Part B

Syllabus Prescribed for 2022-23 Year UGProgramme

Programme: B.Sc. I Semester – II (Computer Science /

Computer Application [Voc/Non-Voc]/IT)

Code of the Course/Subject	Title of the Course/Subject	(Total Number of Periods)
1CS2	**Data Structure and OOPS**	**84 Periods**

COs

Upon completion of this course successfully, Students would be able to -

1. Implement basic data structures such as arrays, stacks.
2. use linked list, trees and queues.
3. Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data.
4. Describe the procedural and object-oriented paradigm with concepts of streams, classes, functions, data and objects.
5. Perform programming on functions, inline functions, constructor and destructor.
6. Perform programming on the concept of function overloading, operator overloading, virtual functions and polymorphism.

Units	Content	
Unit I	**Data structure:** Introduction to data structure, Types of data structure: Primitive and Non-primitive, Linear and Non-linear data structure, Data structure operations. **Array:** Definition and concepts, Memory Representations, Operations: Traversing, Insertion, Deletion. **Stacks:** Definition and concepts, Memory Representations, Operations: Traversing, Insertion, Deletion.	**14 (Periods)**
Unit II	**Queue:** Definition and concepts, Memory Representations, Operations: Traversing, Insertion, Deletion. Types of Queue. **Linked List:** Definition and concepts, Memory Representations, Types of Linked List, and Operations: Traversing, Insertion, Deletion. **Tree:** Definition and Terminologies, Memory Representations of Trees, Types of Trees : Binary Trees, Complete Binary Trees, Binary Search Trees, Traversing : Preorder, Inorder, Postorder, Insertion, Deletion.	**14 (Periods)**
Unit III	**Searching and Sorting:** Definition and concept. **Searching Techniques:** Linear Search**,** Binary Search and Indexed Sequential Search. **Sorting Techniques:** Bubble Sort, Selection Sort, Insertion Sort, Radix Sort, Merge Sort and Quick Sort.	**14 (Periods)**
Unit IV	**Object Oriented Programming:** Features, Advantages and Applications of OOPS. Comparisons between POP and OOP, Introduction to C++, Program structure in C++. **Classes and Objects:** Classes and Objects Specifiers, Defining data member and member functions, Accessing members. **Managing Console I/O:** Formatted and Unformatted, Usage of manipulators: endl & setw, Scope Resolution Operator.	**14 (Periods)**
Unit V	**Functions in C++:** Passing objects to and returning objects from functions. Function Overloading and Default argument, Inline function, Friend function. Array of Objects, Pointer to objects, 'this' pointer. Constructor and Destructor: Types of constructor, Usage of Constructor.	**14 (Periods)**
Unit VI	**Operator Overloading:** Definition, Overloading Unary and Binary operators. **Inheritance:** Definition, Types of Inheritance, Visibility mode; Types of inheritance with example, Virtual base classes and Abstract base classes.	**14 (Periods)**

*SEM : Assignment, Class test, Study tour, Industrial visit, Group discussion or any other innovative practice/activity
COs: 1. Acquire skill to work with core components of data structure 2. Acquire object oriented programming skill.

**Activities	1. Assignment 2. Group discussion 3. Study tour/ Industrial visit

Course Material/Learning Resources

Text books:

1. Object Oriented Programming with C++ : E Balagurusamy TMH
2. Data Structures , Seymour Lipschutz , Schaum's Outlines Series, Tata McGraw-Hill.
3. Text Book of Computer Science (Data Structure and C++): S D Pachpande, R B Ghayalkar and Athar Iqbal, Dnyanpath Publication.

Reference Books:

1. Fundamentals of Data Structures in C, Ellis Horowitz, Sartaj Sahni and Susan Anderson-Freed. W. H. Freeman and Company.
2. Object-Oriented Programming in C++, Fourth Edition, Robert Lafore, SAMS Publication.
3. Data Structure and Algorithms :Aho, Hopcroft, Ulman
4. Introduction to Data Structure : Bhagat Singh, Thomas L Naps
5. Mastering in C++ by K. R. Venugopalan.
6. Data Structure and C++: P.S.Bodkhe, A.A.Tayade, S.B.Agarmore, Dnyanpath Publication.

Weblink to Equivalent MOOC on SWAYAM if relevant:

1. https://onlinecourses.swayam2.ac.in/cec22_cs19/
2. https://onlinecourses.nptel.ac.in/noc22_cs92/
3. https://onlinecourses.nptel.ac.in/noc22_cs70/

Any pertinent media (recorded lectures, YouTube, etc.) if relevant:

1. https://www.youtube.com/watch?v=RBSGKlAvoiM
2. https://www.youtube.com/watch?v=zg9ih6SVACc

Syllabus Prescribed for 2022-23 Year UG Programme

Programme: LAB 2 B.Sc. I Semester II (Computer Science /

Computer Application [Voc/Non-Voc]/IT)

Semester - II

Code of the Course/Subject	Title of the Course/Subject	(Number of Periods/Week)
1CSLAB2	**Data Structure and OOPs**	**06 Periods/Batch per week**

 Course name: Data Structure and OOPs lab
 COs

Upon completion of this course successfully, Students would be able to   demonstrate/perform/accomplish the following

1. Perform various operations Data structure using CPP.
2. Develop the concept of dynamic memory allocation through linked list.
3. Design stack and queue with contiguous and non-contiguous data storage mechanism.
4. Perform the various operations on binary tree.
5. Implement sorting on 1-D array using different techniques.

Practical List of Data Structure

1. Write a Data Structure program in C to insert the element into the STACK using PUSH operation.
2. Write a Data Structure program in C to delete the element from the STACK using POP operation.
3. Write a Data Structure program in C to insert the element into the QUEUE.
4. Write a Data Structure program in C to delete the element from the QUEUE.
5. Write a Data Structure program in C to insert the node into the Linked List.
6. Write a Data Structure program in C to delete the node from the Linked List.
7. Write a Data Structure program in C to demonstrate the Linear Search.
8. Write a Data Structure program in C to demonstrate the Binary Search.
9. Write a Data Structure program in C to demonstrate the Bubble Sort.
10. Write a Data Structure program in C to demonstrate the Sorting Algorithms.

Practical List of Object Oriented Programming language

1. Write a program in C++ to demonstrate Class and Object.
2. Write a program in C++ to demonstrate constructor and destructor.
3. Write a program in C++ to demonstrate Inline function.
4. Write a program in C++ to demonstrate the use of friend function.
5. Write a program in C++ for default argument.
6. Write a program in C++ for unary operator overloading.
7. Write a program in C++ for Binary operator overloading.
8. Write a program in C++ for function overloading.
9. Write a program in C++ for virtual base class.
10. Write a program in C++ to implement the Inheritance.

Weblink to Equivalent Virtual Lab if relevant:

1. http://cse01-iiith.vlabs.ac.in/

Distribution of Marks for Practical Examination

> **Time: 4 hours (One Day Examination)   Marks: 50**
> **Exercise-I 15**
> **Exercise-II.............. 15**
> **Viva-Voce............... 10**
> **Record 10**
>   **Total: 50**

By the end of the Lab/Practical Course, generally students should be able to:

1. Collect data and revise the experimental procedure iteratively, reflectively, and responsively
2. Design and execute an experimental procedure, work independently, interpret experimental results, and draw a reasonable, accurate conclusion.
3. Evaluate the process and outcomes of an experiment quantitatively and qualitatively,
4. Extend the scope of an investigation whether or not results come out as expected,
5. Communicate the process and outcomes of an experiment, and
6. Conduct an experiment collaboratively and ethically.