DATA STRUCTURES USING C Programming

Course Code: BECSE1C038
Course Title: Data Structures using C Programming
Semester: I
Credits: 05 (03 Theory and 02 Lab)

Rationale

Data structures plays significant role for designing efficient and accurate algorithms in several application areas of computer engineering. Various data structures such as arrays, stack, queue, trees are used for developing algorithms in Artificial intelligence, computer vision, and image processing etc. Moreover, design and analysis of algorithms using time and space complexity is also important parameter that needs basic knowledge of different data structures.

Course Outlines

Contents	**No. of Lectures**
Unit - I Introduction to Data Structures, Abstract Data Type (ADT), Arrays and Strings, Structures, Recursion, Pointers, Dynamic memory allocation Algorithm Design, Scalability, Introduction to Complexity Analysis , Big O Notation, Relationship between time complexity and hardware performance	**10**
Unit - II Linked Lists:- ADT type, Linear List , Linear Linked list, doubly linked list, circular linked list, header Linked list, various implementations and applications of Linked Lists	**10**
Unit -III Stack: - ADT type, specifications, array based and linked list based, recursion and its removal with stack, stack as buffer, searching, matching, integration and other applications, managing multiple stacks, various implementations and applications of Stacks Queues:- ADT type, array based and linked list based,, queue as buffer, searching, Circular queues, Deque, Managing multiple queues, , various implementations and applications of Queues	**10**
Unit - IV Binary Trees:- Introduction to non-linear data structures, ADT type, array based and linked list based, binary tree, binary search tree, AVL tree, tree traversal, various implementations and applications of Trees Searching:- Linear and Binary Search Hashing:- Hash table Various implementations and applications of Searching and Hashing	**10**
Unit - V Sorting Algorithms: Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort, Shell Sort, Radix Sort, various implementations and applications of Sorting	**10**

Graphs: - ADT type, array based and linked list based, graph traversal algorithms i.e. Breadth First & Depth First, various implementations and applications of graphs	

Course Outcomes

At the end of the course, the student will be able to**:**

- Understand the concepts of basic data structures.
- Implementation of various data structures using c programming language.
- To apply data structures in a variety of real-life and engineering applications.
- To analyse space and time complexity of different algorithms.
- To understand and use various searching and sorting algorithms in other engineering applications.

Text Books

1. Symour Lipschutz,' Theory and Problems of Data Structures'', St. Schaum's Outline series in Computers, Tata McGraw – Hill.
2. Horowitz, E. , and Sahni, S. , ''Fundamentals of data structures'' , Computer Science Press.
3. Tanhenbaum, A.M., and Augenstein, M.J. , "Data Structures with C" , Prentice – Hall.
4. "Tremblay & Sorenson , An introduction to Data Structures with Applications:, Tata McGraw – Hill.

Reference Books

1. Aho, A.V. , Hopcraft, and Ullman, J.E., ''Data structures and Algorithms'' , Addison Wesley.
2. Thomas Coremen, Introduction to Algorithms, Second edition, Prentice Hall of India (2007) 2nd ed.
3. Mark Allen Weiss, Data Structures & Algorithm analysis in C, Dorling Kingsley (2002) 3rd ed.

***More Reference Books**

R1: Reema Thareja: Data Structures Using C, 2e, Oxford University Press 2014.
R2: Horowitz and Sahani: Fundamental of Data Structures in C, 2nd Edn, 2008
R3: Kruse, Tonso, Leung: Data Structures and Program Design in C, 2000
R4: Richard F. Gilberg & Behrouz Forouzan: Data Structures, A Pseudocode Approach with C,
2001.
R5: Weiss: Data Structures and Algorithm Analysis in C/C++, 3rd Edn, 2006
R6: Carrano and Prichard: Data Abstraction and Problem solving with C++, 5th Edn, 2007
R7: Sedgewick : Algorithms in C/C++
R8: Sahani : Data Structures, Algorithms and applications in C++, 1997.
R9: Corman et al: Introduction to Algorithms, 3rd Edn., 2009.
R10: Heileman : Data Structures, Algorithms and Object Oriented Programming, 2002.
R11: Sorenson and Tremblay: An Introduction to Data Structures with Applications, 2nd Edn, 2008.
R12: Knuth: The Art of Computer programming Vol I, Vol III
R13: Hubbard, John R.: Schaum's Outline of Data Structures with C++, 2000.