

Course Title and Code	CS214 - Data Structures
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I. Course Identification and General Information:

Course Title	Data Structures	Course Code	CS214	Pre-requisite	MATH212
Department	Computer Science	Course Level	6	Credit Hours	3(2+1)

II. Course Description/Topics: The following course topics will be covered.

- Data Structures? (Linear and non-linear), built-in and abstract data structures.
- Data Structure Operations (Insertion, Deletion, Traversing/Visiting, Searching, Sorting etc.)
- Records/structs (heterogeneous aggregates)
- Algorithms: Complexity, Time-Space tradeoff. Basics of algorithm and Algorithmic Notations
- Introduction to Array, Linear Array, Representation of linear array in memory.
- Traversing, Inserting, Deleting into/from an array
- Sorting: (Bubble Sort) and Searching: (Linear and Binary Search)
- Multidimensional array and its presentation in memory. Matrices:
- Linked Lists: Presentation of Linked Lists in Memory.
- Linked List Operations: (Traversing, Searching, Insertion, Deletion)
- Circular, Header Linked and Two-way Lists.
- Stack?, Representation of stack using Array and Linked list.
- Arithmetic Expressions: Polish Notation (Infix to pre-fix-fix and post-fix notation Conversion and its evaluation using stack.), Recursion(Quick Sort, Find Factorial, Tower of Hanoi)
- Queues: Representation of queue using Array and Linked list. Circular Queue, Priority Queue.
- Introduction to Tree. Binary Trees (2-tree, complete tree), Presentation Binary Tree in Memory
- Terminologies (Parent, Child, Brothers, Siblings, Levels, Height/Depth, Path/Brach, etc.)
- Traversing Binary Tree (Pre-Order, In-Order, Post-Order), Recursion in processing of Binary Tree.
- Binary Search Tree. (Searching, inserting, and deleting in a Binary Search Tree).
- Sorting: (Insertion Sort, Bubble Sort, Selection Sort, Merging, Merge-sort, Radix Sort, Quick Sort)
- Graph theory and Terminologies, (Sequential Directed and Undirected graphs)
- Traversing a Graph. Minimum-Cost Spanning Tree.

III. Course Outcomes: Summary of the main learning outcomes for students enrolled in the course.

1. Discuss the appropriate use of built-in data structures.
2. Describe common applications for each data structure in the topic list.
3. Write programs using:(arrays, strings, linked lists, stacks, queues, Trees, and graphs).
4. Compare alternative implementations of data structures with respect to performance.
5. Compare and contrast the costs and benefits of dynamic and static data structure implementations.
6. Choose the appropriate data structure for modeling a given problem.

IV. Required Text:

- Data structures using C and C++ by YEDIDYAH LANGSAM

V. References:

- Theory and problems of data structures by Lipchuiz