Course Syllabus

CS 6363.004 Design and analysis of computer algorithms; Spring 2018; TR 10:00-11:15 AM; ECSS 2.412
Class URL: https://www.utdallas.edu/~rbk/teach/2018/6363.html

Professor Contact Information
Balaji Raghavachari; (972) 883-2136; rbk@utdallas.edu; ECSS 4.225
Office hours: Tue/Thu 11:20-11:55 AM, 2:20-3:00 PM. Wed 9:00 AM - 1:00 PM, or by appointment.

Course Prerequisites, Co-requisites, and/or Other Restrictions
CS 5343 or equivalent (Data structures and algorithms): Analysis of algorithms. Stacks, queues, and trees, including B-trees. Heaps, hashing, and advanced sorting techniques. Disjoint sets and graphs.

Course Description
Topics: Algorithm design techniques: divide-and-conquer, dynamic programming, greedy algorithms; Sorting and searching; Graph algorithms; Computational complexity, lower bounds, NP-Completeness. Proofs of correctness.
* Running time analysis of algorithms, order notation
* Mathematical background: sums of sequences, Logs and polynomials, recurrences
* Correctness of algorithms: loop invariants, proof by induction
* Divide and conquer: merge/quick sort, binary search, median, n-bit multiplication, FFT, closest pair, convex hull
* Lower bounds, sorting lower bound
* Dynamic programming: rod cutting, matrix-chain multiplication, activity selection, knapsack, LCS, LMIS
* Greedy algorithms: activity selection, Huffman coding
* Graphs, DFS and its applications
* Minimum spanning trees: generic algorithm, implementation of Prim/Kruskal, disjoint sets
* Shortest paths: BFS, Bellman-Ford, DAG-shortest path, Dijkstra, Floyd-Warshall
* Max-flow problem: Ford-Fulkerson, Edmonds-Karp, Push/relabel, min-cost flow
* NP-completeness: introduction, reductions.

Student Learning Objectives/Outcomes
Study efficient algorithms for a number of fundamental problems, learn techniques for designing algorithms, prove correctness and analyze running times.
1. Ability to understand asymptotic notations, recurrences, algorithm analysis
2. Ability to understand divide and conquer algorithms
3. Ability to understand greedy algorithms
4. Ability to understand dynamic programming algorithms
5. Ability to understand graph algorithms, flow networks
6. Ability to understand NP-Completeness

Required Textbooks and Materials

Assignments & Academic Calendar
Exam 1: Feb 15 (Thu); Exam 2: Mar 29 (Thu); Final exam: as announced by the Registrar.

Grading Policy:
Score minimum in each category to earn a grade: (1) average of mid-term exams, (2) final exam, (3) biweekly homework assignments, (4) one programming project. Not meeting cut-off scores for C is an “F”. Cut off scores:

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<thead>
<tr>
<th>Grade</th>
<th>Exams 1 and 2</th>
<th>Final exam</th>
<th>Assignments</th>
<th>Project</th>
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</thead>
<tbody>
<tr>
<td>A</td>
<td>90% in each, or 92% average</td>
<td>80%</td>
<td>80%</td>
<td>90%</td>
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<tr>
<td>A-</td>
<td>82.5% in each, or, 85% average</td>
<td>75%</td>
<td>80%</td>
<td>80%</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
<th>A</th>
<th>B</th>
<th>C</th>
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<tbody>
<tr>
<td>B+</td>
<td>75% in each, or 77.5% average</td>
<td>50%</td>
<td>75%</td>
<td>70%</td>
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<tr>
<td>B</td>
<td>70% average</td>
<td>50%</td>
<td>70%</td>
<td>70%</td>
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<tr>
<td>B-</td>
<td>60% average (including final)</td>
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<td>70%</td>
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<td>C</td>
<td>50% average (including final)</td>
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<td>60%</td>
<td>60%</td>
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**Course & Instructor Policies**

- Attendance policy: one grade reduction for missing 3 classes (without valid excuse and prior permission from instructor), and a grade of “F” for missing 5 classes, without proper excuse. Send email to instructor prior to class, with proper excuse, to avoid being marked absent.
- Assignments are due in class, on the specified date. Turn in what is completed by the deadline, for partial credit. No late submissions will be accepted. All submissions must be your own work. Solutions copied from the internet, instructor's manual, etc., will be given zero credit.
- No browsing/email/gaming/social networking is allowed during the lectures. Students may not use phones during class. You must get instructor's approval to use computers in class.
- The following are not allowed in class: audio or video recordings, photos.
- Notes written by instructor on white paper will be scanned and posted on elearning.
- Regular class attendance and participation is expected and is the responsibility of each individual. There is a strong correlation between regular class attendance and good performance. You are responsible for any handouts, announcements, reading material and contents of lectures that you missed.

See also UTD's policies at [https://go.utdallas.edu/syllabus-policies](https://go.utdallas.edu/syllabus-policies)