CSE 459/598: Logic for Computer Scientists

Time and Place: MW 5:00 - 6:15 p.m., BYAC 240

Instructor: Joohyung Lee (`joolee@asu.edu`)

Instructor's Office Hours: MW 3:00 - 4:00 p.m., BY 472

Description: Mathematical logic plays a fundamental role in various areas of computer science : computer architecture (Boolean logic, digital gates, hardware verification), software engineering (specification, verification), programming languages (semantics, type theory, logic programming), databases (relational algebra, database query language), artificial intelligence (automated theorem proving, knowledge representation), algorithms and theory of computation (complexity, computability, expressiveness), etc.

This course is an elementary but mathematically solid introduction to propositional logic, first order logic, logic programming, and their applications in computer science. You will learn the subjects mainly by doing homework problems, by presenting your solutions to the class, and by studying and discussing the solutions presented by others. There is no required textbook; the necessary theory and the statements of problems to discuss will be provided in a series of handouts. You should make a serious effort to solve each of them. Try to figure out solutions by yourself or in collaboration with other students, but not by asking someone who already knows the answers, and not by reading books.

Schedule

1. Propositional logic: syntax and semantics, proof methods : strong induction, structural induction, natural deduction, proof theory vs. model theory, soundness and completeness theorem

2. Logic programming: answer set programming, declarative problem solving

3. First-order logic

Reference: Recommended but not required.

- Logic in Computer Science : modelling and reasoning about systems (2nd ed), Huth and Ryan, Cambridge.

Class Homepage

        http://peace.eas.asu.edu/joolee/teaching/459-s10 .

Important announcements and handouts will be listed in the homepage.

Class Participation. We will discuss problems in each handout except for the ones marked with the superscript ^{e} (exercise problems for your own). You are expected to volunteer to present at least one solution at some point, preferably more; in this way you get credit for class participation. Graduate students are expected to present at least three solutions. These should be solutions that you found by yourself, without much help from others.

Electronic Homework. Several times during the semester you will receive e-mail messages with additional homework problems.

- When you work on these additional problems, you may consult the materials handed out in class and your notes, but not any books, and you should not accept any help.

- If you find a solution, e-mail it to the instructor (`joolee@asu.edu`) as plain ASCII text (not in LaTeX or PostScript) in the body of the message (not as an attachment). Late homework will not be accepted. **When you reply, append your name to the title of the message, but otherwise do not change the title. This will help the instructor deal with a large volume of emails. There will be penalty for the submissions not following this instruction.**

- If you cannot come up with a satisfactory solution, it's okay to send the instructor a brief note saying that you tried and failed. Or you can describe your attempted solution and explain why you think it is not completely satisfactory.

- In some cases, the instructor may send you additional questions or ask you to clarify your answer. If you get such a message, please send him a prompt reply. You're responsible for timely response.

- Since the standard keyboard does not have characters for many special symbols that we are going to need, those symbols will be represented in our e-mail correspondence as shown in the following charts.

In handouts:	$\wedge$	$\vee$	$\rightarrow$	$\leftrightarrow$	$\neg$	$\bot$	$\top$	$\odot$
In e-mail:	`&`	`|`	`->`	`<->`	`-`	`bot`	`top`	`sun`

In handouts:	σ	Γ	$\Rightarrow$	$\forall$	$\exists$
In e-mail:	`sigma`	`Gamma`	`=>`	`forall`	`exists`

Use `_` and `^` to show subscripts and superscripts. For instance, you can write a_1 as `a_1` and F^I as `F^I`.

Tests. There will be no make-up tests. The first test will be given during the regular class period on February 22 (tentative). The second midterm will be given during the regular class period on March 31 (tentative). The final exam will be given in the final week. You will be allowed to use class handouts and the notes that you made during the semester, but not books.

Project The project is individual. You may choose your own topic, or the instructor may assist you in selecting one.

Graduate students in 598 section are expected to carry out a project that is more challenging and has higher risk.

Grading Your grade will be determined by class participation (10%), the homework submitted electronically (25%), two tests (20% + 20%) and the project (25%). If you believe that there is a mistake in the grading, you must report to the instructor within one week of when the graded work is returned to you.

The policies are subject to change, if necessary.

Information on the classes taught by Joohyung Lee can be found at

http://peace.eas.asu.edu/joolee/teaching .

Academic Dishonesty Cheating will result in failure in the course (getting the permanent grade XE). Read the following quote from
http://www.asu.edu/studentlife/judicial/integrity.html.

STUDENT OBLIGATIONS

Each student must act with honesty and integrity, and must respect the rights of others in carrying out all academic assignments. A student may be found to have engaged in academic dishonesty if, in connection with any Academic Evaluation or academic or research assignment (including a paid research position), he or she:

Engages in any form of academic deceit;

Refers to materials or sources or uses devices (e.g., computer disks, audio recorders, camera phones, text messages, crib sheets, calculators, solution manuals, materials from previous classes, or commercial research services) not authorized by the instructor for use during the Academic Evaluation or assignment;

Possesses, reviews, buys, sells, obtains, or uses, without appropriate authorization, any materials intended to be used for an Academic Evaluation or assignment in advance of its administration;

Acts as a substitute for another person in any Academic Evaluation or assignment;

Uses a substitute in any Academic Evaluation or assignment;

Depends on the aid of others, including other students or tutors, in connection with any Academic Evaluation or assignment to the extent that the work is not representative of the student's abilities;

Provides inappropriate aid to another person in connection with any Academic Evaluation or assignment, including the unauthorized use of camera phones, text messages, photocopies, notes or other means to copy or photograph materials used or intended for Academic Evaluation;

Engages in Plagiarism;

Uses materials from the Internet or any other source without full and appropriate attribution;

Permits his or her work to be submitted by another person in connection with any Academic Evaluation or assignment, without authorization;

Claims credit for or submits work done by another;

Signs an attendance sheet for another student, allows another student to sign on the student's behalf, or otherwise participates in gaining credit for attendance for oneself or another without actually attending;

Falsifying or misrepresenting hours or activities in relationship to an internship, externship, field experience, clinical activity or similar activity; or

Attempts to influence or change any Academic Evaluation, assignment or academic record for reasons having no relevance to academic achievement.

The Grade of "XE"

The XE grade denotes failure through academic dishonesty. The XE grade will be recorded on the student's official and unofficial transcript with the notation "failure due to academic dishonesty." The XE grade shall be treated in the same way as an "E" for the purposes of grade point average and determination of academic standing.

No student with an XE grade on his or her transcript shall be permitted to represent that University in any extracurricular activity or to run for or hold office in any recognized student organization.