

***Syllabus***

Of

**Data Structure and Algorithms**

Course Code: **CSC 2516/CSC2511**

Course Classification: **Compulsory**

Semester and Year offered:

Credit Value: **3**

Name(s) of Academic Staff:

1. **Course Outline**

This course will focus on data structures and algorithms for manipulating them. Data structures for storing information in lists, trees, queues and stacks will be covered. Some basic graph algorithms will also be discussed.

1. **Course Learning Outcomes (CLO)**

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| --- | --- |
| CLO1 | Demonstrate the concepts of abstract data types in structured programming method. (C3,PLO1) |
| CLO2 | Apply the variation of data structure techniques (P3, PLO3,PLO6) |
| CLO3 | Design a variety of algorithms to solve real world problems. (C6, PLO2) |

1. **Transferable Skills (if applicable)**: *(Skills learned in the course of study which can be useful and utilized in other settings)*

* Digital Skills
* Cognitive Skills

1. **Course Content Outline and Subtopics**

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| --- | --- | --- | --- |
| **S.N** | **Course Outline** |  | **LHr** |
| 1 | Abstract Data Types  ● Introduction  ● Basic Definitions  ● Common Structures  ● Abstract Data Type (ADT) ● Model for an ADT ● Algorithm Efficiency  • Analysis of Algorithms o Efficiency of Algorithms o Computational Problems o The Time Complexity Function o The Big O Notation | CLO1 | 2 |
| 2 | Searching ● List Searches  ● Search Algorithm ● Hashed List Searches | CLO1, CLO3 | 2 |
| 3 | Linked List ● Linear List Concept  ● Linked List Concepts  ● Linked List Algorithm  ● Processing a Linked List  ● List Application | CLO1, CLO3 | 3 |
| 4 | Stack ● Basic Stack Operations  ● Stack Application ● Stack Array Implementation | CLO1, CLO2 | 2 |
| 5 | Queues ● Queue Operation  ● Queue Linked List Design ● Queuing Theory ● Queue ADT – Linked List Implementation | CLO2, CLO2 | 2 |
| 6 | Recursion ● Factorial – A Case Study  ● How Recursion Works ● Designing Recursive Algorithms ● Fibonacci Numbers – A Case Study ● Implementation of Recursion | CLO2, CLO3 | 2 |
| 7 | Tree ● Basic Tree Type  ● Binary Tree ● Binary Tree Traversals ● Expression Tree ● Implementation of Binary Tree | CLO2, CLO1 | 4 |
| 8 | Search Tree ● Binary Search Tree  ● AVL Trees ● AVL Tree Implementation | CLO2,CL1 | 5 |
| 9 | Sorting ● General Sort Concepts ● Insertion Sort ● Selection Sort ● Exchange Sorts | CLO2,CLO3 | 3 |
| 10 | Graphs ● Terminology ● Operations ● Graph Storage Structures ● Graph Algorithms | CLO2,CLO1 | 3 |

1. Mapping of the Course Learning Outcomes to the Programme Learning Outcomes, Teaching Methods and Assessment Methods
   1. Internal Assessment

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| --- | --- | --- |
| S.N | Type of assessment | Weightage % |
| 1 | Written Assessment | 10 |
| 2 | Assignment/Lab Works | 30 |
| 3 | Quiz | 10 |

* 1. Final Assessment (Final Exam)

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| --- | --- | --- |
| S.N | Type of assessment | Weightage % |
| 1 | Final Examination | 50 |

1. **References (include required and further readings, and should be the most current)**

* John, C. Shreyans,D. Payas, R (2019). C++ Data Structures and Algorithm Design Principles: Leverage the power of modern C++ to build robust and scalable applications, Packt Publishing Ltd.
* Karumanchi, N. (2016). Data Structures and Algorithms Made Easy, 5th ed., CreerMonk Publications.
* Jain, H. (2016). Problem Solving in Data Structures and Algorithms using C, 1st ed. Taran Technologies Private Limited.
* Frank M. Carrano, Timothy M. Henry, Timothy Henry (2016). Data Abstraction &amp; Problem Solving with C++: Walls and Mirrors, 7th Edition, Pearson.