| Course code: Course Title | Course Structure | | | Pre-Requisite |
|---|---|---|---|---|
| | L | T | P | |
| **EC102:Data Structures and Algorithms** | 3 | 0 | 2 | **NIL** |

**Course Objective:** The students will be able to differentiate kinds of data structures with their respective applications and understand applications of data structures. They will be able to apply data structures in various programs and learn to use data structures for different programs.

| S. NO | Course Outcomes (CO) |
|---|---|
| **CO1** | Access different kinds of data structures with their respective applications. |
| **CO2** | Devise data structures for programs |
| **CO3** | Differentiate between static and dynamic data structures |
| **CO4** | Develop programs using different types of data structures |

| S. NO | Contents | Contact Hours |
|---|---|---|
| **UNIT 1** | Introduction: Introduction to Algorithmic, Complexity- Time-Space Trade off. Introduction to abstract data types, design, implementation and applications. Introduction to List data structure. Arrays and Strings: Representation of Arrays in Memory: one dimensional, Two dimensional and Multidimensional, Accessing of elements of array, performing operations like Insertion, Deletion and Searching. Sorting elements of arrays. Strings and String Operations | **10** |
| **UNIT 2** | Stacks and Queues: Introduction to data structures like Stacks and Queues. Operations on Stacks and Queues, Array representation of Stacks, Applications of Stacks: recursion, Polish expression and their compilation conversion of infix expression to prefix and postfix expression, Operations of Queues, Representations of Queues Applications of Queues, Priority queues. Linked Lists: Singly linked lists, Representation of linked list, Operations of Linked list such as Traversing, Insertion and Deletion, Searching, Applications of Linked List. Concepts of Circular linked list and Doubly linked list and their Applications. Stacks and Queues as linked list. | **10** |

| UNIT 3 | Trees: Basic Terminology, Binary Trees and their representation, binary search trees, various operations on Binary search trees like traversing, searching, Insertion and Deletion, Applications of Binary search Trees, Complete Binary trees, Extended binary trees. General trees, AVL trees, Threaded trees, B- trees. Searching and Sorting: Linear Search, Binary search, Interpolation Search, Insertion Sort, Quick sort, Merge sort, Heap sort, sorting on different keys, External sorting. | 12 |
|--------|---|---|
| UNIT 4 | Graphs: Terminology and Representations, Graphs & Multi-graphs, Directed Graphs, Representation of graphs and their Transversal, Spanning trees, shortest path and Transitive Closure, Activity Networks, Topological Sort and Critical Paths. File Structure: File Organization, Indexing & Hashing, Hash Functions, Collision Resolution Techniques. | 10 |
| | **TOTAL** | |

**REFERENCES**

| S.No. | Name of Books/Authors/Publishers | Year of Publication / Reprint |
|-------|----------------------------------|-------------------------------|
| 1 | Introduction to Algorithms, by T. H. cormen, C.E. Leiserson, R. L. Rivest, C. Stein, Fourth Edition, 2022. | 2022 |
| 2 | Data Structures, Tannenbaum, PHI, 2007( Fifth Impression) | 2007 |
| 3 | An introduction to data structures and application by Jean Paul Tremblay & Pal G. Sorenson (McGraw Hill), Second Edition, 2017. | 2017 |
| 4 | Data structure and program design in C, R.L. Kruse, B.P. Leary, C.L. Tondo, PHI, 2009( Fourth Impression) | 2009 |
| 5 | Seymour Lipschutz  Saucham's series , data Structures,  Mc, Graw Hill Publication,  2018 | 2018 |

# B. Tech. Environmental Engineering