ESO 207A: Course Handout

Even Semester 2018-2019

January 15, 2018

1 Objectives

The course objectives are:

- To teach the importance of organizing data for ease in storage and retrieval and manipulation of data.
- To discuss about design of basic sets operations on collections of data objects.
- To create client view of operating on data in the form of abstract data types.
- To create appropriate storage representations for each data structure.
- To teach concept of data management and data protection.
- To implement basic operations on both basic and advanced data structure so that applications using these data structures can be developed.
- To improve analytical ability for creating efficient computer programs.

2 Contents

Introduction: Computational models such as Turing Machine and RAM. Time Complexity, Big-Oh, little-Oh, Big-Omega, little-omega, Theta notations for analysis of upper and lower bounds of running times.

Abstract data type: Representations, Operations and Implementations.

Linear Data Structures: Linked list, Stack, Queue.

Heaps and Priority Queues: Binary Heaps, Binomial Trees and Binomial Heaps.

Binary Trees: Representation, Preorder, Inorder and Postorder traversals. Prefix, Infix and Postfix Expressions and evaluations. Representing General Tree as Binary trees.

Binary Search Trees: BST, AVL and Red-Black trees.

Hashing: Various Hash functions, Closed and Open hashing.

String Matching: Naive string matching algorithm, KMP algorithm.

Advanced Data Structures: Splay trees, Skip lists.

Graph: directed and undirected graphs, Spanning trees, shortest paths, DFS, BFS, connected components, Biconnected components.

Divide and conquer algorithms: Hoffman coding, Merge Sorting, Quick Sort. Median Finding.

Greedy algorithms: Bin packing, Dijkstra's Shortest Path Algorithms, Builidng binary heap, Kruskal's MST, Matroids,

3 Mark Distribution

Test elements	Description	Marks
Home Assignments	There will be 6 paper (12 marks) and 6 programming (18 marks) assignments. The paper assignments have to be prepared on LaTeXand uploaded to course website	30
Quizzes	There will be 4 quizzes 4 marks each. Three best performances will be considered for credits.	12
Mid Term	Exam	23
End Term	Exam	35

4 Submission of Assignments

All paper assignments should be prepared using overleaf (LaTeX) and only pdf files should be uploaded using the link as per announcements made on the course website from time to time.

All programs should be prepared in a single file (no header files if your using C) and uploaded using appropriate link as announced in the course website.

4.1 Anti Cheating Policy

Cases of cheating in assignments, exams, or quizzes if detected will be dealt with severely. The anti-cheating policy will be as follows:

1. At fist instance, if student is found cheating either in an assignment or a quiz, he/she gets 0 for the test element and 5% less in grand total.
2. At second instance of cheating in an assignment or quiz, a student will get 0 in the test elements, 5% less in total and one grade lower.
3. If a students is found cheating multiple times and across various test elements including examination, he/she will get an F.

5 Teaching Assistants

A set of five Teach Assistants have been identified for providing assistances to students and help in evaluation. The names and email of these students are provided below.

1. Kapil Dolas, email: kapildd@iitk.ac.in (has additional responsibility of leading maintenance of course website)
2. Divya Theodore, email: divtheo@cse.iitk.ac.in
3. Divyanshu Shende, emil: divush@cse.iitk.ac.in
4. Rushab Munot, email: rushabmunot1@gmail.com
5. Shubham Kumar Pandey, email: shubhkp@cse.iitk.ac.in

6 Reference Books

Following books are used as references for course materials and additional explanations.

1. Aho, Hopcroft and Ullman: Data Structure and Algorithms.
2. Corman, Leiserson, Rivest and Stein: Introduction to Algorithms.
3. Goldwasser, Tamassia and Goodrich: Data Structures and Algorithms in <Python C or Java>.
4. Weiss: Data Structures and Algorithms Analysis in C.

7 Special Assistances

Students having difficulties to cope up are advised to meet TAs according their conveniences. Each TA will handle issues related to a group of 18-20 students. Students are also welcome to meet the instructor during 1 hour slot on Saturdays between 4.30-5.30PM. Please do not clutter mail boxes of TAs and the Instructor by sending unnecessary emails. If you have specific issue try to get it resolved by personal meeting with TAs.