Units: 4 units

Lectures:
Section 30101D: 5:00-8:20 PM Monday
Section 30102D: 5:00-8:20 PM Wednesday
Section 30099D: 5:00-8:20 PM Wednesday (DEN)

Instructor: Shawn Shamsian
Office: SAL 318
Office Hours:
Wednesdays: 2:30-4:30 PM
Thursdays: 4:00-6:00 PM
Link: https://usc.zoom.us/j/8466668303
Email: sshamsia@usc.edu

Teaching Assistants:
A link to a Google calendar holding all TA office hour information will be made available through D2L.

Course Information

- **Course Outline:** The course is intended as a first graduate course in the design and analysis of algorithms. The focus is on developing an understanding of the major algorithm design techniques. Algorithmic techniques covered include divide and conquer, greedy, and dynamic programming. Other topics include network flow, NP-completeness, approximation algorithms, and linear programming. At times, the practical side of algorithm design and implementation is also explored with interesting examples of their usage in solving industry problems.

At the end of this course, students should have:

- A good understanding of major algorithm design and analysis techniques
- Ability to design, analyze complexity of, and prove correctness of moderately difficult problems
- A good understanding of the NP, NP-complete, and NP-hard classifications and ability to demonstrate hardness of NP-complete problems
- Ability to solve problems through reduction such as reduction to network flow problems (max flow, min cut, feasible circulation) or linear programming
- An understanding of different methods to solving problems approximately
- Overall better problem-solving skills

- **Textbook:**
  *** Algorithm Design**
  Jon Kleinberg/Eva Tardos
  The class will be relying mostly on this textbook, but additional material will occasionally be drawn from the following:
  * Introduction to Algorithms (second Edition)
  Thomas H Cormen, Charles E. Leiserson, Ronald L. Rivest and Cliff Stein published by MIT Press and McGraw-Hill.

Students in the class are expected to have a reasonable degree of mathematical sophistication, and to be familiar with the basic notions of algorithms and data structures, discrete mathematics, and probability. Undergraduate classes in these subjects should be sufficient. If you have doubts about meeting these prerequisites, please contact the instructor.

Exams and Grading Breakdown

Exams	Date	% of Grade
Exam 1	September 30	30%
Exam 2	November 4	30%
Exam 3	December 2	25%
Final project	December 8	5%
Homework	Assigned Weekly	10%
	Total	100%

Exam 1 covers the material corresponding to weeks 1 through 5.
Exam 2 covers the material corresponding to weeks 7 through 10.
Exam 3 covers the material corresponding to weeks 12 through 14.

Assignment Submission Policy

Homework assignments are assigned on a weekly basis. Homework submissions past the due date for that assignment will not be accepted.

Additional Policies

Exam dates will be announced by the first week of classes. Students need to make sure they can take exams on those dates and times. There will be no makeup exams.

Course Schedule: A Weekly Breakdown

	Topics/Daily Activities	Readings and Homework	Homework Due Date
Week 1	intro, stable matching	Reading: chapter 1 Home assignment 1	Week 2
Week 2	Asymptotic notation, BFS, DFS, greedy algorithms	Reading: chapters 2, 3, 4 Home assignment 2	Week 3
Week 3	Greedy algorithms	Reading: chapter 4, supplemental text chapters 6,19 Home assignment 3	Week 4
Week 4	heaps, MST, shortest path	Reading: chapter 4, 5 Home assignment 4	Week 5
Week 5	divide and conquer	Reading: chapter 5 Home assignment 5	Week 6
Week 6	**exam I**		
Week 7	dynamic programming	Reading: chapter 6 Home assignment 6	Week 8
Week 8	dynamic programming	Reading: chapter 6 Home assignment 7	Week 9
Week 9	network flow - max flow	Reading: chapter 7 Home assignment 8	Week 10
Week 10	network flow - circulation	Reading: chapter 7 Home assignment 9	Week 11
Week 11	**exam II**		
Week 12	NP-completeness	Reading: chapter 8 Home assignment 10	Week 13
Week 13	NP-completeness	Reading: chapter 8, supplemental text chapter 34 Home assignment 11	Week 14
Week 14	approximation algorithms randomized algorithms linear programming	Reading: chapter 11, supplemental text chapter 35 Home assignment 12	Week 15
Week 15	**exam III**		

Statement on Academic Conduct and Support Systems

Academic Conduct

Plagiarism – presenting someone else's ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of Academic Integrity on the Viterbi website: https://viterbischool.usc.edu/academic-integrity/.

Discrimination, sexual assault, and harassment are not tolerated by the university. You are encouraged to report any incidents to the *Office of Equity and Diversity* http://equity.usc.edu or to the *Department of Public Safety* https://dps.usc.edu/contact/. This is important for the safety of the whole USC community. Another member of the university community – such as a friend, classmate, advisor, or faculty member – can help initiate the report, or can initiate the report on behalf of another person.

Support Systems

A number of USC's schools provide support for students who need help with scholarly writing. Check with your advisor or program staff to find out more. Students whose primary language is not English should check with the *American Language Institute* http://dornsife.usc.edu/ali, which sponsors courses and workshops specifically for international graduate students. *The Office of Student Accessibility Services* *https://osas.usc.edu/* provides certification for students with disabilities and helps arrange the relevant accommodations. If an officially declared emergency makes travel to campus infeasible, *USC Emergency Information* *http://emergency.usc.edu* will provide safety and other updates, including ways in which instruction will be continued by means of blackboard, teleconferencing, and other technology.