

## COURSE HANDOUT

DATA STRUCTURES USING C (BCAMJ-201)

2<sup>nd</sup> SEMESTER

ACADEMIC YEAR (2023-24)

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Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
							Sessional	Final Exam	Total
BCAMJ-201	Data Structures Using C	Core	4	4	0	0	40	60	100

### COURSE OUTCOMES

At the end of the course the student will be able to:	
CO1	Understand the basics of data types and data structures.
CO2	Compare different data structures in context of their properties.
CO3	Identify the use of different data structures to solve a given problem
CO4	Apply different data structures to solve different sorting and searching problems
CO5	Appreciate applicability of advanced data structures to model and solve real world problems

#### Unit-I

**Introduction to data structures:** - Introduction to data structures: Binary and Decimal Integers, Real Numbers, Character Strings, Abstract Data Types, Sequences as Value Definitions, Data Types in C, Pointers in C, Data Structures and C, Representation of Arrays, Structure in C.

(3 Hours)

#### Unit-II

**Stacks and Queues:** - Concept of Stacks, Operation on Stacks, Representing Stacks in C, Implementing the pop Operation, testing for Exceptional Conditions, Implementing the Push Operation, Multiple stacks, Application of stacks in Infix, Postfix, and Prefix, Recursion, Concept of Queues, Operation on Queues, Multiple Queues, Priority Queues, Circular Queues

(10 Hours)

#### Unit-III

**Linked Lists:** - Insertion, Deletion and traversal on Linear Linked Lists, Doubly Linked List, circular Linked List, Linked List as data structure, Header nodes, Stacks & Queues using linked list, Dynamic memory management, Garbage Collection.

(10 Hours)

#### Unit-IV

**Trees:** - Binary trees and its representation using Linked list, Operations on Binary Trees, Traversal Algorithms, Applications, Threaded Binary Trees and its traversal algorithms, Heterogeneous binary trees, List representation using binary trees, Optimum search trees, AVL trees.

**Graphs** Representation of Graphs, traversal methods, Applications undirected graphs, Directed Graph & their traversal, Depth first, Breadth First, Shortest path algorithms, Minimum Cost Spanning tree.

(18 Hours)

#### Unit-V

**Searching & Sorting:** Exchange Sort (Bubble, Quicksort), Selection & Tree Sorting. Insertion sort, Shell Sort, Address Calculation Sort, Merge & Radix Sort. Sequential Searching, Searching an Ordered Table, Index sequential search, Binary search, Interpolation search, Tree searching

(5 Hours)

**Textbooks**

S.No	Name of the Books	Name of the Author	Publisher Name	Edition (Pub.Yr.)
1	Data Structure using C	Tenenbaum, Langsam, Augenstein	Pearson/Addison Wesley	2 <sup>nd</sup> (2007)
2.	Fundamentals of data structures	Horowitz E. and Sahni S	Cambridge University Press	2 <sup>nd</sup> (2004)

**Reference Books**

S.No	Name of the Books	Name of the Author	Publisher Name	Edition (Pub.Yr.)
1	Data structures and Program Design	Robert L Kruse	Prentice Hall	1 <sup>st</sup> (1972)

**COURSE PLAN**
**Unit-I Introduction to Data Structures**

S.No	Topics	Resource/Link
1	Binary and Decimal integers, Real Numbers, Character Strings	Book 1, Chapter 1
2	Abstract Data Types, Sequence as Value Definitions	Book 1, Chapter 1
3	Data types in C, Pointers in C	Book2, Chapter 2
4	Representation of Arrays	Book 3, Chapter 1
5	Structure in C	Book1, chapter 3
Unit-II Stacks and Queues		
1	Concepts of Stacks, operations on stack, Implementing the pop operations Implementing the push operation, Testing for Exceptional Conditions	Book2, Chapter 3



2	Representing Stacks in C	Book2, Chapter2
3	Multiple Stacks, Applications of stacks in Infix, Prefix, Postfix, Recursion	Book2, Chapter 4
4	Concept of queues, operations on queues	Book 3, Chapter 2
5	Representing Queues in C	Book 1, Chapter 1
6	Multiple Queues, Priority Queues, Circular Queues	Book 2, Chapter 2

**Unit-III Linked Lists**

1	Concept of Linked lists, Insertion Deletion and Traversal on linked lists	Book 2, Chapter 1
2	Doubly linked list, Circular linked list	Book 1, Chapter 6
3	Representing linked lists in C	Book 2, Chapter 1
4	Linked lists as Data Structures	Book 1, Chapter 5

5	Implementation of Stacks and Queues using linked lists	Book 2, Chapter 4
6	Dynamic memory management, Garbage Collection	Book 4, Chapter 5
7	Header nodes	Book 2 , Chapter 2

**Unit-IV Trees and graphs**

1	Binary trees and its representation using linked list	Book 4, Chapter 4
2	Operation on binary trees	Book 3, Chapter 1
3	Traversal algorithms, applications, Directed Graph and Traversal Depth First search, Breadth First Search	Book 4, Chapter 2
4	Heterogeneous Binary Trees, optimum Search Trees, AVL Trees	Book 3, Chapter 3



5	Representation of Graphs, traversal methods	Book 2, Chapter 4
6	Applications undirected graphs and traversal	Book 1, Chapter 3
<b>Unit-V Searching and Sorting</b>		
1	Exchange sort (Bubble sort, Quick sort) Selection & Tree Sorting, insertion sort, Shell Sort	Book 1, Chapter 1
2	Address Sort, Calculation Sort, merge sort	Book 3, Chapter 6
3	Sequential Searching, searching an ordered Table, index sequential search, Binary search, interpolation search, tree searching	Book 3, Chapter 7

#### ADDITIONAL WEB RESOURCES

1	<b>VLAB:</b> <a href="http://cse01iiith.vlabs.ac.in/exp2/Simulation.html?domain=Computer%20Science&amp;lab=Data%20Structures#">http://cse01iiith.vlabs.ac.in/exp2/Simulation.html?domain=Computer%20Science&amp;lab=Data%20Structures#</a> This is a Vlab on DS which gives a hands-on experience to the students.
2	<b>NPTEL LINK:</b> <a href="https://nptel.ac.in/courses/106105085/">https://nptel.ac.in/courses/106105085/</a> This site contains video lectures on various topics of Data Structures including the transcripts of the videos which will help the students from exam point of view also.

#### GRADING AND ASSESSMENT

- **Sessional Test:** 20 marks
- **Assignment:** 10 marks
- **Attendance:** 10 marks
- **Final Examination:** 60marks

#### COURSE POLICIES

- **Attendance:** Minimum 75% attendance is mandatory to appear in the final examination of the course.
- **Academic Integrity:** MIET's academic integrity policies apply. Plagiarism will not be tolerated.
- **Late Submissions:** Assignments and projects must be submitted by the specified timelines.

#### FACULTY INFORMATION

- **Office Hours**  
Monday (12:05 PM - 12:55 PM)  
Friday (12:05 PM - 12:55 PM)
- **Contact Information**  
| [tajamul.cse@mietjammu.in](mailto:tajamul.cse@mietjammu.in)