CS 5300-Advanced Algorithms and Data Structures
Syllabus, Procedures and Policies
January, 2016

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Office Hours: 3:00pm- 5:00pm T, 1:00 pm-3:00pm R, 11:30am – 12:30pm F
(other times by appointment)

I. Purpose of the Course

This course is designed for graduate students in computer science and is intended to introduce them to the standard techniques used in analyzing algorithms. Examples from a variety of computer science sub-disciplines will be presented. The relationships between these sub-disciplines will be shown through the study of NP-completeness.

II. Objectives and Desired Student Competencies

Upon completion of this course the student should be able to:

- Analyze algorithms with respect to both their time complexity and space complexity
- Compare algorithms using established analysis techniques
- Determine an appropriate strategy for utilizing an algorithm, given both time and monetary constraints
- Understand the notions of class P and class NP problems

III. Course Content Outline

A. Foundations
   1. The Role of Algorithms in Computing (ch1)
   2. Getting Started (ch2)
   3. Growth of Functions (ch3)
   4. Divide-and-Conquer (ch4)

B. Sorting and Order Statistics
   1. Heapsort (ch6)
2. Quicksort (ch7)
3. Sorting in Linear Time (ch8)
4. Medians and Order Statistics (ch9)

C. Data Structures
   1. Elementary Data Structures (ch10)
   2. Hash Tables (ch11)
   3. Binary Search Tree (ch12)

D. Advanced Design and Analysis Techniques
   1. Dynamic Programming (ch15)
   2. Greedy Algorithms (ch16)

E. Graph Algorithms
   1. Elementary Graph Algorithms (ch22)

F. Selected Topics
   1. String Matching (ch32)
   2. NP-Completeness (ch34)

G. Optional (according to course progress)
   1. Advanced Data Structures
      a. B-Trees (ch18)
      b. Fibonacci Heaps (ch19)
   2. Graph Algorithms
      c. Minimum Spanning Trees (ch23)
      d. Single-Source Shortest Paths (ch24)
      e. All-Pairs Shortest Paths (ch25)
   3. Graph Algorithms
      f. Multithreaded Algorithms (ch27)

IV. Procedures and Policies

1. Attendance: You are expected to attend all lectures and to complete all work assigned. Advance arrangements for unavoidable absence should be made whenever possible. Neither absence nor notification of absence relieves you of the responsibility of meeting all course requirements.

2. Exams, Quizzes, Course Projects: There will be two exams: a midterm and a final. Homework will be regularly assigned for weekly quiz preparation only, thus will not be collected. I will drop your lowest two quizzes. Two programming course projects will be assigned separately. WORK MUST BE SHOWN on quizzes, exams and project
reports in order to receive credit. No late work will be accepted. *Students must complete both projects in order to pass the course.*

Make-up exams will be given for valid excuses. No make-up of a make-up exam will be given.

3. **Grading Policy:** Your grade will be based on attendance (5%), quizzes (20%), course projects (25%), mid-term exam (25%), and final exam (25%). In general, A: 90-100, B: 80-89, C: 70-79, D: 60-69, and F: < 60. However, a curve may be given to an exam depending on the overall performance. "Borderline" cases will be determined by a combination of class attendance, general attitude, improvement, etc.

4. **Honor Code:** Academic dishonesty will not be tolerated in this class. Any form of cheating will be dealt with according to the guidelines on page 196-199 of the UCM Planner/Handbook 2013-2014. You can also find the Academic Dishonesty Policy online at [http://www.ucmo.edu/student/documents/honest.pdf](http://www.ucmo.edu/student/documents/honest.pdf).

5. **Students with Special Needs:** Students with documented disabilities who are seeking academic accommodations should contact the Office of Accessibility Services, Union 222, 660-543-4421.