COS 487: Theory of Automata and Computation **Fall 2002**

Course Announcement

September 13 *Professor Amit Sahai*

This objective in this course is to study two kinds of questions at a theoretical level. First, what computations can be performed on a computer? (This is the subject of **computability theory**.) Second, how efficiently can they be performed? (This is the subject of **complexity theory**.) These questions will ultimately be studied with respect to an idealized model of the computer, namely, the Turing machine. But we will start off by studying weaker models of computation: finite automata and grammars.

The issues studied in this course constitute the logical foundations of computer science. Time permitting, we will explore how they touch upon current areas of research, including computer security and cryptography.

Prerequisites: This course is meant for both undergraduate and graduate students. We will assume some level of mathematical maturity; COS 341 (or an equivalent course) is adequate preparation.

Textbook: *Theory of Computation* by Michael Sipser, printed by PWS publishing. This is an excellent textbook.

Grading: 50% of your grade will be determined by a combination of your assignments and your responses to oral questions in class. The remainder of your grade will be determined by the midterm and final exams. The final exam will be a take-home test.

Teaching Assistant: Your TA will be Manoj Prabhakaran (mp@cs). There will be a weekly optional precept for this course taught by the TA.

Tentative course contents: Finite automata and regular languages. Context-free grammars and push-down automata. Computability theory: halting problem and Gödel's incompleteness theorem. Complexity theory: time and space hierarchy theorems, polynomial time computations, P v/s NP, NP-completeness and PSPACE-completeness.

Honor Code for this class:
Collaborating with your **classmates** on assignments is OK and in fact encouraged. You **must**, however, list your collaborators for each problem (you will not be penalized in any way for collaboration), and write up your solutions on your own. The assignment questions have been carefully selected for their pedagogical value and may be similar to questions on problem sets from past offerings of this course at this and other universities. Using any pre-existing solutions from these sources, or using solution material from the Web is **strictly prohibited.**