

Computing and Software 701
Logic and Discrete Mathematics
In Software Engineering
Fall 2004
Course Outline

Revised: 22 September 2004

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.

Instructor

Dr. William M. Farmer
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Course Web Site

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

Lecture Schedule

TR 13:30 - 14:45 ITB 222

Teaching Assistant

Marc Bender (bendermm@mcmaster.ca)

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

R. P. Grimaldi, *Discrete and Combinatorial Mathematics*, Fifth Edition, Pearson Education, 2004. ISBN: 0-201-72634-3.

Work Plan

There will be two 75-minute lectures per week by the instructor. 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.

Grading

The course grade will be based on the exercises, the presentation, a midterm test on October 28, and a final exam on December 16 as follows:

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

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 instructor.
4. A student may use calculators and his or her texts and notes during the midterm test and final exam.
5. The instructor 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 instructor's teaching methods are always welcomed.

Syllabus

00 Preliminaries

01 What is Mathematics?

02 What is Logic?

03 Propositional Logic

04 Numbers, Sets, Functions, and Relations

- 05 Kinds of Mathematical Models
- 06 First-Order Logic
- 07 Equational Logic and Algebraic Reasoning
- 08 Recursion and Induction
- 09 Simple Type Theory
- 10 Order Structures
- 11 Algebraic Structures
- 12 Graphs and Trees
- 13 Finite State Machines
- 14 Axiomatic Method
- 15 Mechanized Mathematics Systems