Course code	Course Name	L-T-P - Credits	Year of Introduction
EE362	Data Structures and Algorithms	3-0-0-3	2016

Prerequisite: EE207 Computer programming

Course Objectives

- To introduce the fundamental concept of data structures and to emphasize the importance of data structures in developing and implementing efficient algorithms
- To impart knowledge about algorithm specification

Syllabus

Linear Structures , Tree Structures , Applications of trees , Balanced Search Trees and Indexing , Graphs , Shortest-path algorithms , Applications of graphs , Algorithm Design , Algorithm Analysis , Dynamic programming

Expected outcome.

The students will be able to:

i. Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms
ii. Describe common applications for arrays, records, linked structures, stacks, queues, trees, and graphs
iii. Write programs that use arrays, records, linked structures, stacks, queues, trees, and graphs
iv. Demonstrate different methods for traversing trees
v. Compare alternative implementations of data structures with respect to performance
vi. Compare and contrast the benefits of dynamic and static data structures implementations
vii. Describe the concept of recursion, give examples of its use, describe how it can be implemented using a stack

Text Book:

1. Robert Kruse, Data Structures and program design in C, Pearson Education Asia
2. Samanta,Classic Data Structures, PHI
3. Trembley & Sorenson, An introduction to Data Structures with applications:, McGraw Hill

References:

1. Donald E Knuth, The Art of Computer Programming, Vol.1: Fundamental Algorithms, Addison-Wesley, 1997.
2. Langsam, Augenstein & Tanenbaum, Data Structures using C & C++: Pearson, 1995
3. N.Wirth, Algorithms + Data Structures & Programs:, PHI
4. Sahni & Mehta, Fundamentals of Data Structures in C++: Horowitz, , Galgottia Pub.
5. Thomas Standish, Data structures in Java:, Pearson Education Asia

Course Plan

Module	Contents	Hours	Sem. Exam Marks
I	Linear Structures : Abstract data types(ADT), List ADT, Array based implementation, Linked list implementation, Curser based linked lists, Doubly linked lists, Applications of lists, Stack ADT, Queue ADT, Circular queue implementation, Applications of stacks and queues	7	15%

II	Tree Structures : Need for nonlinear structures, Tree ADT, Tree traversals, Left child right sibling data structures for general trees, Binary tree ADT, Expression trees, Applications of trees, Binary search tree ADT	7	15%
FIRST INTERNAL EXAMINATION			
III	Balanced Search Trees and Indexing : AVL trees, Binary heaps, B-trees, Hashing, Separate chaining, Open addressing, Linear probing	7	15%
IV	Graphs : Definitions, Topological sort, Breadth-first traversal, Shortest-path algorithms, Minimum spanning tree, Prim's and Kruskal's algorithms, Depth-first traversal, Bio connectivity, Euler circuits, Applications of graphs	7	15%
SECOND INTERNAL EXAMINATION			
V	Algorithm Design: Greedy algorithm, Divide and conquer, Dynamic programming, Backtracking, Branch and bound, Randomized algorithms	7	20%
VI	Algorithm Analysis : Asymptotic notations, Recurrences, NP complete problems	7	20%
END SEMESTER EXAM			

QUESTION PAPER PATTERN:

Maximum Marks: 100 Exam Duration: 3Hourrs.

Part A: 8 compulsory questions.

One question from each module of Modules I - IV; and two each from Module V & VI.

Student has to answer all questions. (8 x5)=40

Part B: 3 questions uniformly covering Modules I & II. Student has to answer any 2 from the 3 questions: (2 x 10) =20. Each question can have maximum of 4 sub questions (a,b,c,d), if needed.

Part C: 3 questions uniformly covering Modules III & IV. Student has to answer any 2 from the 3 questions: (2 x 10) =20. Each question can have maximum of 4 sub questions (a,b,c,d), if needed.

Part D: 3 questions uniformly covering Modules V & VI. Student has to answer any 2 from the 3 questions: (2 x 10) =20. Each question can have maximum of 4 sub questions (a,b,c,d), if needed.