, inverse Adjacency list, adjacency multi list, orthogonal list

8.3 Traversals – BFS and DFS

8.4 Spanning Tree

8.5 Applications – AOV network – topological sort, AOE network – critical path

References:

1. Fundamentals of Data Structures ---- By Horowitz Sahani (Galgotia)
2. Data Structures using C and C++ --- By YedidyahLangsam, Aaron M. Tenenbaum, Moshe J. Augenstein
3. Introduction to Data Structures using C---By Ashok Kamthane
4. Data Structures using C --- Bandopadhyay&Dey (Pearson)
5. Data Structures using C ---By Srivastav

Course Outcomes	Programme Outcomes (POs)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	3	3	2	3	2
CO2	3	3	3	3	2	3	2
CO3	2	3	3	2	2	3	2
CO4	1	3	3	2	1	2	1
CO5	2	2	3	1	1	2	1
CO6	3	3	3	3	2	3	2
CO7	3	3	3	3	2	3	2

Mapping of PO1 With All CO's with Justification :

CO1. With PO1: Applying well-organized data structures is a fundamental principle of computer science that directly contributes to solving a wide range of applications.

CO2. With PO1: The ability to differentiate and select appropriate data structures is crucial in applying fundamental principles to solve diverse problems in computer science applications.

CO3. With PO1: Understanding discrete structures is fundamental to applying computer science principles in various applications.

CO4. With PO1: Studying logic and Boolean Algebra is essential for applying fundamental principles in various computational applications.

CO5. With PO1: While proof techniques contribute to applying fundamental principles, their direct application may vary in different applications.

CO6. With PO1: Understanding graph theory contributes directly to visualizing and simplifying problems in various applications of computer science.

CO7. With PO1: Efficient implementation of data structures is crucial in applying fundamental principles to a wide range of practical applications in computer science.

Mapping of PO2 With All CO's with Justification :

CO1. With PO2: Well-organized data structures are integral to designing and correctly implementing solutions to significant computational problems.

CO2. With PO2: The ability to differentiate and select appropriate data structures is crucial in designing and implementing effective solutions to computational problems.

CO3. With PO2: Understanding discrete structures is essential for designing and implementing solutions to significant computational problems.

CO4. With PO2: While logic and Boolean Algebra contribute to problem-solving, their direct impact on the design and implementation of solutions may vary.

CO5. With PO2: Proof techniques may be less directly tied to the practical aspects of designing and implementing solutions to computational problems.

CO6. With PO2: Graph theory directly contributes to visualizing and simplifying problems, enhancing the design and implementation of computational solutions.

CO7. With PO2: Efficient implementation of data structures is crucial in the design and correct implementation of solutions to significant computational problems.

Mapping of PO3 With All CO's with Justification:

CO1: With PO3: Understanding and using data structures is fundamental to the discipline, and it forms the basis for solving a variety of problems.

CO2: With PO3: Differentiating between various data structures is crucial in selecting the most appropriate one for solving specific problems, reflecting a deep understanding of the discipline.

CO3: With PO3: Discrete structures are foundational concepts in the discipline, and understanding them is essential for a solid grasp of the basics.

CO4: With PO3: Propositional logic and Boolean Algebra are fundamental to computer science, and studying them contributes significantly to understanding the basics of the discipline.

CO5: With PO3: Proof techniques are fundamental to understanding the theoretical aspects of computer science, aligning closely with the goal of imparting a basic understanding of the discipline.

CO6: With PO3: Graph theory is a fundamental part of computer science, and understanding its basics contributes to visualizing and simplifying a wide range of problems.

CO7: With PO3: Efficient implementation of data structures is a practical application of the basics of the discipline, demonstrating a strong connection between understanding and application.

Mapping of PO4 With All CO's with Justification:

CO1. With PO4: Proficiency in utilizing well-organized data structures is crucial for ongoing professional development in the field of computer science.

CO2. With PO4: The ability to differentiate and select appropriate data structures is a skill that contributes significantly to professional development in solving diverse and complex problems.

CO3. With PO4: Understanding discrete structures is valuable for professional development, though its direct impact may vary depending on the specific career path.

CO4. With PO4: While logic and Boolean Algebra are important foundations, their direct impact on professional development may be more evident in specific applications.

CO5. With PO4: While proof techniques contribute to theoretical knowledge, their direct impact on day-to-day professional development may be limited.

CO6. With PO4: Graph theory skills contribute to problem-solving and visualization, enhancing one's capabilities for continued professional development.

CO7. With PO4: Efficient implementation of data structures is a practical skill that directly supports ongoing professional development in various computer science roles.

Mapping of PO5 With All CO's with Justification:

CO1. With PO5: While well-organized data structures contribute to problem-solving, their direct connection to understanding the societal and environmental impact may be less evident.

CO2. With PO5: The ability to differentiate and select appropriate data structures is important for problem-solving but may not directly correlate with understanding societal and environmental impacts.

CO3. With PO5: While understanding discrete structures is valuable, its direct link to societal and environmental contexts may be less immediate.

CO4. With PO5: Logic and Boolean Algebra may have limited direct relevance to societal and environmental impacts.

CO5. With PO5: Analyzing proof techniques may have limited direct application to understanding the societal and environmental impact of IT solutions.

CO6. With PO5: While graph theory contributes to problem-solving, its direct connection to societal and environmental impacts may be less immediate.

CO7. With PO5: Efficient implementation of data structures is essential for problem-solving, but its direct link to societal and environmental impacts may be less direct.

Mapping of PO6 With All CO's with Justification:

CO1. With PO6: Proficiency in using well-organized data structures is a key aspect of developing expertise in the practice of computing.

CO2. With PO6: The ability to differentiate and select appropriate data structures is a skill that directly contributes to proficiency in solving computational problems.

CO3. With PO6: Understanding discrete structures is crucial for developing proficiency in various computational practices.

CO4. With PO6: While logic and Boolean Algebra are important, their direct impact on the practical aspects of computing proficiency may vary.

CO5. With PO6: Analyzing proof techniques contributes to theoretical knowledge, but their direct impact on practical computing proficiency may be less immediate.

CO6. With PO6: Understanding graph theory enhances proficiency by providing tools for visualizing and simplifying computational problems.

CO7. With PO6: Efficient implementation of data structures is a practical skill that is integral to developing proficiency in the practice of computing.

Mapping of PO7 With All CO's with Justification :

CO1. With PO7: Proficiency in using well-organized data structures contributes to problem-solving skills, which are important for independent study and research.

CO2. With PO7: The ability to differentiate and select appropriate data structures supports problem-solving skills necessary for independent study and research.

CO3. With PO7: Understanding discrete structures is valuable for independent study and research, providing a theoretical foundation for various applications.

CO4. With PO7: While logic and Boolean Algebra are important, their direct relevance to transitioning to employment may be limited.

CO5. With PO7: Analyzing proof techniques may contribute to theoretical knowledge but may have limited direct impact on transitioning to employment.

CO6. With PO7: Understanding graph theory enhances problem-solving skills, contributing to the capacity for independent study and research.

CO7. With PO7: Efficient implementation of data structures is a practical skill that can enhance the ability to transition to employment in hardware/software companies through hands-on experience.

Subject: Computer Science   **Paper Code :** CSCO2302
Title of Paper: Introduction to Web Technology   **Paper:** II
Credit: 3(4 Lectures/Week)   **No. of lectures:** 48
OBJECTIVES: Students successfully completing this course will be able:

1. To understand different Web technologies.
2. To keep pace with the rapidly changing landscape of web application development.
3. To Design dynamic and interactive web pages.

<u>**Course Outcomes:**</u>

CO1: Students will able to Design web pages using HTML5, CSS, JavaScript and Bootstrap.

CO2: Students will able to Design dynamic, interactive and elegant Web sites.

CO3: Students will be able to write a server side application to catch form data sent from client and store it on database.

CO4: Students will able to Analyze a web page and identify its elements and attributes.

CO5: Students will able to Create web pages using Cascading Style Sheets. Build dynamic web pages using JavaScript (Client side programming).

CO6: Students will able to Build dynamic web pages using JavaScript (Client side programming).

CO7: Students will able to Acquiring the basic concepts of the Web with reference to its architecture.

Title and Contents		No. of Lectures
Unit 1	**Basics of Web Design** 1.1 History of the Internet 1.2 World Wide Web Consortium (W3C) 1.3 Personal, Distributed and Client/Server Computing 1.4 Key Software Trend: Object Technology 1.5 Software Technologies 1.6 Client Server Architecture	04
Unit 2	**Introduction to HTML5** 2.1 Difference between HTML & HTML5 2.2 HTML Document and Basic Structure 2.3 Working with HTML Text, Heading, Paragraph, formatting 2.4 HTML Color, Link, Image 2.5 HTML Lists, Tables and Frames 2.6 HTML Forms Block, Layout 2.7 Browser Portability	12
Unit 3	**Specific Elements of HTML5** 3.1 Header & Footer 3.2 Navigation Section 3.3 Article & Aside 3.4 The Meter Element 3.5 Working with Hyperlinks and Multimedia 3.6 Working with Forms and controls.	9
Unit 4	**The Basic of CSS** 4.1 Into. Concepts of CSS & Creating of CSS, Using Inline CSS,CSS Color 4.2 Using Internal CSS, Using ID's and Classes, Creating External CSS. 4.3 Linking to External CSS, Inefficient Selectors and Efficient Selectors. 4.4 HTML Elements State, the CSS Box Model, Fonts 4.5 Introduction to CSS 3.0 4.6 Alpha Color Space, Opacity	16

Unit 5	**JavaScript**	3
	5.1 Introduction to JavaScript	
	5.2 JavaScript Basics – Data Types, Control Structure	
	5.3 JavaScript Functions	
	5.4 Working with events	
	5.5 JS Popup boxes	
	5.6 JavaScript Objects	
Unit 6	**Emerging Trends in Web Technologies**	4
	6.1 Introduction to –	
	6.1.1) CMS-Wordpress/Drupal/Joomla	
	6.1.2) jQuery	
	6.1.3) AngularJS	
	6.1.4) Bootstrap	

Note: Regular Practical assignment on HTML5 is 50% and one mini Project.

References:

1) Html & CSS: The Complete Reference, Fifth Edition by Thomas A. Powell and published by McGraw Hill.
2) HTML 5 in simple steps by Kogent Learning SolutionsInc., Publisher Dreamtech Press
3) Head First HTML with CSS & XHTML Book by Elisabeth Freeman and Eric Freeman.
4) The Essential Guide to CSS and HTML Web Design Book by Craig Grannell.
5) Beginning XML by Joe Fawcett, Liam R.E. Quin & Danny Ayers
Published by John Wiley & Sons, Inc.

Mapping of this course with Programme Outcomes

Course Outcomes	Programme Outcomes (POs)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	2	1	2	2	2
CO2	3	3	2	1	2	2	2
CO3	3	3	3	1	3	3	2
CO4	2	1	1	1	1	2	1
CO5	3	2	2	1	2	2	2
CO6	3	3	2	1	2	2	2
CO7	2	1	1	1	1	1	1

Weight: 1 - Partially related   2 - Moderately Related   3 - Strongly related

Mapping of PO1 with All CO'S
CO1: PO1: Strongly relates (3) - This outcome directly applies mathematical and computer fundamentals to design web pages by utilizing HTML5, CSS, JavaScript, and Bootstrap.
CO2: PO1: Strongly relates (3) - This outcome requires the application of mathematics, statistics, and computer fundamentals to design dynamic and interactive websites.
CO3: PO1: Strongly relates (3) - This outcome involves applying computer fundamentals and knowledge of programming to develop server-side applications for handling form data.
CO4: PO1: Moderately relates (2) - This outcome involves applying knowledge of computer fundamentals and HTML to analyze web pages, with a slightly lower emphasis on mathematics and statistics.
CO5: PO1: Strongly relates (3) - This outcome directly applies computer fundamentals to create web pages using Cascading Style Sheets (CSS) and dynamic web pages using JavaScript.

CO6: PO1: Strongly relates (3) - This outcome involves applying computer fundamentals to build dynamic web pages through client-side programming using JavaScript.

CO7: PO1: Moderately relates (2) - This outcome involves understanding the basic concepts of the web and its architecture, with a focus on computer fundamentals.

Mapping of PO2 with All CO'S

CO1: PO2: Moderately relates (2) - Designing web pages involves the use of the latest technologies (HTML5, CSS, JavaScript, Bootstrap) but may not necessarily require in-depth knowledge of various languages.

CO2: PO2: Strongly relates (3) - Designing dynamic and interactive websites requires the use of the latest technologies and languages for effective implementation.

CO3: PO2: Strongly relates (3) - Writing server-side applications using JSP involves both designing and implementing solutions using the latest technologies and languages.

CO4: PO2: Partially relates (1) - Analyzing web pages is more focused on understanding the structure and content rather than actively designing solutions using various languages.

CO5: PO2: Moderately relates (2) - Creating web pages with CSS and building dynamic pages with JavaScript require knowledge of the latest technologies but may not cover a broad range of languages.

CO6: PO2: Strongly relates (3) - Building dynamic web pages with client-side programming emphasizes the use of the latest technologies and languages for effective implementation.

CO7: PO2: Partially relates (1) - Acquiring basic concepts of the web and its architecture involves understanding principles rather than actively designing solutions with various languages.

Mapping of PO3 with All CO'S

CO1: PO3: Moderately relates (2) - Designing web pages involves the use of modern engineering and IT tools (HTML5, CSS, JavaScript, Bootstrap) but may not explicitly emphasize modeling and prediction techniques.

CO2: PO3: Moderately relates (2) - Designing dynamic and interactive websites requires the use of modern tools, but the emphasis may not be on explicit prediction and modeling techniques.

CO3: PO3: Strongly relates (3) - Writing server-side applications involves the use of modern engineering and IT tools, especially for database interactions.

CO4: PO3: Partially relates (1) - Analyzing a web page may involve modern tools, but it may not explicitly include prediction and modeling techniques.

CO5: PO3: Moderately relates (2) - Creating web pages with CSS and building dynamic pages with JavaScript involves using modern tools, but the focus may not be on explicit prediction and modeling techniques.

CO6: PO3: Moderately relates (2) - Building dynamic web pages with client-side programming involves modern tools, but may not explicitly include prediction and modeling techniques.

CO7: PO3: Partially relates (1) - Acquiring basic concepts of the web and its architecture may involve modern tools, but may not explicitly include prediction and modeling techniques.

Mapping of PO4 with All CO'S

CO1: PO4: Partially relates (1) - Designing web pages with HTML5, CSS, JavaScript, and Bootstrap may not directly address the societal and environmental impact of IT solutions.

CO2: PO4: Partially relates (1) - Designing dynamic and interactive websites may not explicitly consider the societal and environmental impact of IT solutions.

CO3: PO4: Partially relates (1) - Writing server-side applications may not explicitly consider the societal and environmental impact of IT solutions.

CO4: PO4: Partially relates (1) - Analyzing a web page may not directly address the societal and environmental impact of IT solutions.

CO5: PO4: Partially relates (1) - Creating web pages with CSS and building dynamic pages with JavaScript may not explicitly consider the societal and environmental impact of IT solutions.

CO6: PO4: Partially relates (1) - Building dynamic web pages with client-side programming may not directly address the societal and environmental impact of IT solutions.

CO7: PO4: Partially relates (1) - Acquiring basic concepts of the web and its architecture may not explicitly consider the societal and environmental impact of IT solutions.

Mapping of PO5 with All CO'S

CO1: PO5: Moderately relates (2) - Designing web pages involves ethical considerations related to user experience, accessibility, and information presentation, but may not explicitly address broader professional ethics and responsibilities.

CO2: PO5: Moderately relates (2) - Designing dynamic and interactive websites involves ethical considerations, such as user privacy and security, but may not explicitly address broader professional ethics.

CO3: PO5: Strongly relates (3) - Writing server-side applications involves considerations of professional ethics and responsibilities, especially when dealing with sensitive form data and database interactions.

CO4: PO5: Partially relates (1) - Analyzing a web page may not explicitly address broader professional ethics and responsibilities, but ethical considerations may arise in data handling.

CO5: PO5: Moderately relates (2) - Creating web pages with CSS and building dynamic pages with JavaScript involves ethical considerations related to user experience and functionality but may not explicitly address broader professional ethics.

CO6: PO5: Moderately relates (2) - Building dynamic web pages with client-side programming involves ethical considerations related to user interactions, security, and privacy but may not explicitly address broader professional ethics.

CO7: PO5: Partially relates (1) - Acquiring basic concepts of the web and its architecture may not explicitly address broader professional ethics, but ethical considerations may arise in discussions of data transmission and system design.

Mapping of PO6 with All CO'S

CO1: PO6: Moderately relates (2) - Designing web pages may involve both individual work and collaboration in a team, but the emphasis is on individual skills in web design technologies.

CO2: PO6: Moderately relates (2) - Designing dynamic and interactive websites may involve both individual and collaborative efforts, emphasizing skills in web design technologies and teamwork.

CO3: PO6: Strongly relates (3) - Writing server-side applications involves individual and team work, as it requires collaboration in designing and implementing the application.

CO4: PO6: Moderately relates (2) - Analyzing a web page may involve both individual and collaborative efforts, as it requires understanding the structure and attributes of a web page.

CO5: PO6: Moderately relates (2) - Creating and building web pages involve both individual and team work, emphasizing skills in web design technologies and potential collaboration in implementing dynamic features.

CO6: PO6: Moderately relates (2) - Building dynamic web pages with client-side programming may involve both individual and collaborative efforts, emphasizing skills in JavaScript and teamwork.

CO7: PO6: Partially relates (1) - Acquiring basic concepts of the web and its architecture may not explicitly emphasize teamwork but could involve collaborative discussions.

Mapping of PO7 with All CO'S

CO1: PO7: Moderately relates (2) - Designing web pages may contribute to innovation, employability, and entrepreneurial skills by creating opportunities for value creation, but the direct link to entrepreneurship may be moderate.

CO2: PO7: Moderately relates (2) - Designing dynamic and interactive websites may contribute to innovation and employability, but the direct link to entrepreneurial skills may be moderate.

CO3: PO7: Moderately relates (2) - Writing server-side applications may contribute to innovation, employability, and entrepreneurial skills, but the direct link to entrepreneurship may be moderate.

CO4: PO7: Partially relates (1) - Analyzing a web page may not directly contribute to innovation and entrepreneurial skills, but it may indirectly support employability.

CO5: PO7: Moderately relates (2) - Creating and building web pages may contribute to innovation and employability, but the direct link to entrepreneurial skills may be moderate.

CO6: PO7: Moderately relates (2) - Building dynamic web pages with client-side programming may contribute to innovation and employability, but the direct link to entrepreneurial skills may be moderate.

CO7: PO7: Partially relates (1) - Acquiring basic concepts of the web and its architecture may not directly contribute to innovation and entrepreneurial skills, but it may support employability.

Subject: Computer Science   **Paper Code :** CSCO2303
Title of Paper: Lab Course I based On Data structure   **Paper:** III (Lab Course-I)
Credit: 2(3 Hour Practical /batch/Week)   **No. of Practical's:** 12

Prerequisites:
- Basic knowledge of algorithms and problem solving.
- Knowledge of C Programming Language.
  Course Outcome:
    o CO1.To understand different Data structure.
    o CO2. Be able to design and analyze the time and space efficiency of the data structure
    o CO3.Be capable to identity the appropriate data structure for given problem • 4.Have practical knowledge on the applications of data structures.
    o CO5.Ability to understand a systematic approach to organizing, writing and debugging C programs
    o CO6.Ability to implement linear and non-linear data structure operations using C programs
    o CO7.Ability to solve problems implementing appropriate data structures

- ➢ Assignment 1 – Sorting Algorithms
    o Bubble Sort
    o Insertion Sort
    o Quick Sort
    o Merger Sort

- ➢ Assignment 2 - Recursive Sorting Algorithms
    o Quick sort,
    o Merge Sort

- ➢ Assignment 3 - Searching Method
    o Linear search,
    o Binary search

- ➢ Assignment 4 - Stack
    o Static Stack Implementation
    o Dynamic Stack Implementation

- ➢ Assignment 5 Queue
    o Static and Dynamic Implementation
    o Linear Queue,
    o Circular queue

- ➢ Assignment 6 Linked List –
    o Dynamic Implementation of Singly Linked List
    o Dynamic Implementation of Doubly Linked List
    o Dynamic Implementation of Circular Linked List.

- ➢ Assignment 7 Tree –
    o Binary Search Tree Traversal: Create, add, delete, and display nodes.

- ➢ Assignment 8 Graph –
    o Adjacency matrix to adjacency list conversion, in degree, out degree

Mapping of PO's With All CO's:

Course Outcomes	Programme Outcomes (POs)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	3	2	2	3	2
CO2	3	3	2	2	1	2	2
CO3	3	3	3	2	2	3	3
CO4	3	3	2	3	2	3	2
CO5	2	2	2	3	1	3	2
CO6	3	3	2	3	2	3	3
CO7	3	3	3	3	2	3	3

Mapping of PO1 With All CO's with Justification:

CO1. With PO1: Understanding various data structures is fundamental to applying computer science principles to a wide range of applications.

CO2. With PO1: Designing and analyzing the efficiency of data structures directly contribute to applying fundamental principles to various applications in computer science.

CO3. With PO1: The ability to identify the appropriate data structure is crucial in applying fundamental principles to solve diverse problems in computer science applications.

CO4. With PO1: Strongly Related. Practical knowledge of data structure applications directly supports the application of fundamental principles in various computer science contexts.

CO5. With PO1: While understanding programming is essential, its direct link to applying principles in various applications may vary.

CO6. With PO1: Implementing data structure operations using C programs directly aligns with applying fundamental principles to solve a wide range of problems.

CO7. With PO1: Solving problems by implementing appropriate data structures is a direct application of fundamental principles to address various challenges in computer science applications.

Mapping of PO2 With All CO's with Justification:

CO1. With PO2: Understanding various data structures is foundational for designing and implementing solutions to significant computational problems.

CO2. With PO2: Designing and analyzing the efficiency of data structures is integral to creating solutions for significant computational problems.

CO3. With PO2: The ability to identify the appropriate data structure is crucial in the design and implementation of solutions to significant computational problems.

CO4. With PO2: Practical knowledge of data structure applications is essential for designing and implementing solutions to significant computational problems.

CO5. With PO2: While understanding programming is crucial, its direct link to designing and implementing solutions may vary.

CO6. With PO2: Implementing data structure operations using C programs is directly related to designing and implementing solutions to significant computational problems.

CO7. With PO2: Solving problems by implementing appropriate data structures is a direct application of designing and implementing solutions to significant computational problems.

Mapping of PO3 With All CO's with Justification:

CO1. With PO3: Understanding various data structures is fundamental to imparting a basic understanding of the discipline.

CO2. With PO3: While design and analysis contribute to the understanding of the basics, their direct relationship may vary.

CO3. With PO3: The ability to identify the appropriate data structure is crucial in imparting a basic understanding of the discipline.

CO4. With PO3: Practical knowledge of data structure applications contributes to the practical understanding of the discipline.

CO5. With PO3: Understanding programming approaches is important in imparting a basic understanding of the discipline.

CO6. With PO3: Implementing data structure operations is relevant to understanding the basics, but its direct relationship may vary.

CO7. With PO3: Solving problems through the implementation of appropriate data structures directly contributes to imparting a basic understanding of the discipline.

Mapping of PO4 With All CO's with Justification:

CO1. With PO4: Understanding various data structures is important for professional development, though its direct connection may vary.

CO2. With PO4: Design and analysis contribute to professional development, but their direct impact on preparation for continued development may vary.

CO3. With PO4: The ability to identify the appropriate data structure is valuable for continued professional development but may not be the sole factor.

CO4. With PO4: Practical knowledge of data structure applications is directly tied to preparing for continued professional development.

CO5. With PO4: Understanding a systematic approach to programming is crucial for continued professional development.

CO6. With PO4: Implementing data structure operations using C programs is directly related to preparing for continued professional development.

CO7. With PO4: Solving problems through the implementation of appropriate data structures is directly tied to preparing for continued professional development.

Mapping of PO5 With All CO's with Justification:

CO1. With PO5: Understanding data structures is important, but its direct connection to societal and environmental impacts may vary.

CO2. With PO5: Design and analysis contribute more directly to technical aspects, and their connection to societal impacts may be less evident.

CO3. With PO5: Identifying appropriate data structures is relevant to solving real-world problems but may not directly address societal and environmental impacts.

CO4. With PO5: Practical knowledge of data structures applications contributes to understanding real-world scenarios, but the direct link to societal and environmental contexts may vary.

CO5. With PO5: Understanding a systematic approach to programming is more directly tied to technical aspects than societal and environmental impacts.

CO6. With PO5: Implementing data structures in C programs contributes more directly to technical skills, and its connection to societal and environmental impacts may be less immediate.

CO7. With PO5: Solving problems with data structures is essential, but the direct link to societal and environmental contexts may vary.

Mapping of PO6 With All CO's with Justification:

CO1. With PO6: Understanding various data structures is fundamental to developing proficiency in the practice of computing.

CO2. With PO6: Designing and analyzing the efficiency of data structures contributes to developing proficiency in the practical aspects of computing.

CO3. With PO6: The ability to identify the appropriate data structure is crucial for developing proficiency in the practice of computing.

CO4. With PO6: Practical knowledge of data structure applications is directly tied to developing proficiency in the practice of computing.

CO5. With PO6: Understanding a systematic approach to programming is fundamental to developing proficiency in the practical aspects of computing.

CO6. With PO6: Implementing data structure operations using C programs is directly related to developing proficiency in the practice of computing.

CO7. With PO6: Solving problems through the implementation of appropriate data structures is crucial for developing proficiency in the practice of computing.

Mapping of PO7 With All CO's with Justification:

CO1. With PO7: Understanding various data structures contributes to the capacity for independent study and research, but it may not be the sole factor.

CO2. With PO7: Design and analysis contribute to independent study and research skills, but their direct impact may vary.

CO3. With PO7: The ability to identify the appropriate data structure is crucial for independent study and research, contributing to skills needed for transitioning to employment.

CO4. With PO7: Practical knowledge of data structure applications contributes to the practical understanding needed for independent study and research.

CO5. With PO7: Understanding a systematic approach to programming is important for independent study and research but may not be the sole factor.

CO6. With PO7: Implementing data structure operations are directly related to independent study and research skills, contributing to transitioning to employment.

CO7. With PO7: Solving problems through the implementation of appropriate data structures is crucial for developing the capacity for independent study and research, supporting transitioning to employment.

Subject: Computer Science   **Paper Code :** CSCO2304
Title of Paper: Lab Course II based On Web Technology   **Paper:** IV (Grade)
Credit: 2(3 Hour Practical/Week/batch)   **No. of Practical:** 13

OBJECTIVES: Students successfully completing this course will be able:
   1. To understand different Web technologies.
   2. To keep pace with the rapidly changing landscape of web application development.
   3. To Design dynamic and interactive web pages.

Learning Outcome:

CO1: Students will practically implement technologies like HTML5, CSS, JavaScript and Bootstrap.
CO2: Students will Apply HTML5 technologies to design dynamic, interactive and elegant Web Sites.
CO3: Students will Analyze a web page and identify its elements and attributes.
CO4: Students will Create web pages using Cascading Style Sheets.
CO5: Students will Practically Build dynamic web pages using JavaScript (Client-side programming).
CO6: Students will Apply Bootstrap technologies to design dynamic, interactive and elegant Web Sites.
CO7: Students will Practically implement and Design dynamic, interactive and elegant Web sites.

Assignment on Web Technology Using (HTML5, CSS & Java Script)	
Sr. No.	**Assignment Name**
1	Be acquainted with elements, Tags and basic structure of HTML files.
2	Develop the concept of basic and advanced text formatting.
3	Practice the use of multimedia components in HTML documents.
4	Designing of webpage-Document Layout, Working with List, Working with Tables.
5	Practice Hyper linking, Designing of webpage-Working with Frames, Forms and Controls.
6	Prepare creating style sheet, CSS properties, Background, Text, Font and styling etc.
7	Working with List, HTML elements box, Positioning and Block properties in CSS.
8	Designing with cascading style sheet-Internal and External style sheet.
9	Working with CSS 3.0,Alpha Color Space, Opacity
10	Practice the use JavaScript Basics Programs Data Types, Control Structure
11	Develop the concept of basicand advance using JavaScript Functions
12	Practicethe use JavaScript events (onClick, onMousemove and onMouseover events of button object)
13	Designing event driven JavaScript program and use Popup boxes
14	Working with JavaScript Objects

Mapping of this course with Programme Outcomes

Course Outcomes	Programme Outcomes (POs)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	2	1	2	2	1
CO2	3	3	2	1	2	2	1
CO3	3	1	1	1	1	2	1
CO4	3	2	2	1	2	2	1
CO5	3	3	2	1	2	2	1
CO6	3	3	2	1	2	2	1
CO7	3	3	2	1	2	2	1

Weight: 1 - Partially related   2 - Moderately Related   3 - Strongly related

Mapping of PO1 with All CO'S

CO1: PO1: Strongly relates (3) - The application of technologies like HTML5, CSS, JavaScript, and Bootstrap directly aligns with the computer knowledge, involving mathematics, statistics, and computer fundamentals.

CO2: PO1: Strongly relates (3) - Applying HTML5 technologies for dynamic and interactive web design aligns with the computer knowledge and fundamentals specified in PO1.

CO3: PO1: Strongly relates (3) - Analyzing a web page requires applying knowledge of HTML elements and attributes, which is part of the computer knowledge and fundamentals outlined in PO1.

CO4: PO1: Strongly relates (3) - Creating web pages with Cascading Style Sheets (CSS) involves applying knowledge of design principles and computer fundamentals specified in PO1.

CO5: PO1: Strongly relates (3) - Building dynamic web pages with client-side programming (JavaScript) aligns with the application of computer knowledge and fundamentals.

CO6: PO1: Strongly relates (3) - Applying Bootstrap technologies for dynamic and interactive web design aligns with the computer knowledge and fundamentals specified in PO1.

CO7: PO1: Strongly relates (3) - Designing dynamic and interactive web sites involves applying computer knowledge and fundamentals, including mathematics, statistics, and programming.

Mapping of PO2 with All CO'S

CO1: PO2: Strongly relates (3) - Applying these technologies aligns with designing and developing solutions for IT applications using the latest technologies, as specified in PO2.

CO2: PO2: Strongly relates (3) - Applying HTML5 technologies for dynamic and interactive web design is directly aligned with designing solutions for IT applications using the latest technologies.

CO3: PO2: Partially relates (1) - While analyzing a web page is part of the development process, it may not explicitly capture the design aspect of solutions using the latest technologies.

CO4: PO2: Moderately relates (2) - Creating web pages with Cascading Style Sheets (CSS) is part of the solution development process, but the explicit mention of the latest technologies is not emphasized.

CO5: PO2: Strongly relates (3) - Building dynamic web pages with client-side programming (JavaScript) aligns with designing and implementing solutions using the latest technologies.

CO6: PO2: Strongly relates (3) - Applying Bootstrap technologies for dynamic and interactive web design directly aligns with designing solutions using the latest technologies.

CO7: PO2: Strongly relates (3) - Designing dynamic and interactive web sites is directly aligned with designing solutions for IT applications, as specified in PO2.

Mapping of PO3 with All CO'S

CO1: PO3: Moderately relates (2) - Applying these technologies is part of modern tool usage, but the direct connection to the application of appropriate techniques and resources may be moderate.

CO2: PO3: Moderately relates (2) - Applying HTML5 technologies for dynamic and interactive web design contributes to modern tool usage, but the connection to prediction and modeling may be moderate.

CO3: PO3: Partially relates (1) - Analyzing a web page involves modern tool usage, but the direct connection to prediction and modeling is not explicitly mentioned.

CO4: PO3: Moderately relates (2) - Creating web pages with Cascading Style Sheets (CSS) is part of modern tool usage, but the emphasis on prediction and modeling is not explicit.

CO5: PO3: Moderately relates (2) - Building dynamic web pages with client-side programming (JavaScript) contributes to modern tool usage, but the connection to prediction and modeling may be moderate.

CO6: PO3: Moderately relates (2) - Applying Bootstrap technologies for dynamic and interactive web design is part of modern tool usage, but the emphasis on prediction and modeling is not explicit.

CO7: PO3: Moderately relates (2) - Designing dynamic and interactive web sites involves modern tool usage, but the connection to prediction and modeling may be moderate.

Mapping of PO4 with All CO'S

CO1: PO4: Partially relates (1) - The application of technologies is not explicitly connected to understanding the impact on societal and environmental contexts or demonstrating knowledge of sustainable development.

CO2: PO4: Partially relates (1) - The application of HTML5 technologies for web design is not explicitly connected to understanding societal and environmental impact or demonstrating knowledge of sustainable development.

CO3: PO4: Partially relates (1) - Analyzing a web page does not explicitly address understanding societal and environmental impact or demonstrating knowledge of sustainable development.

CO4: PO4: Partially relates (1) - Creating web pages with Cascading Style Sheets (CSS) is not explicitly connected to understanding societal and environmental impact or demonstrating knowledge of sustainable development.

CO5: PO4: Partially relates (1) - Building dynamic web pages with client-side programming (JavaScript) is not explicitly connected to understanding societal and environmental impact or demonstrating knowledge of sustainable development.

CO6: PO4: Partially relates (1) - Applying Bootstrap technologies for web design is not explicitly connected to understanding societal and environmental impact or demonstrating knowledge of sustainable development.

CO7: PO4: Partially relates (1) - Designing dynamic and interactive web sites is not explicitly connected to understanding societal and environmental impact or demonstrating knowledge of sustainable development.

Mapping of PO5 with All CO'S

CO1: PO5: Moderately relates (2) - Applying technologies involves considerations of ethical principles related to responsible use and design, but the direct link to professional ethics and responsibilities may be moderate.

CO2: PO5: Moderately relates (2) - Applying HTML5 technologies for web design involves ethical considerations, but the direct connection to professional ethics and responsibilities may be moderate.

CO3: PO5: Partially relates (1) - Analyzing a web page may involve ethical considerations, but the direct link to professional ethics and responsibilities is not explicitly mentioned.

CO4: PO5: Moderately relates (2) - Creating web pages with Cascading Style Sheets (CSS) involves ethical considerations related to design principles, but the direct link to professional ethics and responsibilities may be moderate.

CO5: PO5: Moderately relates (2) - Building dynamic web pages with client-side programming (JavaScript) involves ethical considerations, but the direct connection to professional ethics and responsibilities may be moderate.

CO6: PO5: Moderately relates (2) - Applying Bootstrap technologies for web design involves ethical considerations, but the direct link to professional ethics and responsibilities may be moderate.

CO7: PO5: Moderately relates (2) - Designing dynamic and interactive web sites involves ethical considerations, but the direct connection to professional ethics and responsibilities may be moderate.

Mapping of PO6 with All CO'S

CO1: PO6: Moderately relates (2) - Applying technologies involves individual work, but the direct connection to functioning in diverse teams is not explicitly mentioned.

CO2: PO6: Moderately relates (2) - Applying HTML5 technologies for web design involves individual skills, but the connection to team collaboration is not explicitly emphasized.

CO3: PO6: Moderately relates (2) - Analyzing a web page may involve both individual and collaborative efforts, contributing to functioning in diverse teams to some extent.

CO4: PO6: Moderately relates (2) - Creating web pages with Cascading Style Sheets (CSS) may involve individual work, but the direct connection to team collaboration is not explicitly mentioned.

CO5: PO6: Moderately relates (2) - Building dynamic web pages with client-side programming (JavaScript) may involve individual and collaborative efforts, contributing to functioning in diverse teams to some extent.

CO6: PO6: Moderately relates (2) - Applying Bootstrap technologies for web design involves individual skills, but the connection to team collaboration is not explicitly emphasized.

CO7: PO6: Moderately relates (2) - Designing dynamic and interactive web sites involves individual skills, but the connection to team collaboration is not explicitly emphasized.

Mapping of PO7 with All CO'S

CO1: PO7: Partially relates (1) - Applying technologies is a component of innovation and employability, but the direct connection to identifying opportunities, creating value, and pursuing entrepreneurial skills is not explicitly mentioned.

CO2: PO7: Partially relates (1) - Applying HTML5 technologies for web design is a component of innovation and employability, but the direct connection to entrepreneurial skills and creating value is not explicitly emphasized.

CO3: PO7: Partially relates (1) - Analyzing a web page is not explicitly linked to innovation, employability, or entrepreneurial skills in the provided context.

CO4: PO7: Partially relates (1) - Creating web pages with Cascading Style Sheets (CSS) is a component of employability, but the direct connection to innovation and entrepreneurial skills is not explicitly mentioned.

CO5: PO7: Partially relates (1) - Building dynamic web pages with client-side programming (JavaScript) is a component of employability, but the direct connection to innovation and entrepreneurial skills is not explicitly emphasized.

CO6: PO7: Partially relates (1) - Applying Bootstrap technologies for web design is a component of employability, but the direct connection to innovation and entrepreneurial skills is not explicitly mentioned.

CO7: PO7: Partially relates (1) - Designing dynamic and interactive web sites is a component of employability, but the direct connection to innovation and entrepreneurial skills is not explicitly emphasized.