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|----------------------------------|--------------------------------------------------|
| <b>Subject Code : 2CS1010301</b> | <b>Subject Title: OOPS WITH DATA STRUCTURE</b>   |
| <b>Pre-requisite:</b>            | <b>Basic Knowledge of Procedural Programming</b> |

**Course Objective:**

This course is intended to make the students aware of Object Oriented Programming (OOP) concepts. Students are expected to learn various terminologies related to OOP such as class, objects, inheritance, polymorphism, encapsulation, abstraction etc. The course aims to make the students to formulate and solve data problem using algorithms and different data structure techniques.

| Teaching Scheme(Hours per week) |          |           |        | Evaluation Scheme (Marks) |            |                       |            |                       |            |                       |            |       |
|---------------------------------|----------|-----------|--------|---------------------------|------------|-----------------------|------------|-----------------------|------------|-----------------------|------------|-------|
| Lecture                         | Tutorial | Practical | Credit | Theory                    |            |                       |            | Practical             |            |                       |            | Total |
|                                 |          |           |        | University Assessment     |            | Continuous Assessment |            | University Assessment |            | Continuous Assessment |            |       |
|                                 |          |           |        | Min. Marks                | Max. Marks | Min. Marks            | Max. Marks | Min. Marks            | Max. Marks | Min. Marks            | Max. Marks |       |
| 3                               | -        | 4         | 5      | 28                        | 70         | 12                    | 30         | 12                    | 30         | 8                     | 20         | 150   |

| Subject Contents |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |             |            |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|------------|
| Sr. No.          | Topics                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Total Hours | Weight (%) |
| 1.               | <b>Basic Concepts of Objects Oriented Programming:</b> Introduction, Object-Oriented Paradigm, Basic Concept of OOP, Procedural Programming Vs. Object Oriented Programming.<br><b>Introduction to C++:</b> History of C++, Structure of C++ Program, Output Operator (<<), Input Operator (>>), Basic Data types, Symbolic Constants, Reference Variable, Scope Resolution Operator, Manipulators.<br><b>Functions in C++:</b> Inline Function, Default Argument Function, Function Overloading. | 9           | 15         |
| 2.               | <b>Classes and Objects:</b> Specifying a Class, Creating Objects, Accessing Class Members, Defining Member Functions, Nesting of Member Function, Private Member Function, Friend Function.<br><b>Static Members:</b> Static Data Member, Static Member Function.                                                                                                                                                                                                                                 | 9           | 20         |
| 3.               | <b>Constructors and Destructors:</b> Introduction, <b>Types of Constructor</b> (Default Constructor, Parameterized Constructor), Multiple Constructors, Destructors.<br><b>Inheritance / Extending Classes:</b> Introduction, Defining Derived Classes.<br><b>Types of Inheritance:</b> Single Inheritance, Multilevel Inheritance, Multiple Inheritance, Hierarchical Inheritance.                                                                                                               | 9           | 25         |

|           |                                                                                                                                                                                                                                                                                                                                                                                                               |           |           |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-----------|
| <b>4.</b> | <b>Introduction to Data Structure:</b><br>Introduction to Data Structure.<br>Types of Data structure: Primitive and Non- Primitive Data Structure, Linear and Non-Linear Data Structure.<br><b>Linear Data Structures:</b><br>Introduction to Arrays.<br>Stack: Introduction, Application of Stack, Polish Notation<br>Queues: Introduction, Simple Queue, Circular Queue.<br>Linked List: Singly Linked List | <b>12</b> | <b>25</b> |
| <b>5.</b> | <b>Sorting:</b> Introduction, Selection, Bubble, Insertion, Shell,<br><b>Searching:</b> Introduction, Sequential Search and Binary Search.                                                                                                                                                                                                                                                                    | <b>9</b>  | <b>15</b> |

#### Course Outcomes:

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

- To solve a problem in Object Oriented manner in contrast to Procedural method.
- To have fundamental knowledge on object oriented programming concepts.
- To design programs involving classes, objects, constructor, destructor, inheritance, polymorphism, etc.
- To understand the concept of Managing Data in organization.
- To create algorithms and programs to solve a problem of various operations on Queues, Stacks, Linked Lists, Sorting, Searching.
- To learn the basic searching and sorting algorithms.
- To evaluate algorithms with respect to time and space complexity

#### List of References:

1. Object Oriented Programming With C++, By E Balagurusamy, Tata McGraw-Hill.
2. Object Oriented Programming and C++, By Rajaram, New Age International Publishers.
3. Teach Yourself C++, By Herbert Schildt, Tata McGraw-Hill.
4. Let Us C++, By Yashavant Kanetkar, BPB Publications.
5. An Introduction to Data Structure with Applications, Tremblay J. and Sorenson P., Tata McGraw-Hill international Edition.
6. Expert Data Structure with C, R. B. Patel, Khanna books.
7. Classic Data Structures by Debasis Samanta, PHI Publications.
8. "Data Structures Using C & C++", Tenenbaum, PHI.

#### E-Resources / Web Links:

- <https://www.w3schools.com/PHP/default.asp>
- <https://www.tutorialspoint.com/cplusplus/index.htm>
- <https://www.javatpoint.com/cpp-tutorial>
- <https://www.programiz.com/cpp-programming>
- <http://www.studytonight.com/cpp/introduction-to-cpp.php>
- <https://www.w3schools.in/data-structures/intro>

- <https://www.javatpoint.com/data-structure-tutorial>
- <https://www.geeksforgeeks.org/data-structures/>
- [https://www.tutorialspoint.com/data\\_structures\\_algorithms/index.htm](https://www.tutorialspoint.com/data_structures_algorithms/index.htm)
- <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.

1. Write an Object Oriented (O.O.) Program in C++ that displays "Hello Friends!" message on the screen.
2. Write a Program of reference variable.
3. Write a Program for scope resolution operator.
4. Write a Program to implement the use of manipulator operators.
5. Write a Program of inline function.
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 swap private data of classes.
11. Write a Program to implement static data member and static member function.
12. Write a Program to implement the default constructor.
13. Write a Program to implement the parameterized constructor.
14. Write a Program to implement the multiple constructors.
15. Write a Program to implement destructor.
16. Write a Program to implement single inheritance.
17. Write a Program for multilevel inheritance.
18. Write a Program for multiple inheritance.
19. Write a Program for hierarchical inheritance.
20. Write a program to implement the concept of Stack using array.
21. Write a program to implement the concept of Simple Queue using array.
22. Write a program to implement the concept of Singly Linked list.
23. Write a program to implement the concept of Selection Sort.
24. Write a program to implement the concept of Bubble Sort.
25. Write a program to implement the concept of Insertion Sort.
26. Write a program to implement the concept of Shell Sort.
27. Write a program to implement the concept of Sequential Search.
28. Write a program to implement the concept of Binary Search.