

Course Code- **MC1101**Course Title- **Data Structures and Algorithms**

Teaching Scheme				Examination Scheme			
Lectures	Tutorials	Practicals	Credits	CT	TA	ESE	Total
3	--	--	3	20	20	60	100

**Course Objectives**

- 1 Understanding of fundamental data structures and algorithms
- 2 To familiarize students with basic data structures and their use in fundamental algorithms.
- 3 To understand and design efficient algorithms for sorting and searching

**Course Outcomes-** After studying this course, students will be able to:

- CO 1 Demonstrate an understanding of basic data structures (such as an array-based list, linked list, stack, queue, binary search tree) and algorithms.
- CO 2 Understanding of data structures.
- CO 3 Apply data structures to algorithmically design efficient computer programs that will cope with the complexity of actual applications.
- CO 4 Design and implementation of data structures and algorithms
- CO 5 Analysis of data structures and algorithms.

**Course Contents**

Unit No	Detailed Contents	Contact Hours
1	Data types. Object, data structure and abstract data types (ADT), Arrays in C, Structures in C, Classes in C++, Primitive operations in stack, representing stacks in C, example- infix, postfix and prefix, efficiency of algorithm, algorithm analysis, Analysis – Big-Oh, Theta, Omega	6
2	Queues and its representation, priority queue, array implementation, stacks, operations in stack, array implementation of lists, linked lists using dynamic variables, examples of list operations in C, circular lists, header nodes, doubly linked list, examples.	6
3	Trees, applications of trees, operations in binary trees, tree traversals, evaluating an expression tree, binary search trees, optimal and average BST's trees and red-black trees Sorting: merge, quick, radix, selection, heap Introduction to Graphs, Breadth first search, Depth first search	6
4	Spanning trees: Prim's and Kruskal's algorithm, union-find datastructure, Dijkstra's algorithm for shortest path. shortest path tree. Shortest and longest paths in directed acyclic graphs	6
5	Searching and Hashing algorithms. Search algorithms – Sequential Search, Ordered lists, binary search. Searching using Hashing. Hash tables. Hash functions. Some examples of hash functions. Collision	6

resolution.

### Text Books

- 1 Aaron M. Tanenbaum, "Data Structures using C and C++"
- 2 E. Horowitz, S. Sahni, S. Anderson-freed, "Fundamentals of Data Structures in C", Second Edition, University Press, ISBN 978-81-7371-605-8

### Reference Books

- 1 Jean-Paul Tremblay, Paul. G. Soresan, "An introduction to data structures with Applications", Tata Mc-Graw Hill International Editions, 2nd edition 1984, ISBN-0-07-462471-7
- 2 Data Structures and Algorithms. Aho, Ullman & Hopcroft
- 3 Purely Functional Data Structures, Chris Okasaki, Cambridge University Press; New Ed edition
- 4 Data & File Structures Using C, Reema Thareja, Oxford University Press

### E Books/ Online learning material

- 1 <https://nptel.ac.in/courses/106/102/106102064/>

### Assessment Table:

Assessment Tool	Course Outcomes				
	CO1	CO2	CO3	CO4	CO5
Evaluation I (Class Test) 20 Marks	5	5	5	5	
Teachers Assessment 20 Marks		5	5	5	5
ESE Assessment 60 Marks	15	15	10	10	10

### Teaching Strategies:

1. Use of different technologies in classroom
2. Use of different pedagogical approaches like flipped classroom
3. Use share pair strategy
4. Student centric teaching learning
5. Use of different resources like NPTEL courses
6. Use of MCQs, Assignments, Test etc.

### Teachers' Assessment:

Teachers assessment will be based on one or many of the following

1. Multiple choice questions
2. Assignments
3. Power Point Presentation on allotted topics
4. Quiz
5. Surprise test
6. Interview / Viva