**National University**





**of Computer & Emerging Sciences**

**Course Outlines of BS/MS/PhD Electrical Engineering Degree Program**

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| **Course Title** | Data Structures and Algorithms | | **Course Code** |  |
| **Pre-requisite(s)** | Programming for Engineers - II | | **Credit Hrs** | 3 |
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| **Text Book(s)** | **Title** | **Data Structures and Algorithms** | | |
| **Author** | Aho et. Al. | | |
| **Publisher** |  | | |
| **Ref. Book(s)** | **Title** | **Data Structures Using C++** (2nd Edition) | | |
| **Author** | D. S. Malik | | |
| **Publisher** | Course Technology, Cengage Learning | | |
| **Title** | **Introduction to Algorithms** (3rd Edition) | | |
| **Author** | Cormen et. al. | | |
| **Publisher** | MIT Press | | |
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| **Objective:** | The objective of this course is to introduce basic data structures like array, stack, queue, linked list, hash table and binary trees. Students will learn the complexity analysis of different algorithms like sorting, searching performed on these data structures and will be able to choose suitable data structures for a range of different problems. | | | |
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| **Course Contents/Topics** | | | | |
| 1. Role of algorithms in computing; pseudocode; analysis of algorithms; insertionsort | | | | |
| 1. Growth of functions; asymptotic notation functions and growth times; the big Oh notation; complexity analysis | | | | |
| 1. Abstract data type (ADT); Elementary data structures; arrays; stacks; queues; linked lists | | | | |
| 1. Recursion; trees, tree traversal | | | | |
| 1. Tree ADT; binary tree; tree implementations | | | | |
| 1. Generic linked lists; template | | | | |
| 1. STL; set ADT; hash table | | | | |
| 1. Hash table implementation; collision resolution; chaining; open addressing | | | | |
| 1. Radix tree; deletion in binary search trees | | | | |
| 1. Polynomial and large integer storage; directed graphs; Dijkstra’s algorithm | | | | |
| 1. Graph traversal; directed acyclic graphs; depth first search | | | | |
| 1. Prim’s algorithm; Kruskal’s algorithm, minimum spanning tree (MST) | | | | |
| 1. Undirected graphs; undirected graphs traversal; breadth first search | | | | |
| 1. Parallelism; threading; network programming | | | | |
| 1. Sorting algorithms: Bubblesort, insertionsort, selectionsort, quicksort, mergesort, heapsort | | | | |
| 1. GUI Programming; MFC | | | | |