

Branch Name:	Bachelor of Computer Application (BCA)
Program Code:	CS101
Course Title:	Data Structures with OOPS
Course Code:	23-CAM202-2C
Pre-requisite Course:	Basic Knowledge of C language. Condition, Loop, functions.

Course Objective (CO):

This course is intended to make the students:

- Students aware of Object-Oriented Programming (OOP) concepts.
- Acquire knowledge of various types of data structures, operations and algorithms. And Sorting and searching operations.
- Analyze the performance of Stack, Queue, Lists, Trees, and Hashing, Searching and Sorting Techniques.
- Implement all the applications of Data structures in a high-level language.
- Design and apply appropriate data structures for solving computing problems.

Teaching and Examination Scheme:

Teaching Scheme(Hours per week)				Evaluation Scheme (Marks)								
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory				Practical				Total
				University Assessment		Continuous Assessment		University Assessment		Continuous Assessment		
				Min. Marks	Mix. Marks	Min. Marks	Mix. Marks	Min. Marks	Max. Marks	Min. Marks	Max. Marks	
3	-	4	5	18	50	09	25	09	25	09	25	125

Course Contents:			
Sr. No.	Topic	Total Hours	Weight (%)
1.	Basic Concepts of Objects Oriented Programming: Introduction, Object-Oriented Paradigm, Basic Concept of OOP, Procedural Programming Vs. Object Oriented Programming. Introduction to C++: History of C++, Structure of C++Program, Output Operator (<<), Input Operator (>>), Basic Data types, Symbolic Constants, Reference Variable, Scope Resolution Operator, Manipulators. Functions in C++: Inline Function, Default Argument Function, Function Overloading.	10	20
2.	Classes and Objects: Specifying a Class, Creating Objects, Accessing Class Members, Defining Member Functions, Nesting of Member Function, Private Member Function, Friend Function. Static Members: Static Data Member, Static Member Function.	12	25

3.	Constructors and Destructors: Introduction, Types of Constructor (Default Constructor, Parameterized Constructor), Multiple Constructors, Destructors. Inheritance/Extending Classes: Introduction, Defining Derived Classes. Types of Inheritance: Single Inheritance, Multilevel Inheritance, Multiple Inheritance, Hierarchical Inheritance.	12	25
4.	Introduction to Data Structure: Introduction to Data Structure. Types of Data structure: Primitive and Non- Primitive Data Structure, Linear and Non-Linear Data Structure. Linear Data Structures: Introduction to Arrays. Stack: Introduction, Application of Stack. Queues: Introduction, Simple Queue, Circular Queue, priority Queue. Linked List: Singly Linked List, Double Linked List. Sorting: Introduction, Selection, Bubble, Insertion, Shell, Quick sort Searching: Introduction, Sequential Search and Binary Search.	14	30

Course Learning Outcomes (CLO):

At the end of this course, the student would be able

1. **CLO1:** To understand the concept of Managing Data in organization.
2. **CLO2:** To create programs to solve a problem of various operations on Queues, Stacks, Linked.
3. **CLO3:** Lists, Sorting, Searching. To learn the basic searching and sorting algorithms.
4. **CLO4:** Understand how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms.
5. **CLO5:** Learn the benefits of dynamic and static data structures implementations.
6. **CLO6:** Demonstrate different methods for traversing trees.

List Text Book:

1. Object Oriented Programming With C++, By E Balagurusamy, Tata McGraw-Hill.
2. "An Introduction to Data Structure", Nirav Prakashan 1st Edition 2013.
3. Object Oriented Programming and C++, By Raja ram, New Age International Publishers.
4. "Classic Data Structures ", by DEBASIS SAMANTHA 2nd EDITION, PHI publications , 2009.
5. "Data Structures and Algorithms", by NARASIMHA KARUMANCHI, CAREERMONK Publications , 2017.

List of Reference Book:

1. Teach Yourself C++, By Herbert Schildt, Tata McGraw-Hill.
2. Let Us C++, By Yashavant Kanetkar, BPB Publications.
3. Data structures by Lipschutz, McGraw Hill Education.
4. Fundamentals of Data Structures in C by Sahni Horowitz, University Press.
5. Data Structures And Algorithms by Alfred V Aho and John E Hopcroft and Jeffrey D Ullman, Pearson Education.

E-Resource / Web Links:

1. <http://www.studytonight.com/cpp/introduction-to-cpp.php>
2. <https://www.w3schools.in/data-structures/intro>
3. <https://www.javatpoint.com/data-structure-tutorial>
4. <https://www.geeksforgeeks.org/data-structures/>
5. https://www.tutorialspoint.com/data_structures_algorithms/index.htm
6. <https://www.studytonight.com/data-structures/>

List of Experiments:

Note: The experiment list provided beneath is for reference only. The course teacher may change/formulate it as per his/her methodology and requirement.

Practical List

1. Write an Object Oriented (O.O.) Program in C++ that displays “Hello Friends!” message on the screen.
2. Write a Program of reference variables.
3. Write a Program for scope resolution operators.
4. Write a Program to implement the use of manipulator operators.
5. Write a Program of inline functions.
6. Write a Program to implement the concept of default argument function.
7. Write a Program for function overloading.
8. Write a Program for nesting of member functions.
9. Write a Program for a friend function.
10. Write a Program to implement the default constructor.
11. Write a Program to implement the parameterized constructor.
12. Write a Program to implement a destructor.
13. Write a Program to implement single inheritance.
14. Write a Program for multilevel inheritance.
15. Program for implementation of stack using arrays.
16. Program for implementation queue using array.
17. Program for implementation of circular queue.
18. Program for implementation linear linked list (creation, insertion, deletion, display).
19. Program for implementation of doubly linked list.
20. Program for bubble sort.
21. Program for selection sort.
22. Program for insertion sort.
23. Program for quick sort.
24. Program for linear (sequential) searching.
25. Program for binary searching.

Mapping of CLO with PO and PSO

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	L	M		H	H	M		L	L				L		L
CLO2			L	M		H	M	M		L	L			M	M
CLO3	L	M		L	H	M		L	L				L		
CLO4	M				L	H		H	H	M		L	L	H	
CLO5	L	M		H	H	M		L	L				L		
CLO6		L	M		L	H	M		L	L				M	

H: High, M: Medium, L: Low