SHIVAJI UNIVERSITY, KOLHAPUR - 416 004, MAHARASHTRA

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शिवाजी विद्यापीठ, कोल्हापूर - ४१६ ००४,महाराष्ट्र

दूरध्वनी - ईपीएबीएक्स - २६०९०००, अभ्यासमंडळे विभाग दुरध्वनी ०२३१—२६०९०९३/९४

Estd. 1962
"A++" Accredited by
NAAC(2021)
With CGPA 3.52

SU/BOS/Science/498   Date: 10/07/2023

To,

The Principal, All Concerned Affiliated Colleges/Institutions Shivaji University, Kolhapur	The Head/Co-ordinator/Director All Concerned Department (Science) Shivaji University, Kolhapur.

Subject: Regarding syllabi of B.Sc. Part-II (Sem. III & IV) as per NEP-2020 degree programme under the Faculty of Science and Technology.

Sir/Madam,

With reference to the subject mentioned above, I am directed to inform you that the university authorities have accepted and granted approval to the revised syllabi, nature of question paper and equivalence of B.Sc. Part-II (Sem. III & IV) as per NEP-2020 degree programme under the Faculty of Science and Technology.
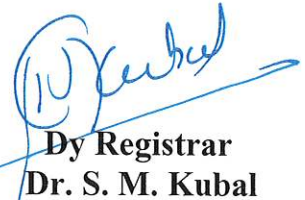
B.Sc.-II (Sem. III & IV) as per NEP-2020			
1.	Computer Science (Opt)	8.	Food Technology &Management (Entire)
2.	Computer Science (Entire)	9.	Biochemistry
3.	Animation (Entire)	10.	Biotechnology (Optional/Vocational)
4.	Information Technology (Entire)	11.	Biotechnology (Entire)
5.	Food Science and Technology (Entire)	12.	Environmental Science (Entire)
6.	Food Science	13.	Pollution
7	Food Science and Quality Control (Entire)		

This syllabus, nature of question and equivalence shall be implemented from the academic year 2023-2024 onwards. A soft copy containing the syllabus is attached herewith and it is also available on university website **www.unishivaji.ac.in**)

The question papers on the pre-revised syllabi of above-mentioned course will be set for the examinations to be held in October /November 2023 & March/April 2024. These chances are available for repeater students, if any.

You are, therefore, requested to bring this to the notice of all students and teachers concerned.

Thanking you,

Dy Registrar
Dr. S. M. Kubal

Copy to:

1	The Dean, Faculty of Science & Technology	8	P.G. Admission/Seminar Section
2	Director, Board of Examinations and Evaluation	9	Computer Centre/ Eligibility Section
3	The Chairman, Respective Board of Studies	10	Affiliation Section (U.G.) (P.G.)
4	B.Sc. Exam/ Appointment Section	11	Centre for Distance Education

SHIVAJI UNIVERSITY, KOLHAPUR

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Choice Based Credit System with Multiple Entry and Multiple Exit Options

As per NEP-2020

Syllabus for

B.Sc. Part – II

COMPUTER SCIENCE (Optional)

SEMESTER – III AND IV

(Syllabus to be implemented from Academic Year 2023-24)

B.Sc. Computer Science (Optional) Semester - III & IV
(CBCS) NEP-2020 Syllabus to be implemented from June 2023 Onwards

1. **TITLE:** Computer Science
2. **YEAR OF IMPLEMENTATION**: Revised Syllabus will be implemented from June 2023 onwards.
3. **DURATION:** B.Sc. in Computer Science Part - II The duration of the course shall be one year and two semesters.
4. **PATTERN:** The pattern of examination will be semester.
5. **STRUCTURE OF COURSE:**

STRUCTURE OF COURSE

Sr. No.	Paper	Name of Paper	Marks		
			Theory	Internal	Total
Computer Science (Semester - III)					
1	DSC-C11	Web Technology	40	10	50
2	DSC-C12	Object Oriented Programming Using C++	40	10	50
Computer Science (Semester - IV)					
3	DSC-D11	Cyber Security Essentials	40	10	50
4	DSC-D12	Data Structure Using C++	40	10	50
Practical (Annual)					
5	Practical Paper-II	Computer Science Practical Paper Based on DSC-C11	50 (Practical)	-	50
6	Practical Paper-III	Computer Science Practical Paper Based on DSC-C12 and DSC-D12	50 (Practical)	-	50

6. **EQUIVALENCE IN ACCORDANCE WITH TITLES AND CONTENTS OF PAPERS**

(FOR REVISED SYLLABUS)

Sr. No.	Title of old paper	Sr. No.	Title of New paper
SEMESTER III			
1	PHP and MySQL	1	Web Technology
2	Object Oriented Programming Using C++	2	Object Oriented Programming Using C++
SEMESTER – IV			
3	Cyber Security Essentials-I	3	Cyber Security Essentials
4	Data Structure Using C++	4	Data Structure Using C++
PRACTICAL (ANNUAL PATTERN)			
5	Computer Science Practical Paper - II	5	Computer Science Practical Paper - II
6	Computer Science Practical Paper - III	6	Computer Science Practical Paper - III

Course Code: DSC-C11   Computer Science Paper –V
Course Title: Web Technology
Total Contact Hours: 36 Hrs (45 Lectures of 48 Min.)
Teaching Scheme: Theory – 03 Lect. / Week

Credits: 02   **Total Marks: 50**

Course Outcomes:
Upon successful completion of this course, students will be able to
1. understand the principles of web design.
2. construct basic websites using HTML and Cascading Style Sheets.
3. build dynamic web pages with validation using JavaScript.
4. develop a modern web application that meets the current industry requirement.

Unit – 1: Introduction to Internet, HTML, CSS and JavaScript   **18 Hrs.**

1.1 Fundamentals
    1.1.1 Introduction Internet.
    1.1.2 WWW, Web Browsers, Web Servers.URL and URI.

1.2 Overview of different protocols
    1.2.1 HTTP, SMTP, FTP.

1.3 HTML
    1.3.1 Introduction,
    1.3.2 Standard HTML Document Structure
    1.3.3 Basic Text Formatting Elements <b>, <strong>, <i>, <s>, <emp>, <u>, <small>, <big>, <tt>.
    1.3.4 Images <img>, Hypertext Links<a>, <span> and <div>,Lists -Ordered and Unordered, <input> (Type – Text, Password, Button, Submit, Reset).

1.4 Cascading Style Sheets
    1.4.1 Introduction
    1.4.2 Types of CSS
    1.4.3 Basic syntax
    1.4.4 Selectors –element, id, class, group, universal.
    1.4.5 Style Properties of color, font, text, size and border

1.5 Java Script
    1.5.1 Introduction
    1.5.2 Document Object Model
    1.5.3 Variables, Datatypes and Operators
    1.5.4 Control Statement – if, if-else, break
    1.5.5 Looping Statements – while, for
    1.5.6 Element Access in Java scripts – getElementById() and getElementsByName()
    1.5.7 Event and event handling – onClick(), onBlur(), onFocus(), onKeyPress()
    1.5.8 dialog boxes – alert(), prompt(), confirm().

Unit – 2: Introduction to PHP   **18 Hrs.**

2.1 Introduction PHP –

        2.1.1 Introduction and Features,

        2.1.2 PHP basic syntax <?php...?>,

        2.1.3 Comment(single and multiline),

        2.1.4 Echo command, PHP script execution in web browser.

        2.1.5 Variables: Basics, Variable naming rules, unset(), gettype(), isset(),

        2.1.6 constants -define() and constant()

        2.1.7 Operators: Arithmetic, Comparison, Relational, Assignment, Increment Decrement, Ternary, Other operators(., $, @, {}, ``, =>),

        2.1.8 Strings: Single Quoted and Double Quoted, escape sequences,

        2.1.9 Forms: HTML forms, action and get & post methods. PHP super global variables ($_GET, $_POST, $_REQUEST

        2.1.10 Decision-Making Statements: if, if... else, if ... elseif...else, switch statement, iterative Statements: for, while, do... while, foreach, break and continue statement

        2.1.11 Exit statements: exit, die

        2.1.12 User-Defined Functions: Declaring functions, Function call

        2.1.13 Arrays: Concept, Types(Numerical/List, Associative/Maps, Multidimensional), accessing array elements

2.2 Database Connection – Connection to MySQL

        2.2.1 Establishing Connection - mysqli_connect()

        2.2.2 Closing connection - mysqli_close()

        2.2.3 Select a database - mysqli_select_db()

        2.2.4 Execute MySQL commands- mysqli_query()

        2.2.5 Fetch data from tables - mysqli_fetch_row(), mysqli_fetch_array(), mysqli_fetch_assoc()

Reference Books –

1. Web Programming – John Dean, John and Bartlett Learning
2. Internet Fundamentals & Concepts – Shubhra Garg, S.K.Kataria& Sons
3. Web Technologies HTML, JavaScript, PHP, Java, JSP, ASP.NET, XML, and AJAX - Comprehensive Problem Solver, Black Book -Kogent Learning Solutions Inc, Dreamtech Press, Willey India Pvt Ltd.
4. Internet and World Wide Web How to Program – P. J. Deitel, H. M. Deitel,, Pearson
5. PHP and MySQL byDreamtech Publications
6. PHP Concepts Unleashed for Novice – Vol I - By Poornima Naik, Kavita Oza, Evincepub Publishing
7. PHP A Beginner's Guide – Vikram Vaswami
8. Beginning PHP 6, Apache, MySQL Web Development- By Timothy Boronczyk, ElizabethNaramore, Jason Gerner, Yann Le Scouarnec, Zeremy Stolz, Michael K. Glass
9. PHP and MySQL by Rajendra Salokhe, Aruta Publications
10. Learning Laravel: The easiest way – Jack Vo, Lean Publishing
11. Beginning Laravel -Sanjib Sinha, Apress
12. Web application development with Laravel PHP Framework version 4 - Jamal Armel, Metropolia

Practical Based on DSC-C11

1) For PHP practical use HTML form to take user input (avoid console-based input).
2) Also, provide more assignments to students for practice apart from the list provided below.

Sr. No.	Particulars
1.	Create a web page to demonstrate the use of text formatting elements.
2.	Create a web page having a link to another web page containing a gallery of images.
3.	Design a web page to demonstrate CSS selectors.
4.	Design a Web page to demonstrate the use of – CSS Text, Color, Border, and Size properties.
5.	Design a web page having three sections Header, Footer and Navigation Bar. Use <div>,<span>, and CSS.
6.	Create a web page i) To check given number is odd or even ii) To check given number is a Palindrome or not. iii) To check given number is Armstrong or not.
7.	Create a web page to perform simple arithmetic calculations
8.	Create a web page with a Textbox and 4 buttons. Click on the 1st button will display the text entered in the text box on the web page, click on 2nd button will change text color, click on 3rd button will change font and click on 4th button will set border to text.
9.	Design an HTML form with the following fields and validate user input using JavaScript: Roll No., Name and Email address.
10.	Design a web page to input temperature in degree Celsius. Convert the temperature to degree Fahrenheit using PHP script.
11.	Design a web page to input a number. Using PHP script check whether given number is Odd/Even.
12.	Design a web page to input a number. Using PHP script check whether given number is Palindrome/Armstrong and display message in Web page accordingly.
13.	Design a web page to input a number. Using PHP script check whether given number is Prime or Not.
14.	Write a PHP script that will display array elements, smallest element in array, largest element in array and Sum of elements of array. (Use hard coded array)
15.	Write PHP script to display 'n' terms of Fibonacci series using user defined function.
16.	Write PHP script to display factorial of natural number using user defined function.

17.	Create Employee database in MySQL with table EmployeeMaster (EmpId, EmpName, EmpDepartment). Create a web page having a form with the above fields, connect the web page to MySQL and perform Insert, Update and Delete operations through the web page.

18.	Use the Employee database (Specified in Sr. No.17) and perform the following operation through the web page
	   i. Display all employee details.
	   ii. Display Employees from a specific department.
	   iii. Display count of employees in a particular department.

19.	Create Student Database in MySQL with the following table: StudentMaster (RollNo, StudentName, AdmittedClass, DateOfBirth). Design a complete web form to perform CRUD operation on the above table.

3) Assignments using Laravel PHP web framework -

Introduce the following concepts to the students:

    a. Introduction of Laravel
    b. Features of Laravel
    c. Introduction of MVC Pattern
    d. Laravel Directory Structure
    e. Installation - using Composer
    f. Laravel Application Structure
    g. Laravel Routing - Basic Routing, Routing Parameters, Laravel Named Routes
    h. Laravel Controllers, Routing Controllers, Resource Controllers
    i. Laravel Views, Passing data to views

Create a minimum of two basic Laravel Web Applications.

Credits: 02   **Total Marks: 50**

Course Outcomes:
Upon successful completion of this course, students will be able to
1. understand the principles of web design.
2. understand how C++ improves C with object oriented features
3. learn syntax and semantics of C++ programming language
4. learn how to write inline functions for efficiency and performance.
5. learn how to overload functions and operators in C++.
6. learn how to design C++ classes for code reuse.
7. learn how inheritance promotes code reuse in C++.
8. learn how inheritance and virtual functions implement dynamic binding with polymorphism.

Unit – 1: Introduction to C++   **12 Hrs.**
  1.1 Object oriented programming Concepts: Object, class, Encapsulation, Abstraction, Polymorphism, Inheritance
  1.2 Procedure Oriented programming versus Object oriented programming
  1.3 Basic C++ program:
      1.3.1 Header file, using namespace std, main(), input:>> extraction using cin and output: << insertion using cout operator
      1.3.2 C++ Tokens:
             1.3.2.1 Keywords - bool, class, delete, namespace, friend
             1.3.2.2 Identifiers, Constants, Strings
  1.4 Structure of C++ Program
  1.5 Benefits of C++ over C Language
  1.6 C++ Data Types:
      1.6.1 Built-in / Fundamental: void, char, int, float, double
      1.6.2 User defined- struct, union, enum, class
      1.6.3 Derived- array, function, pointer, reference

  1.7 Variable:
      1.7.1 Definition, Declaration, Initialisation
      1.7.2 Dynamic Initialisation and reference variables
  1.8 Operators in C++:
      1.8.1 DMA operators: new, delete
      1.8.2 Scope resolution operator::
      1.8.3 Manipulators: setw, endl, setprecision
  1.9 Function:
      1.9.1 Function Call: by value, by pointer, by reference, return by reference
      1.9.2 Default arguments, const arguments
      1.9.3 Inline function
      1.9.4 Function overloading

Unit – 2: Object Oriented Programming   **24 Hrs.**

   2.1 Class:
      2.1.1 Difference between struct and class
      2.1.2 Class specification: class declaration, class definition, adding data membersand member functions
      2.1.3 Access modifiers/ visibility labels – private, public, protected members
      2.1.4 Member function definition - inside the class and outside the class
      2.1.5 Object definition and memory allocation of object
      2.1.6 Use of this pointer
      2.1.7 Static members - data members and member function
      2.1.8 Scope of a variable - local, local to class, global
   2.2 Friend function and friend class:
      2.2.1 Characteristics of friend function, Declaration and Definition of friend function
      2.2.2 Use of friend class
   2.3 Constructor and Destructor:
      2.3.1 Constructor - Definition, Characteristics, features
      2.3.2 Types - Default, parameterized, copy
      2.3.3 Destructor- Definition, Need of destructor
   2.4 Operator overloading:
      2.4.1 Concept, Rules
      2.4.2 Definition of operator function:
             2.4.2.1 Using member function to overload unary and binary operators
                   Example: unary operator --, ++ and Binary-Arithmetic Operator
             2.4.2.2 Using friend function to overload unary and binary operators
                   Example: unary operator --, ++ and Binary-Arithmetic Operator
   2.5 Inheritance:
      2.5.1 Concept, Definition
      2.5.2 Types: single, multilevel, multiple, hierarchical, hybrid
      2.5.3 Defining derived class
      2.5.4 Introducing protected members, visibility of derived members
      2.5.5 Diamond problem with hybrid inheritance -virtual inheritance and virtual base class
   2.6 Polymorphism:
      2.6.1 Concept, Definition
      2.6.2 Types: Compile time/early binding/static binding and run time/ late binding / dynamic binding
      2.6.3 Pointer to object
      2.6.4 Virtual and pure virtual functions -abstract class, rules for virtual functions

Reference Books

1. Object - Oriented Programming in C++ by Rajesh K. Shukla - Wiley India Pvt. Ltd
2. Object Oriented Programming Using C++ by Poonam Ponde
3. Object-Oriented Programming with C++ by E Balagurusamy - McGraw Hill India
4. Mastering C++ by K. R. Venugopal - McGraw Hill Higher Education
5. C++ Programming by D. Ravichandran
6. A Tour of C++ (2nd Edition) - Bjarne Stroustrup.
7. The C++ Programming Language (4th Edition) - Bjarne Stroustrup.

Practical Based on DSC-C12

Use "Problem Solving Techniques" for following problems and implement code through C++ programming language. It includes: Problem Analysis, Algorithm, Flowchart, Output Tracing using Algorithm, Source Code with Output

First introduce the C++ compilation process and components (cpp, g++, as only) with a simple program and Debugging using(GDB).

Sr. No.	Content
1	**Function Default Argument:** i) To calculate perimeter of square(4*r), rectangle(2*l+2*b), triangle (a+b+c) ii) To calculate area of square(r*r), rectangle(l*b), trapezium(1/2*h*(s1+s2)) Keeping other argument to default value zero.
2	**Function Overloading:** i) To calculate perimeter of square(4*r), rectangle(2*l+2*b), triangle (a+b+c) ii) To calculate area of square(r*r), rectangle(l*b), trapezium(1/2*h*(s1+s2))
3	**Constructor And Destructor:** Demonstrate the working of constructor (default, parameterised, copy) and destructor to allocate and de-allocate memory to or from an array of integers using DMA operators new and delete.
4	**Static Members:** Display counter which counts numbers of objects of class, counter is incremented in constructor and decremented in destructor.
5	**Friend Function:** Create two classes Celsius and Fahrenheit and define friend functions to add and to compare two temperatures.
6	**Operator Overloading:** To overload binary arithmetic operator using member function/friend function
7	**Operator Overloading:** To overload unary --, ++ operator using member function/friend function
8	**Pure Virtual Function And Inheritance:** To specify base class Shape with pure virtual methods Input(), Perimeter() and Area(). Inherit three classes Square, Rectangle and Triangle from class Shape with appropriate data members and override methods Input(), Perimeter() and Area(). Use Pointer of class Shape to access objects of Three classes and Demonstrate working in "main" function.

Course Code: DSC-D11   Computer Science Paper –VII
Course Title: Cyber Security Essentials
Total Contact Hours: 36 Hrs (45 Lectures of 48 Min.)
Teaching Scheme: Theory – 03 Lect. / Week

Credits: 02   **Total Marks: 50**

Course Outcomes:
Upon successful completion of this course, students will be able to
1. understand the concept of information security management.
2. learn different access control methods.
3. understand wireless network security.
4. learn cyber security laws and the importance of security audit.

Unit – 1: Computer Networks and Information Security   **12 Hrs.**

- **Basic Terminologies:** Network, Internet, Internet Protocols, IP Address, MAC Address, Domain Name Server (DNS), DHCP. Components of computer networks - files server, workstation. Network, devices - hub, repeater, bridge, router, gateway.
- **OSI Model, TCP/IP Model**
- **Information Security:** Network Security, Types of Network Security, Cyber Security, CIA Triad, Common Types of Attacks -Distributed denial of service (DDoS), Man in the middle, Email attacks, Password attacks, Malware attacks. DoS attack, Goals for Security, E-commerce Security, Security protocols, Computer Forensics, Security Management- Overview of Security Management, Information Classification Process, Security Policy, Risk Management, Security Procedures and Guidelines, Business Continuity and Disaster Recovery, Ethics and Best Practices.

Unit – 2: Network Security, Access Controls, Cyber Security and Cyber Laws   **24 Hrs.**

- **Wireless Network Security:** Components of wireless networks, Security issues in wireless, Firewall, types of firewall.
- **Access Controls:** Overview of Authentication and Authorization, Overview of Intrusion Detection Systems, Intrusion Detection Systems and Intrusion Prevention Systems.
- **Introduction to Cyber Security:** Firewalls, Intrusion Detection Systems, Response, Scanning, Security policy, Threat Management, Cyber Security Vulnerabilities and Cyber Security Safeguards Introduction to Cryptography, Network-based Intrusion detection, Intrusion prevention system, ethical hacking
- **Cyber Security:** Email security: PGP and SMIME, Web Security: web authentication, SSL and SET, Database Security.
- **Cyber Security Laws:** Cyber Crime, Security Assurance, Security Laws, Intellectual Property Rights, International Standards, Security Audit- Need, Importance.

References:

1. Computer Network -AS Tannenbum
2. Cyber Security for Beginners: Everything you need to know about it (Cyber security, Cyber war, Hacking) - Harry Colvin.
3. How NOT To Use Your Smartphone - Rodney D Cambridge.
4. Online Safety: Scams, SPAM, Viruses and Clouds (Cyber Security Community Book - A.M. Perry.

5. Cyber Security Essentials- James Graham, Richard Howard, Ryon Olson (E-book)
6. Network Security Secrets and Solutions – Stuart McClure, Joe Scambray, George Kurtz.
7. Information Assurance Handbook: Effective Computer Security and Risk Management Strategies – Corey Schou, Steven Hernandez.
8. Applied Network Security Monitoring: Collection, Detection, and Analysis – Chris Sanders, Jason Smith.
9. E-Commerce- Indian Perspective- P.T. Joseph S.J.
10. E-Commerce and Security- Kjell Orsborn (E-book)

B.Sc. Part – II Computer Science (Optional) (Semester – IV)
Course Code: DSC-D12   Computer Science Paper –VIII
Course Title: Data Structure Using C++
Total Contact Hours: 36 Hrs (45 Lectures of 48 Min.)
Teaching Scheme: Theory – 03 Lect. / Week

Credits: 02   **Total Marks: 50**

Course Outcomes:
Upon successful completion of this course, students will be able to
1. understand the basic concepts such as Abstract Data Types, Linear and Non-Linear Data structures.
2. choose appropriate data structures to represent data items in real-world problems.
3. analyze the time and space complexities of algorithms.
4. design programs using a variety of data structures such as array, stacks, queues, and linked list.
5. analyze and implement various kinds of searching and sorting techniques.

Unit – 1: Introduction to Data Structures: Stack and Queue   18 Hrs.

 1.1 Concept of Abstract Data Types:
 1.1.1 Definitions, Data types, Data Object, Data structure (D-Data, A-Axioms, O-Operations),
 1.1.2 Classification (Primitive, Non-Primitive: Array, Files, List: Linear, Non-Linear),
 1.1.3 Basic Operations (Traversing, Searching, Insertion, Deletion, Sorting, Merging)

 1.2 Sorting:
 1.2.1 Definition
 1.2.2 Stable-Unstable Sorting
 1.2.3 Adaptive-Non Adaptive Sorting
 1.2.4 Order of Sorting (Increasing, Decreasing, Non Increasing, Non Decreasing)
 1.3 Sorting Techniques: Bubble sort, Selection sort, Insertion sort, Quick sort
 1.4 Searching: Linear and Binary Search
 1.5 Stack:
 1.5.1 Definition
 1.5.2 Operations (Push, Pop, Peek, Isfull, Isempty),
 1.5.3 Implementation using array
 1.6 Applications of stack: Mathematical Expressions (Well-Parentheses, Notations: Infix, Prefix, Postfix, Conversion from Infix to Postfix and Infix to Prefix)
 1.7 Queue –
 1.7.1 Definition of queue
 1.7.2 Operations (Enqueue, Dequeue, Peek, Isfull, Isempty)
 1.7.3 Types of queue (Linear, Circular, Priority)
 1.7.4 Implementation Linear Queue using array(Compaction)
 1.7.5 Applications of Queue

Unit – 2: Linked List and Trees   18 Hrs.

 2.1 Linked List:
 2.1.1 Concept of linked list
 2.1.2 Types Of Linked List (Singly-Doubly, Linear-Circular)
 2.1.3 Implementation of Linked list

2.1.4 Operations on linear linked list (Insertion, Deletion, Display, Search)

2.1.5 Application

2.1.5.1 Implementation of stack and queue using linked list.

2.2 Trees:

2.2.1 Definition

2.2.2 Terminologies (Root, Child, Parent, Siblings, Descendant, Ancestor, Leaf/External node, Branch node/Internal node, Degree, Edge, Path, Level, Depth, Height of node, Height of tree, Forest)

2.3 Binary Tree:

2.3.1 Definition

2.3.2 Types (Full/Proper/Plane, Complete, Perfect, Skewed, Balanced)

2.4 Binary Search Tree:

2.4.1 Definition

2.4.2 Representation

2.4.3 Operations (Insertion, Deletion, Search, Tree Traversal: Preorder, Inorder, Postorder)

Reference Books

1. Data Structures Using C and C++ by Yedidyah Langsam, Aaron M. Tenenbaum
2. Data Strucure using C++ - E Balagurusamy
3. Data Structures Through C++ by Yashavant Kanetkar
4. Data Strucure Using C++ by D. S. Malik

Practical Based on DSC-D12

Use "Problem Solving Techniques" for the following problems. It includes: Problem Analysis, Algorithm, Flowchart, Output Tracing using Algorithm, and Source Code with Output.
Compiler: GNU g++ and Debugging using (GDB).

Sr. No	Content
1	**Stack And Application:**(Using Array) i) Implementation and Operations on Stack ii) Check Expression is Well-Parenthesised or not "Use [,(,{ brackets" iii) Conversion of infix expression to postfix and prefix "Use (only"
2	**Queue:**(Using Array) i) Implementation and Operations on Linear Queue ii) Implementation and Operations on Circular Queue (Use Count)
3	**Sorting**: i) Bubble sort ii)Insertion sort iii)Selection sort iv)Quick Sort(recursive function)
4	**Searching**: i) Linear Search ii) Binary Search
5	**Linked List**: i) Implementation and Operations on Linear Linked List ii) Implementation and Operations on Circular Linked List(Use Count) iii) Implementation and Operations on Circular Linked List
6	**Stack using Linked List**: i) Implementation and Operations using Linear Linked List on Stack
7	**Queue using Linked List**: i) Implementation and Operations using Linear Linked List on Queue ii) Implementation and Operations using Circular Linked List on Circular Queue
8	**Binary Search Tree using Linked List**: i) Implementation and Operations (insert, display inorder, preorder and post order with recursive function) using Linked List on BST.