**CS 344: Design & Analysis of Computer Algorithms**

**Spring 2017, Sections 1-3, 4 Credits**

**INSTRUCTOR:** Bahman Kalantari , 444 Hill, Tel: (848)445-7297.

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**LECTURE:** M-W 1:10-2:30 PM, CAC AB-2160

**OFFICE HOURS:** W 10:00-11:00 AM; W 3:00-4:00 PM

**Section 1 Recitation :** Monday 8:25 - 9:20 AM, CAC AB-1180

TA: TBA **Office Hours** TBA.

**Section 2 Recitation:** Wednesday 8:25 - 9:20 AM, CAC AB-1170

TA: TBA **Office Hours** TBA.

**Section 3 Recitation:** Monday 10:05 - 11:00 AM, CAC CA-A5

TA: TBA **Office Hours** TBA.

**Prerequisites:** 198:112 Data Structures, 198:206 Introduction to Discrete Structures II

**Exams (No Makeup Exams!): Midterm I: Feb 15; (Spring break: Sat March 11 - Sun March 19); Midterm II (incremental): March 27 (Last lecture: May 1); Final: TBA (cumulative).**

**Grading Guideline: 0.15 (HW & Quizzes) + max 0.20 MIDTERM 1 + 0.20 MIDTERM 2 + 0.45 FINAL, 0.25 MIDTERM 2 + 0.60 FINAL. (Class and recitation attendance and class participation will also be taken into account in grading.)**

**TOPICS: The course will cover a large subset of the following**

**• Methods for expressing and comparing complexity of algorithms: worst and average cases, lower bounds, and asymptotic analysis.**

**• Searching, sorting. Lower bounds for comparison-based sorting; binsort and radix sort.**

**• Divide and conquer. Fast integer multiplication; recurrences; the master theorem; mergesort; randomized median and selection algorithms; quicksort; fast matrix multiplication.**

**• Graph search algorithms. Graphs representations; depth first search; topological search; strongly connected components. Breadth first search and layered DAGs.**

**• Greedy algorithms. Spanning trees and cuts, union-find and path compression; minimum spanning tree (MST) algorithms; randomized algorithms.**

**• Shortest Paths (SPs) in digraphs. Single-source SPs for nonnegative edge weights; priority queues and Dijkstra's; SPs in DAGs; single-source SPs for general edge**

**weights.**

**• Dynamic programming. Paradigm of SPs in DAGs; longest increasing subsequence; (approximate) string matching; integer and (0,1) knapsack problems; chain matrix multiplication; single-pair reliable SPs, all-pairs SPs; independent sets.**

**• Network flows. Max flow min cut theorem; bipartite matching; Menger's theorem and disjoint dipaths. Global minimum cuts.**

**• Elements of NP-completeness & problem reductions.**

**• NP-hard problems. Approximation algorithms.**

**Textbook: Algorithms, Dasgupta, Papadimitriou & Vazirani, McGraw Hill, 1st Edn, 2008.**

**Reference: Introduction to Algorithms, Cormen, Leiserson, Rivest & Stein, McGraw Hill, 3rd Edn, 2001. (Will be placed on reserve at SERC.)**