Course Overview and General Information

Your primary source for class information, homeworks, and handouts is the class web site, http://classes.engineering.wustl.edu/cse541. Please check this site regularly for course announcements. You can send me email at jbuhler@wustl.edu. Ongoing discussions and announcements may be found in the class Piazza board at http://piazza.com/wustl/fall2016/cse541/home. Homeworks will be turned in and grades posted via Blackboard at http://bb.wustl.edu.

- **Where and When:** Tuesdays and Thursdays 2:30-4:00 PM in Crow Rm 201.
- **Prerequisites:** CSE 241 or 247+347, or equivalent undergraduate training in algorithms and data structures, complexity analysis, and basic proof techniques.
- **Your Instructor:** Dr. Jeremy Buhler, jbuhler@wustl.edu.
- **Your Teaching Assistants:**
  - Ray Su, suz@wustl.edu
  - Diqiu Zhou, zhoudiqiu@wustl.edu
- **Office Hours:** My hours and the TAs’ hours are posted to the course Piazza board. If you want to meet me outside my hours, please drop me an email.

1 Course Philosophy and Structure

This course is about the design and analysis of algorithms, with a strong emphasis on *optimization*. That is, given a problem with (possibly) a multitude of feasible solutions and a measure of how good each feasible solution is, we want to find a feasible solution that is the *best* possible by this measure. The problems will be *combinatorial* in nature; that is, they will have discrete (as well as possibly continuous) components.

The only way I know to achieve proficiency in solving combinatorial optimization problems is through experience, i.e. by thinking your own way to a solution. My goals are to point out some basic structures that are common to large classes of optimization problems and, with your help, to work through examples that show how these structures can be exploited to produce efficient algorithms (or to recognize that no such algorithms are likely to exist).

Seeing a solution is only half the battle in algorithm design; you must also express your solution in a form that clearly communicates it and *convinces others (and yourself!) of its correctness*. The standard of evidence for correctness in this course is a *formal proof*, just as you would encounter in any upper-level mathematics course. In this course, I want everyone to improve their competence at explaining and justifying algorithms in the language of formal proof.

I will supply you with some worked examples for each major chunk of the course in the form of “practice problems.” The problems and their solutions may be downloaded separately from the course web site. Please
try to work these problems yourself before looking at the solutions – they are the best way to build and check your understanding. If you come seeking help with the homework, the first thing I’ll probably ask is how you’ve fared with the practice problems.

You should expect to spend at least 10-14 hours on each homework, including time to work the practice problems. For each homework problem, you will need to understand what is being asked, see how to apply the basic structures (e.g. greedy choice, dynamic programming) that you have learned, devise an efficient solution, and write both a clear, concise description of your solution and a formal proof justifying both its correctness and its time complexity. Please start early on the homeworks. Be prepared to put aside some of the problems and come back to them. Steady mental effort, perhaps spaced over a period of hours or days, is usually rewarded. Electronic composition of homework is also helpful, since it lets you revise and improve your arguments without spending time rewriting the parts you are satisfied with.

2 Homeworks

There will be four to five homework assignments, which will be distributed in PDF form from the course web page. Assignments must be turned in electronically using Blackboard. You may compose them electronically (preferred) or scan handwritten solutions, provided they are legible. Please see the course website for detailed turn-in procedures and advice on composing your homework electronically.

Assignments must be turned in on Blackboard by class time on the due date. Late assignments will not be accepted except by prior arrangement.

I expect your homework solutions to be clear, concise, neat, and easy to read – if the graders and I cannot understand your argument, we will mark it wrong.

3 Exams and Grading

There will be three 80-minute exams held in class during the semester. Exams are always closed-book and closed-notes. However, you may use one 8.5 × 11 crib sheet (both sides).

Your final grade in the course will be weighted roughly as follows:

1. each homework: 10% (assuming four)
2. each exam: 20%

I will be asking for student volunteers to help grade the homeworks. If you have solved a homework problem and want to grade it, you must write up your solution and submit it for review through the course’s Piazza board before its due date. Graders will be chosen on a first-come, first-served basis. Due to the difficulty of grading 70+ assignments in a timely fashion, I usually need 2-3 student graders per problem.

Depending on how well I feel you did at grading a problem, you may receive extra credit up to the value of the problem you grade. I will try to avoid having the same student grade several homework problems during the semester; however, I can only spread the grading credit fairly if everyone takes the time to apply for grading and to provide me with good solutions in advance!

4 Policy on Collaborations and Academic Integrity

Please see the separate collaboration policy document on the course web site. You are expected to be familiar with this policy and to abide by it at all times. By turning in an assignment through the Blackboard interface, you certify that you have followed the course collaboration policy for that assignment.