CSE 547T Automata Theory January 15, 2017

Course Overview and General Information

Your primary source for class information, homeworks, and handouts is the class web site, `http://classes.engineering.wustl.edu/cse547`. 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/spring2017/cse547/home`. Homeworks will be turned in and grades posted via Blackboard at `http://bb.wustl.edu`.

- **Where and When**: Mondays and Wednesdays 4:00-5:30 PM in Cupples II Rm 230.
- **Prerequisites**: CSE 241 or 247, 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**:
  - Elliott Battle, *ebattle@wustl.edu*
  - Seth Ebner, *ebner.seth@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.
- **Textbook**: Sipser, "Introduction to the Theory of Computation," 3rd Edition.

1 Course Philosophy and Structure

This course is about *automata* – formal models of computation. Automata are mathematically precise definitions of what we mean when we talk about a "computer," a "computational problem," or an "algorithm." They are simple enough that we can formally prove their properties yet powerful enough to do anything that a real computer can do (for various values of "real").

We study automata to clarify our own understanding of what a computer is and to determine, for several reasonable models of computation, what problems can and cannot be solved in a general way by algorithms. (The observation that some problems cannot be solved by any algorithm is one of the great triumphs of modern mathematics!) Along the way, we will learn mathematical tricks and formalisms related to automata that are of practical use in various areas of computer science, such as pattern matching, parsing, hardware design, and computational biology.

I will give you the definitions you need to understand automata and prove important facts about them in my lectures. However, to solidify your understanding of these ideas so that you can work with them effectively, it is imperative to spend time and intellectual effort on the homeworks.

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 ideas and theorems you have learned in class, and write a clear, concise description of your solution, with formal justification via proofs where appropriate. *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 homeworks 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 be 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 solution, we will mark it wrong.

3 Exams and Grading

There will be two exams; one will be held in class during the semester, while the other will be during finals period. 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: 12.5% (assuming four)
2. each exam: 25%

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 30+ assignments in a timely fashion, I usually need 2 student graders per problem.

Depending on how well I feel you did at grading a problem, you may receive extra credit up to half 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.*