

KL UNIVERISTY
FIRST SEMESTER 2010-11
Course Handout
Academic Division

Dated: 07-07-2010

Course No. : EM C203 / CS C203
Course Title : Data Structures
Course Structure : 3-1-2
Course coordinator : Smt D Haritha
Instructors : Dr K Rajasekhara Rao, Naga Lakshmi

1. Course Description:

Algorithm Analysis, Run Time Calculations, Abstract Data Types, List ADT, Polynomial ADT, Stacks & Queues, Applications of Stacks & Queues, Searching Methods, Internal Sorting Techniques, External Sorting Techniques, Comparison of sorting timing complexities, Binary Trees, Search Trees, AVL Trees, Splay Trees, B-Trees And Hashing techniques.

2. Scope and Objective of the Course:

This course aims to teach a set of skills necessary to create and manage a well defined data structures.

The Course Objectives is to

After In detailed Learning of Data Structures the student will be able to:

- (1) Understand the fundamental concepts of Data Structures.
- (2) Analyze & Synthesize the practical implementation aspects of the algorithms.
- (3) Comprehend both Linear & Non Linear Data Structures like Stacks, Queues, Trees.
- (4) Implement various algorithms, keeping the data abstraction and modularity Principles in mind.
- (5) Emphasize the concepts and constructs rather than on language features..

The Study of Data Structures involves 2 complementary Goals.

The 1st Goal is to identify and develop useful mathematical entities and operations and to determine what classes of problems can be solved by using these entities and operations.

The 2nd Goal is to determine representations for those abstract entities and to implement the abstract operations on these concrete representations.

After Completing this course student should be able to know how to create & manipulate the available Data Structures like lists, stacks, queues, trees and so on. By using them they can create any applications like,

- Compiler Design,
- Operating System,
- Database Management System,
- Statistical analysis package,
- Numerical Analysis,

- Graphics,
- Artificial Intelligence,
- Simulation

3. Books:

(i) Textbook:

- a. Mark Allen Weiss: "Data Structures and Algorithm Analysis in C", 2nd ed, AW.

(ii) Reference Book:

- a. Langson, Augenstein & Tenenbaum, 'Data Structures using C and C++', 2nd ed, PHI. 2. Robert L.Kruse, Leung and Tando, 'Data Structures and Program Design in C', 2nd ed, PHI.

4. Syllabus:

UNIT I:

Algorithm Analysis: Mathematical Background, Model, Analysis and Run Time Calculations, **Lists:** Abstract Data Types, the List ADT, Singly Linked, Doubly Linked, Circular Linked List ADTs, Polynomial ADT.

UNIT II:

Stacks And Queues: The Stack ADT and applications; Infix to postfix expression conversion, Evaluation of Postfix expressions. The Queue ADT and Applications.

UNIT III:

Searching: Linear and Binary Searching. **Internal Sorting:** Insertion Sort, Shell Sort, Heap Sort, Merge Sort, Quick Sort, Bucket Sort. **External Sorting:** Model for External Sorting Algorithm, Multiway Merge, Poly Phase Merge, Replacement Selection. Comparison of Sorting Timing Complexities.

UNIT IV:

Binary Trees: Implementation, Expression Tress. **Search Trees:** Binary Search Trees, Implementation. **AVL Trees:** Single Rotations, Double Rotations. **Splay Trees:** Splaying, B-Trees.

Unit V:

Hashing: Hash Function, Separate Chaining, Open Addressing, Rehashing, and Extendible Hashing.

5.Course Plan:

Lecture No.	Learning Objectives	Topics to be Covered	Chapter in the text book
1	Run-time calculations	Algorithm Analysis	T1,P31-P37
2	Complexity notations	Algorithm Analysis	T1, P31-P47
3	Searching Methods	Linear & Binary Search	R1,P369
4	SORTING Techniques	Insertion & Shell Sort	T1,P236
5	SORTING Techniques	Merge Sort	T1,P248
6	SORTING Techniques	Quick Sort	T1, P251
7	External Sorting	External Sorting	T1,P266

8	External Sorting	Model for External Sorting	T1,P267
9	External Sorting Techniques	MULTIWAY MERGE	T1,P269
10	External Sorting Techniques	POLYPHASE MERGE	T1,P270
11	External Sorting Techniques	REPLACEMENT SELECTION	T1,P271
12	Comparison of different sorting techniques	Comparison	R1
13	Understanding Linear DS	Stacks	R1,P73
14	PUSH,POP Operations	Stacks	R1,P80
15	INSERT, DELETE Operations	QUEUES	R1,P158
16	Applications of STACKS	INFIX To POST FIX Conversion	R1,P83
17	Applications of STACKS	INFIX To POST FIX Conversion	R1,P83
18	Applications of STACKS	Evaluating POST FIX Expression	R1,P89
19	DEQueue Operations	DEQUEUE	T1,P85
20	LIST ADT	LIST ADT	T1,P58
21	Operations on SLL	Single Linked List	T1,P58-P65
22	Operations on SLL	Single Linked List	T1,P58-P65
23	Stacks using linked list	Single Linked List	T1,P58-65
24	Operations on DLL	Double Linked List	T1,P67
25	Queues using linked list	Double Linked List	T1,P68
26	Creating & Manipulating POLYNOMIAL ADT	POLYNOMIAL ADT	R1
27	SORTING Techniques	Bucket Sort	T1,P266
28	Trees Introduction	TREES	T1,P105
29	Operations on Binary Trees	BINARY TREE	T1,P111
30	How to construct Expression Trees	Expression trees	T1,P113
31	Understanding BST	BINARY SEARCH TREES	T1,P116
32	Operations on BST	BINARY SEARCH TREES	T1,P116-123
33	Understanding AVL Trees	AVL Trees	T1,P126
34	Operations on AVL Trees	AVL Trees	T1,P128
35	Operations on AVL Trees	AVL Trees	T1,P130
36	Splaying	Splay Trees	T1,P139
37	Understanding B-Trees	B-Trees	T1,P149
38	Operations on B-Trees	B-Trees	T1,P152
39	SORTING Techniques	HEAP Sort	T1,P244
40	Hashing	Hashing	T1,P165
41	Collision Resolution Techniques	Separate Chaining	T1,P168
42	Collision Resolution Techniques	Open Addressing	T1,P173
43	Hashing Techniques	REHASHING	T1,P181

44	Hashing Techniques	Extendable Hashing	T1,P184
45	RIVISION	RIVISION	----

6.Self learning material:

Unit	Topic	Source
I	Dynamic memory allocation	Data Structures Using C – M.Tenenbaum, PHI Ed.,
II	Recursion	T1
III	Heaps	Data Structures Using C – M.Tenenbaum, PHI Ed.,
V	Dynamic m/m management with compaction	Data Structures Using C – M.Tenenbaum, PHI Ed.,
V	Garbage Collection	Data Structures Using C – M.Tenenbaum, PHI Ed.,

7.Evaluation Scheme:

Component	Duration (minutes)	% Weightage	Marks	Date & Time	Venue
Test-1	50 Min	8	10	12-08-2010 9.30 to 10.20 A.M	CSE002, 102 103, 202, 209, 309, NSH
Test-2	50 Min	8	10	16-08-2010 9.30 to 10.20 A.M	CSE002, 102 103, 202, 209, 309, NSH
Assignment submission		4	5	Continuous	
Assignment Test	50 Min	4	5	28.10.10 9.00 to 10.20 A.M	CSE002, 102 103, 202, 209, 309, NSH
Quiz	30 Min	4	5	28.10.10 9.00 to 10.20 A.M	CSE002, 102 103, 202, 209, 309, NSH
Regular Lab Evaluation	Continuous	10	50		
Comprehensive Lab Exam	3 Hrs	8	40		
Comprehensive Exam	3 Hrs	48	60		
Attendance for Theory & Tutorial		4	5	Continuous	
Attendance for Lab		2	10	Continuous	

8. Chamber consultation hour: Informed in the class in first week.

9. Notices: All notices regarding the course will be put in E-learning website.

10. Tutorial: Tutorial will be conducted by the respective in charge faculty. The tutorials are planned to supplement the material taught in the lectures and clear doubts. Student must attend registered section for tutorial in the respective classroom. Class assignment, class tests and other evaluation components will also be conducted during tutorials. Students must actively participate in the tutorial and come prepared for it.

Course Coordinator