CSE 459/598: Logic for Computer Scientists

Time and Place: TTh 1:30pm –2:45 p.m., BYAC 240

Instructor: Joohyung Lee (joolee@asu.edu)

Instructor's Office Hours: M 5 – 6 p.m., Th 3 – 4 p.m. and by appointment (preferably made at least one day ahead), BY 574

TA: TBD

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 and first order logic, and their applications in computer science, in particular the use of logic for programming. You will learn logic 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 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.

In each handout, some problems are marked for class discussion. You are expected to volunteer to present your solutions to at least one of them (preferably more) at some point, which will earn you credit for class participation. These should be solutions that you found by yourself, without much help from others.

Almost weekly 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.

References: These are not required.

- Logic in Computer Science : modelling and reasoning about systems (2nd ed), Huth and Ryan, Cambridge.
- A mathematical introduction to logic (2nd ed), Herbert Enderton, Academic Press.
- Introduction to mathematical logic (4th ed), Eliott Mendelson, Chapman & Hall/CRC.

Class Homepage

`http://peace.eas.asu.edu/joolee/teaching/459-s09 .`

Important announcements and handouts will be listed in the homepage.

Class Participation. In each handout, some problem numbers are marked with the superscript ^{c}. These are the problems that we plan to discuss in class. 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. 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 midterm will be given during the regular class period on February 12 (tentative). The second midterm will be given during the regular class period on March 26 (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.

Grading. Your grade will be determined by class participation (20%), the homework submitted electronically (25%), two midterms (15% + 15%) and the final (25%). If you believe that there is a mistake in the grading, you must bring the inquiry to the instructor/TA 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
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> 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:
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> Engages in any form of academic deceit;
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> 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.