CSE 547 Formal Languages and Automata **January 14, 2009**

Course Overview and General Information

Your primary source for class information, homeworks, and handouts is the class web site, **http://classes.cec.wustl.edu/~cse547**. Please check this site regularly for course announcements.

- **Where and When**: Mondays and Wednesdays 1:00-2:30 PM in Cupples II 200.
- **Prerequisites**: CSE 240 or equivalent discrete math background.
- **Your Instructor**: Dr. Jeremy Buhler. I would prefer that you use the course address, *cse547@cec.wustl.edu* rather than my personal address, *jbuhler@cse.wustl.edu*, for course-related correspondence. See the section on Contact Info below.
- **Your Teaching Assistant**: Trung Nguyen
- **Contact Info**: You can contact the instructor and/or TAs by any of the following means:
  - Send mail to the course account, *cse547@cec.wustl.edu*. Your message will be seen by the instructor and TAs.
  - Send mail to the instructor, *jbuhler@cse.wustl.edu*. Please use the cse547 account in preference to my address if at all possible.
  - Drop in to see us during our office hours, or by appointment. My office is Jolley 530. To call for an appointment, my phone number is 314-935-6180 (though I much prefer email).
- **Office Hours**: Hours for myself and for the TA will be posted to the course website as they are finalized.
- **Textbook**: Martin's *Introduction to Languages and the Theory of Computation*, 3rd Edition. Please do not ask me about earlier editions of the text – I don't know if they are the same as this edition. I will assign some homework problems from the 3rd edition.

1 Course Philosophy

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 20th century 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.

In addition to my lectures, I will supply you with a number of worked examples in the form of "practice problems." The problems and their solutions may be downloaded separately from the web site. *Please 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 ask is how you've fared with the practice problems.

As another way of reinforcing the material, Trung Nguyen, my graduate TA, will hold an approximately weekly one-hour review and recitation section. In these sessions, Trung will lead discussions to review the material and to work through selected practice problems and problems from previous homeworks. Attendance at these sections is optional but recommended for those who want extra help with proofs or just reinforcement of the material.

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.

2 Assignments

I plan to give roughly four written homework assignments. Assignments will be distributed in PDF form from the course web page; you can use Adobe's free Acrobat Reader, XPdf, or GV/GSView to read them.

Assignments must be turned in **at the beginning of class on the due date** or placed in my turn-in box outside Jolley 530 by 12:30 PM on the due date. Assignments turned in anywhere besides the above locations (including my mailbox) will not be counted unless prior arrangements have been made with the instructor, since I won't be able to tell whether homeworks appearing in random locations were turned in on time. **Do not assume** that I will bring a stapler to class, or that your favorite printer will be working five minutes before class time. Late homeworks **will not** be accepted, as I plan to hand out solutions on the day that they are due.

Homeworks will be designed to help you practice and increase your understanding of the material presented in class. Please write your solutions clearly and concisely, keeping in mind that your peers will be grading them – if they can't tell whether your answers are correct, they'll probably mark them wrong. In particular, *I expect you to give correct and well-formed proofs where needed.* If your proof techniques are rusty, please take a look at Martin Chapters 1 and 2 for a refresher. Hand- or type-written solutions are fine, but please, no ASCII art or ASCII math. For hand-written solutions, please use either pencil or blue or black ink. Time spent typesetting your homework in, e.g., LaTeX or Word is much appreciated and will likely make it easier for you to make corrections as you're writing the solutions.

Important Note: your homeworks will be graded by your fellow students on a volunteer basis, managed by myself or a TA. If you have concerns about how something was graded, please talk to

me first.

3 Exams and Overall Grading

I plan to give two exams during the semester: an in-class mid-term, and a final exam. Each exam may cover anything discussed so far, but more weight will be given to material presented since the previous exam.

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

1. homework: 50%
2. exams: 25% each

This weighting is *tentative* and subject to revision.

I will likely need student volunteers to help with grading. If you have solved a homework problem and want to grade it, you must write up your solution and show it to me *before* its due date. Graders will generally be chosen on a first-come, first-served basis, though I will try to ensure that people who have not graded before but want to do so have the opportunity.

Depending on how well I feel you did at grading a problem, you may receive extra credit for grading up to an amount equal to the value of the problem you grade.

4 Policy on Collaborations and Academic Integrity

Please see the separate document on this subject on the course web site. You are expected to be familiar with this document and to attest (by your signature) that you have followed the course collaboration policy on each homework you turn in.