**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** | **Introduction to Algorithms** (3rd Edition) | | |
| **Author** | Cormen et. al. | | |
| **Publisher** | MIT Press | | |
| **Ref. Book(s)** | **Title** | **Data Structures Using C++** (2nd Edition) | | |
| **Author** | D. S. Malik | | |
| **Publisher** | Course Technology, Cengage Learning | | |
| **Title** |  | | |
| **Author** |  | | |
| **Publisher** |  | | |
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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. Elementary data structures; arrays; stacks; queues; linked lists | | | | |
| 1. Arrays, stacks and queues | | | | |
| 1. Basic linked list operations: insertion, deletion, search, cleanup | | | | |
| 1. Advanced linked list operations like reversing, indexing and copying lists | | | | |
| 1. Basic searching algorithms: insertionsort, selectionsort, bubblesort | | | | |
| 1. Advanced searching algorithms: , mergesort, quicksort, heapsort | | | | |
| 1. Hashing; hash function; hash tables | | | | |
| 1. Implementation of hash tables and complexity analysis | | | | |
| 1. Trees: Binary search trees | | | | |
| 1. Implementation and complexity analyses of trees | | | | |
| 1. Radix trees and B-trees | | | | |
| 1. Elementary graphs: shortest path first | | | | |
| 1. Graphs implementation | | | | |
| 1. Multi-threading: data parallelism and task parallelism | | | | |