Computing and Software 701

Logic and Discrete Mathematics In Software Engineering

Fall 2005

Course Outline

Revised: 12 September 2005

Note: This course outline contains important information that may affect your grade. You should retain it throughout the term as you will be assumed to be familiar with the rules specified in this document.

Instructors

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Teaching Assistant

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Course Web Site

http://www.cas.mcmaster.ca/~wmfarmer/CAS-701-04/

Lecture Schedule

MW 10:30 - 12:00 ITB A113B

Calendar Description

"Mathematical objects and logical concepts used in Software Engineering. Higher-order logic. Partial functions and undefined terms. Practical application of the axiomatic method. Recursive definition and inductive proof. Survey of common mathematical structures and axiomatic theories used in Software Engineering. Effective use of mechanized mathematics systems."

Mission

The mission of this course is to give students a graduate-level understanding of the logic and mathematics that is needed for Software Engineering. The course will focus on the creation, use, and understanding of mathematical models. Students taking this course are expected to be familiar with propositional and first-order logic and numbers, sets, functions, and relations.

Required Text

K. H. Rosen, *Discrete Mathematics and Its Applications*, 5th Edition, McGraw-Hill, 2003. ISBN: 0-072-93033-0.

Work Plan

There will be two 75-minute lectures per week given by the instructors. The lectures will present the course topics and will illustrate their use in examples. Students will be expected to attend the lectures, complete assigned exercises, and give one 10-minute presentation to the class.

Academic Dishonesty

Academic dishonesty consists of misrepresentation by deception or by other fraudulent means and can result in serious consequences, e.g., the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: "Grade of F assigned for academic dishonesty"), and/or suspension or expulsion from the university.

It is your responsibility to understand what constitutes academic dishonesty. For information on the various kinds of academic dishonesty please refer to the Academic Integrity Policy, specifically Appendix 3, located at

`http://www.mcmaster.ca/senate/academic/ac_integrity.htm`

The following illustrates only three forms of academic dishonesty:

1. Plagiarism, e.g., the submission of work that is not one's own or for which other credit has been obtained.
2. Improper collaboration in group work.
3. Copying or using unauthorized aids in tests and examinations.

In this course you are encouraged to work and study together, but *all work you submit must be your own*. Plagiarism and copying will not be tolerated! Students may be asked to defend their written work orally.

Other Policy Statements

1. Significant study and reading outside of class is required.
2. Students are expected to regularly attend the lectures and to ask questions.
3. Exercises may not be turned in late and the midterm test and final exam may not be taken later without *prior* approval from the instructors.
4. A student may use calculators and his or her texts and notes during the midterm test and final exam.
5. The instructors reserves the right to require a deferred final exam to be oral.
6. The Faculty of Engineering is concerned with ensuring an environment that is free of all adverse discrimination. If there is a problem, that cannot be resolved by discussion among the persons concerned, individuals are reminded that they should contact their Department Chair and the Human Rights and Equity Services (HRES) office as soon as possible.
7. Suggestions on how to improve the course and the instructors' teaching methods are always welcomed.

Grading

The course grade will be based on the exercises, the presentation, a midterm test on October 24, and a final exam on December 19 as follows:

Exercises	25%
Presentation	10%
Midterm test	25%
Final exam	40%
Total	**100%**

Syllabus

01 Introduction to Mathematics and Logic

02 Propositional Logic

03 Numbers, Sets, Functions, and Relations

04 First-Order Logic

05 Recursion and Induction

06 Simple Type Theory

07 State Machines and Refinement

08 Events and Conditions

09 Logic with States and Time

10 Specification and Verification of Static and Dynamic Properties