17CS41O1–Fundamentals of Data Structures (FDS)

(Common to ECE, EEE, CE and ME)

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| **Course Category:** | Open Elective | | **Credits:** | 3 |
| **Course Type:** | Theory | | **Lecture – Tutorial – Practical:** | 2-2-0 |
| **Prerequisite:** | Basics of mathematics and Logic with programming knowledge in C or any Language as optional. | | **Sessional Evaluation:**  **Univ. Exam Evaluation:**  **Total Marks:** | 40  60  100 |
| **Objectives** | * Familiar with basic techniques of data structures and programming development. * Master the implementation of linked data structures such as linked lists and binary trees. * Learn several sorting and searching techniques including quicksort, merge sort, heap sort, linear and binary search to application development * Exposure on graph theory to learn the basics of graph terminology and supporting traversals * Analyzing problems and writing program solutions to problems using above techniques | | | |
| **Course Outcomes** | Upon the successful completion of the course, the students will be able to: | | | | |
| CO1 | Exposure on the fundamentals of data structures, primitive data types and Programming development | | | |
| CO2 | Learn and apply the utilization of arrays, Linked lists and supporting applications | | | |
| CO3 | Study the basic linear data structures like stacks, queues and their applicability | | | |
| CO4 | Study one of the non-linear data structure, types and properties to get the support for various application developments. | | | |
| CO5 | Understand searching and sorting techniques and apply them for simple to complex applications | | | |
| CO6 | Get the exposure on graph basics and its applicability in various domains | | | |
| **Course Content** | **UNIT – I**  **Introduction**: Overview on data structures, Data representations, Abstract data types, Data types, Primitive data types, Data Structure and structures types, Atomic types, Differences between ADTs, Data types and Data Structures, Refinement stages.  **Principles of Programming**: Software engineering, Program design, Algorithms, Different approaches to design algorithms, Structured programming and Recursion.  **UNIT – II**  **Data structure types and array basics**: Introduction to linear and nonlinear data structures, arrays, array operations, Single, double and multi-dimensional arrays.  **Linked lists**: Introduction, Dynamic memory allocation, Linked list operations, Doubly and circular linked lists.  **UNIT – III**  **Stacks**: Introduction, Stack as ADT, Representation of stacks using arrays and linked lists, Applications, Stacks and recursion.  **Queues**: Introduction, Queue as ADT, Representation of queues, Circular queues, Double ended queues, Priority queues, Applications.  **UNIT – IV**  **Binary Trees**: Introduction to non-linear data structures, Overview on binary trees, types, Basic definitions and properties, Representation of binary trees, Operations and tree traversals. Applications.  **UNIT – V**  **Sorting**: Introduction, Bubble sort, selection sort, Quick sort, Insertion sort and Merge sort.  **Searching**: Introduction, Linear and Binary search techniques.  **UNIT – VI**  **Graphs**: Introduction, Terms associated with graphs, Sequential and linked list representations, Graph traversals, Spanning trees, Shortest path and Graph applications. | | | | |
| **Text Books and References** | **Text Book(s):**   * 1. Data Structures using C by ISRD group, Tata Mc. Graw – Hill company ltd.   **Reference Books:**   1. C & data structures / P.S. Deshpande, O.G. Kakde. CHARLES RIVER MEDIA, INC. 2. Classical Data Structures by Samanta debasis, Prentice Hall of India, 2nd edition. 3. Data structures using C by Reema Thareja, 2nd edition, Oxford University Press. | | | | |
| **E-Resources** | 1. <https://nptel.ac.in/courses> 2. <https://freevideolectures.com/university/iitm> | | | | |