1 Course Description

This course covers the fundamental conceptual building blocks of computation. In addition, it provides a solid grounding in the theory and application of logic. The topics covered here have applications in many fields, from compiler design to system engineering. The logical concepts relating to quantifiers and reasoning can be applied in almost any field. In addition, this course should give you a better understanding of some of the limitations of computers and software.

1.1 Expectations (Preconditions)

You are expected to have a certain level of mathematical maturity. In particular, you should be familiar with basic algebra and calculus, basic discrete mathematics (CS 275), programming in a general purpose programming language, basic data structures including lists, trees and graphs, and elementary algorithmic techniques such as searching and recursion.

1.2 Outcomes (Postconditions)

The student will develop knowledge of a variety of mathematical tools for the design and analysis of algorithms and computer programs. He or she will learn basic concepts of logic, proof construction, and reasoning with variables and quantifiers. The student will learn to understand computation in terms of various abstract forms of automata. Specifically, the successful student will emerge with:

1. an ability to construct and analyze simple proofs using propositional logic;
2. an understanding of predicate calculus syntax, semantics, and basic proof techniques;
3. facility with the elements of automata theory;
4. a basic understanding of properties of formal languages and associated concepts, including grammars and regular expressions;
5. a basic understanding of models of computation, including Turing machines.

2 Policies

This section describes the relevant policies for this course. If you have a question about any of these policies, it’s better to ask sooner rather than later.
2.1 Assessment of Student Performance

Your grade will be determined by your progress with respect to the above course objectives, as measured by your performance on quizzes, examinations, and homework. The weights assigned to each of these components are as follows:

- Quizzes (3, 30 minutes each) 24%
- Midterm Examination (75 minutes) 25%
- Comprehensive Final Exam 25%
- Homework 20%
- Participation 6%

The short, in-class quizzes are intended to help you (and me) assess how well you are doing with each set of topics. They are tentatively scheduled for Tue 5 Feb, Tue 25 Mar, and Tue, 15 Apr. The midterm examination will be Thu 21 Feb. The comprehensive final examination is scheduled for 8:00–10:00 a.m. Tuesday, 29 April 2008. (If you know in advance you will be absent on any of these days, please inform me as soon as possible.)

Course grades are determined as follows: I compute each student’s “raw” total score (out of 100) using the above weights for each type of assignment. The highest raw score in the class becomes the “normalized” maximum. Your final score is then your raw score divided by the normalized maximum. For example, if the highest raw score obtained by anybody in the class is 93, a student with a raw score of 85 would have a final score of 91.40. Letter grades are assigned on the basis of final scores, with the dividing line between A and B falling roughly around 90, between B and C around 80, between C and D around 70, and between D and E around 60. I may move the lines slightly to match the gaps in the final score distribution. In all cases, however, your grade is determined by your numerical score as computed above and where the lines are drawn.

2.2 Participation and Attendance

It is well known that active learners do better than passive ones. Therefore a portion of your grade (6%) is based on your level of “participation” in the course, i.e., the effort you put into being an active learner. Attendance is one component of participation; I will take attendance at the beginning of each class. If you are not in class by the time I take attendance, you will be counted absent. Representing yourself as someone else when I take attendance is considered cheating, and will be dealt with as such (see the subsection on “Academic Conduct” below). Other factors that can affect your participation score include whether you ask questions in class or during office hours, how long it takes me to learn your name, and whether you respond to questions I ask in lecture.

I want you to choose to come to class because you are responsible for the material that I cover in lecture. Lectures will often amplify or take a somewhat different approach to the material in the book; in any case, they represent the primary “added value” that I as the instructor bring to the course. Lecture is also the place where I convey important information about which concepts are the most important, i.e. the ones you need to “get”. I try to make lectures worth your while, and I welcome thoughtful suggestions for improvement.

Absences will be excused only with written documentation. If you are absent to attend a loved one’s funeral, I will need to see a copy of the obituary and any program from the service.

2.3 Homework

Working lots of problems is the best way of “integrating” the concepts and getting them “in your fingertips”—the key to success. Therefore homework will be assigned and collected weekly. Note the following:

- I don’t mind if you work on assignments together, but any assignment you turn in must be your own work. If you work with somebody, indicate that by putting a statement on your paper, something like “I worked on this assignment with Ben Bitdiddle and Fran Fortran.” Keep in mind that if you consistently rely on others to help you solve your homework problems, there is little chance that you will perform well enough on the exams to succeed in the course.
- By the same token, if you look for solutions to problems on the Internet, you are again depriving yourself of the exercise needed to develop your skills. Don’t do it.
• **Homework assignments** must be submitted in “hard copy” (on paper). Emailed assignments will not be graded.

• **Neatness counts.** Illegible or otherwise garbled solutions will not be graded. I strongly recommend that solutions be typed or prepared on a word processor. (For the latter I recommend the free document-preparation system **LATEX**; mathematical formulas and equations don’t work too well in Word.)

• The point of homework is to get you to think about the material and practice it so you’ll do well on the quizzes and exams, which are my primary tool for measuring your progress. This thinking should not stop when you turn in an assignment—some of it should happen after you get the assignment back. Each homework will be graded on a **5-point** scale. I will mark problems that are incorrect, but it will be (mostly) up to you to understand what you did wrong by looking at the solutions I hand out. If you don’t understand why something was marked wrong, ask me—either after class or in office hours.

• **Late homework** will be assessed a **40% penalty** (2 out of 5 points). Homework is considered late if it is not turned in by the time I finish taking attendance in class on the due date. Under no circumstances will homework be accepted after solutions are handed out. In most cases the solutions solutions will be handed out in the lecture following the one in which the homework was due.

### 2.4 Academic Conduct

I expect each student to act honestly and to do his or her own work. It is my responsibility and my intention to protect the interests of the honest students. Therefore **CHEATING IN ANY FORM WILL NOT BE TOLERATED.** Now, I don’t mind if you help each other with understanding the material; in fact, I encourage it. However, anything that you turn in—homework, examinations, whatever—**must be your own work,** composed and written by you without looking at others’ work. **Plagiarism will not be tolerated in any form.**

Academic offenses (including plagiarism, cheating, and falsification or misuse of academic records) are defined in Section 6.3.0 of Part II of the University Senate Rules. You are expected to have read and abide by those rules. In particular, note well the following:

6.3.1 PLAGIARISM. All academic work, written or otherwise, submitted by students to their instructors or other academic supervisors, is expected to be the result of their own thought, research, or self-expression. In cases where students feel unsure about a question of plagiarism involving their work, they are obliged to consult their instructors on the matter before submission.

When students submit work purporting to be their own, but which in any way borrows ideas, organization, wording or anything else from another source without appropriate acknowledgment of the fact, the students are guilty of plagiarism.

Plagiarism includes reproducing someone else’s work, whether it be published article, chapter of a book, a paper from a friend or some file, or whatever. Plagiarism also includes the practice of employing or allowing another person to alter or revise the work which a student submits as his/her own, whoever that other person may be. Students may discuss assignments among themselves or with an instructor or tutor, but when the actual work is done, it must be done by the student, and the student alone.

When a student’s assignment involves research in outside sources or information, the student must carefully acknowledge exactly what, where and how he/she has employed them. If the words of someone else are used, the student must put quotation marks around the passage in question and add an appropriate indication of its origin. Making simple changes while leaving the organization, content and phraseology intact is plagiaristic. However, nothing in these Rules shall apply to those ideas which are so generally and freely circulated as to be a part of the public domain.

When academic dishonesty is suspected, the procedures specified in Section 6.4.0 of the University Senate Rules will be followed.
2.5 Telephones

Please remember to turn off your phone before (every) class. I will try to do the same.

3 Schedule of Topics

Each class is different. The following schedule reflects the order in which topics will be covered, and the corresponding reading in the text; however, details are subject to change. Exam dates are unlikely to change.

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<th>Topic</th>
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<td>Course Intro; Review of Logic, proofs</td>
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<tr>
<td>1</td>
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<td>Review sets, relations. Intro propositional logic</td>
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<td>Propositional Calculus</td>
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<td>Formal proof systems</td>
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<td>[Midterm Thu] Axiom Systems</td>
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<td>Application: Program Correctness</td>
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<td>Intro to languages, recognition problems</td>
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<td>Finite Automata; regular languages</td>
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<td>Catch-up/Algebraic concepts</td>
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