



G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Academic year 2016-2017
I YEAR II-SEM

COURSE DESCRIPTION

Course Code	: 15A05201			
Course Title	: Data Structures			
Course Structure	: Lectures	Tutorials	Practical's	Credits
	5	4	2	6
Course Coordinator	: Mr.R.ANIL KUMAR, Asst.prof			
Team of Instructors	:			

I. Course Overview:

This course will survey important developments in data structures that have not (yet) worked their way into the standard computer science curriculum. This course demonstrates an in-depth understanding of the C language, linear data structures, non linear data structures and advanced data structures implementation in C.

- Installation and development of various application programs.
- Create reusable codes using the templates.
- Creating applications with different technologies.

II. Prerequisite(s)

Level	Credits	Periods/ Week	Prerequisites
UG	3	3	Array, structures, pointers Turboc2/Turboc3/gcc

III. Marks Distribution:

Sessional Marks	University End Exam Marks	Total Marks
<p>For theory subjects, during the semester there shall be Two midterm examinations. Each midterm examination consists of objective paper for 10 marks and subjective paper for 20 marks with duration of 1hour 50 minutes (20 minutes for objective and 90 minutes for subjective paper).</p> <p>Objective paper is set for 20 bits for 10 marks. Subjective paper shall contain 5 questions of which student has to answer 3 questions evaluated* for 20 marks. First midterm examination shall be conducted for I-II units of syllabus and second midterm examination shall be conducted for III-V units. The total marks secured by the student in each midterm examination for 30 marks is considered .The final mid marks are calculated as from the least 20% and from the best 80% marks is considered for the final mid marks.</p>	70	30

IV. Evaluation Scheme:

S.N O	Component	Duration(hours)	Marks
1	I Mid Examination	1hour 50 minutes	30
2	II Mid Examination	1hour 50 minutes	30
3	External Examination	3	70

V. Course Educational Objectives:

To become proficient with the fundamental tools of program design using structured problem solving, data representation, software engineering principles and comparative analysis of algorithms. To develop the ability to design and write programs for implementation

of such algorithms. By the end of the course, the student will be able to develop intermediate to advanced level programming techniques including:

- Be familiar with basic techniques of algorithm analysis
- Declaration and use of various data types.
- Define and build various data structures.
- Understand applicability for the various data structures.
- Understand differences between recursive and iterative methods.
- To analyze solutions for storage management computing problems.
- To design and code algorithms for solutions.
- Implement algorithms into programming code.
- Demonstrate data structure problem solutions
- Be familiar with writing recursive methods
- Master the implementation of linked data structures such as linked lists and binary trees
- Be familiar with advanced data structures such as balanced search trees, hash tables, priority queues and the disjoint set union/find data structure
- Be familiar with several sub-quadratic sorting algorithms including quick sort, merge sort and heap sort.
- Be familiar with some graph algorithms such as shortest path and minimum spanning tree
- Master analyzing problems and writing program solutions to problems using the above techniques.

VI. Course Outcomes:

- a. Explain significance of data, data structures, algorithms and stages of software development life cycle.
- b. Apply searching and sorting techniques on a given set of data
- c. Apply linear and non linear data structures on a given set of data.
- d. Analyze time and space complexity of a given algorithm.
- e. Use modern tools including Eclipse CDT and Visual C++ Builder.
- f. Function effectively as a member or leader in a team during the development of a software project.
- g. Engage in independent and lifelong learning in the context of technological changes.

VII. How Course Outcomes are assessed:

Outcome		level	Proficiency assessed by
A	Apply the knowledge of mathematics, science, engineering Fundamentals and an engineering specialization to the solution of complex engineering problems.	H	Lecture, assignments, exams and project

B	Identify, formulate, review research literature, and analyze complex Engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	S	Assignments and lecture
C	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and Environmental considerations.	S	Project and lectures
D	use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	S	Project
E	create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.	S	Lecture, project And assignments.
F	Apply reasoning informed by the contextual knowledge to assess Societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.	S	Lectures
G	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of and need for sustainable development.	H	Lecturers and Assignments
H	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice	S	Assignments and project
I	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings	S	Lectures
J	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give receive clear instructions.	H	Lectures
K	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments	H	Assignments
L	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments	S	Project

S = Supportive

H = Highly Related

VIII Syllabus:

Unit-1:

Introduction and overview: Asymptotic Notations, One Dimensional array- Multi Dimensional array- pointer arrays.

Linked lists: Definition- Single linked list- Circular linked list- Double linked list- Circular Double linked list- Application of linked lists.

Unit-2:

Stacks: Introduction-Definition-Representation of Stack-Operations on Stacks- Applications of Stacks.

Queues: Introduction, Definition- Representations of Queues- Various Queue Structures- Applications of Queues. **Tables:** Hash tables.

Unit-3:

Trees: Basic Terminologies- Definition and Concepts- Representations of Binary Tree- Operation on a Binary Tree- Types of Binary Trees-Binary Search Tree, Heap Trees, Height Balanced Trees, B. Trees, Red Black Trees.

Graphs: Introduction- Graph terminologies- Representation of graphs- Operations on Graphs- Application of Graph Structures: Shortest path problem- topological sorting.

Unit-4:

Sorting : Sorting Techniques- Sorting by Insertion: Straight Insertion sort- List insertion sort- Binary insertion sort- Sorting by selection: Straight selection sort- Heap Sort- Sorting by Exchange- Bubble Sort- Shell Sort-Quick Sort-External Sorts: Merging Order Files-Merging Unorder Files- Sorting Process.

Unit-5:

Searching: List Searches- Sequential Search- Variations on Sequential Searches- Binary Search- Analyzing Search Algorithm- Hashed List Searches- Basic Concepts- Hashing Methods- Collision Resolutions- Open Addressing- Linked List Collision Resolution- Bucket Hashing.

Text Books:

1. "Classic Data Structures", Second Edition by Debasis Samanta, PHI.
2. "Data Structures A Pseudo code Approach with C", Second Edition by Richard F. Gilberg, Behrouz A. Forouzan, Cengage Learning.

Reference Books:

1. Fundamentals of Data Structures in C – Horowitz, Sahni, Anderson-Freed, Universities Press, Second Edition.
2. Schaum' Outlines – Data Structures – Seymour Lipschutz – McGrawHill- Revised First Edition.
3. Data structures and Algorithms using C++, Ananda Rao Akepogu and Radhika Raju Palagiri, Pearson Education

IX Course Plan:

The course plan is meant as a guideline. There may probably be changes.

Lecture No.	Learning Objective	Topics to be covered	Reference	Web reference
UNIT -1				

1-2	To learn the meaning of asymptote and various asymptotic notations purpose	Asymptotic Notations	R3: 3.11-3.17	www.scribd.com/doc
3	To know the advantage of one-dimensional array and its memory representation	One Dimensional array	T1: Page no: 14-21	www.scribd.com/doc
4-5	To learn in-detail about two dimensional arrays and sparse matrices and its memory representation	Multi Dimensional array-	T1: Page no: 22-30	www.scribd.com/doc
6	To understand the definition of pointer and its usage with arrays	pointer arrays	T1: Page no: 32	www.scribd.com/doc
7-8	To know the definition of linked list ,representation and its advantages and operations on single linked list	Linked lists: Definition- Single linked list-	T1: Page no: 37-50	www.scribd.com/doc
9	To learn in detail about various operations on circular linked list	Circular linked list	T1: Page no: 51-54	www.scribd.com/doc
10	To learn in detail about various operations on Double linked list	Double linked list	T1: Page no: 55-60	www.scribd.com/doc
11	To learn in detail about various operations on circular double linked list	Circular Double linked list	T1: Page no: 60-63	www.scribd.com/doc
12-13	To learn the applications of linked lists	Application of linked lists.	T1: Page no: 63-101	www.scribd.com/doc
UNIT -2				
14	To know the definition of stack	Stacks: Introduction-Definition	T1: Page no: 105	www.scribd.com/doc
15-16	To learn in detail the representation and operations on stacks	Representation of Stack-Operations on Stacks	T1: Page no: 107-111	www.scribd.com/doc
17-19	To know in detail the applications of stacks	Applications of Stacks.	T1: Page no: 111-127	www.scribd.com/doc
20	To know the definition of queue	Queues: Introduction, Definition	T1: Page no: 153-155	www.scribd.com/doc
21	To learn in detail the representation and operations on queues	Representations of Queues	T1: Page no: 156-160	www.scribd.com/doc
22-23	To learn different types of queues and there advantages	Various Queue Structures	T1: Page no: 160-171	www.scribd.com/doc
24-25	To know in detail the applications of queues	Applications of Queues	T1: Page no: 172-187	www.scribd.com/doc
26	To learn and know the definition of hash table ,hash function and its representation	Tables: Hash tables	T1: Page no: 194-198	www.scribd.com/doc
UNIT -3				
27	To learn the basic	Trees: Basic Terminologies	T1: Page	www.scribd.com/

	terminology related to tree data structure with examples		no: 212-215	doc
28	To know the definition and concepts	Definition and Concepts	T1: Page no: 216	www.scribd.com/doc
29	To learn the definition and representation of binary tree	Representations of Binary Tree	T1: Page no: 217-229	www.scribd.com/doc
30	To know in detail the various operations on binary tree	Operation on a Binary Tree	T1: Page no: 230-249	www.scribd.com/doc
31	To know in detail the types of binary trees and operations on it	Types of Binary Trees	T1: Page no: 249-254	www.scribd.com/doc
32-33	To learn the definition of BST and to know in detail the operations on BST	Binary Search Tree	T1: Page no: 254-265	www.scribd.com/doc
34-35	To know the definition of heap and to learn the types of heap trees with operations on it	Heap Trees	T1: Page no: 266-289	www.scribd.com/doc
36-38	To learn the different types of height balanced trees	Height Balanced Trees, B. Trees	T1: Page no: 289-306	www.scribd.com/doc
39-40	To know the definition of B.Trees with operations on it			www.scribd.com/doc
41-42	To know the definition of Red-Black trees with operations on it	Red Black Trees.	T1: Page no: 306-333	www.scribd.com/doc
43	To learn the definition of graph and its terminology	Graphs: Introduction- Graph terminologies	T1: Page no: 375-403	www.scribd.com/doc
44	To know the representation of graphs	Representation of graphs	T1: Page no: 416-421	www.scribd.com/doc
45	To know in detail the operations on graphs	Operations on Graph.	T1: Page no: 431-453	www.scribd.com/doc
46	To know in detail the various applications of graphs	Application of Graph Structures: Shortest path problem	T1: Page no: 454-465	www.scribd.com/doc
47	To know in detail the advantage of topological sorting and its mechanism	topological sorting	T1: Page no: 466	www.scribd.com/doc
UNIT -4				
48	To know in detail the advantages of sorting ,and its classification	Sorting : Sorting Techniques- Sorting by Insertion	T1: Page no: 532-534	www.scribd.com/doc
49	To learn in detail the arrangement of data in sorted order using straight insertion sort	Straight Insertion sort	T1: Page no: 534-540	www.scribd.com/doc
50	To learn in detail the arrangement of data in sorted order using list insertion sort	List insertion sort	T1: Page no: 540-545	www.scribd.com/doc
51	To learn in detail the arrangement of data in	Binary insertion sort	T1: Page no:	www.scribd.com/doc

	sorted order using Binary insertion sort		545	doc
52	To learn in detail the arrangement of data in sorted order using selection sort	Sorting by selection: Straight selection sort	T1: Page no: 536	www.scribd.com/doc
53	To learn in detail the arrangement of data in sorted order using heap sort	Heap Sort	T1: Page no: 573-593	www.scribd.com/doc
54	To learn in detail the arrangement of data in sorted order using Bubble sort	Sorting by Exchange- Bubble Sort-	T1: Page no: 593-602	www.scribd.com/doc
55	To learn in detail the arrangement of data in sorted order using shell sort and quick sort	Shell Sort-Quick Sort	T1: Page no: 603-634	www.scribd.com/doc
56	To learn in detail the arrangement of data in sorted order using merge sort	External Sorts: Merging Order Files-Merging Unorder Files-Sorting Process	T1: Page no: 658-685	www.scribd.com/doc
UNIT -5				
57	To learn in detail how to search an an element in a data structure	Searching: List Searches	T1: Page no: 712-713	www.scribd.com/doc
58	To learn in detail searching an element using sequential search recursive and non-recursive	Sequential Search Variations on Sequential Searches-	T1: Page no: 714-722	www.scribd.com/doc
59	To know the time complexity of sequential search in best,worst and average case			
60	To learn in detail searching an element using binary search recursive and non-recursive	Binary Search- Analyzing Search Algorithm.	T1: Page no: 722-730	www.scribd.com/doc
61	To learn in detail searching an element in a data structure using hash concepts	Hashed List Searches- Basic Concepts Hashing Methods Collision Resolutions- Open Addressing- Linked List Collision Resolution- Bucket Hashing	R3: 8.-6-8.19	www.scribd.com/doc
62	To know the different hashing methods with suitable			
63	To learn and understand definition of collision and its resolution techniques .			

X Mapping of course outcomes leading to the achievement of the program outcomes:

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO1 2
CO.1	3	2	2	1	1	-	-	-	-	-	1	1
CO.2	3	1	2	1	1	1	1	-	-	-	1	1
CO.3	3	2	1	1	2	1	-	-	-	-	1	1
CO.4	2	1	1	2	1	1	1	-	-	-	1	1
CO.5	-	-	-	2	1	2	-	-	-	-	-	-
CO.6	2	2	1	1	-	-	-	-	3	1	2	2
CO.7	-	-	-	-	-	-	-	-	1	1	1	1

XI Mapping of course outcomes leading to the achievement of the program specific outcomes:

CO	PS O1	PS O2
CO.1	3	2
CO.2	3	1
CO.3	3	1
CO.4	2	2
CO.5	3	1
CO.6	3	2
CO.7	1	3

1-Lightly Related

2-Medium Related

3-Highly related

Prepared By : Mr. R.Anil kumar, Assistant professor

