Computer Science 773
Formalized Mathematics
Winter 2001

Preliminary Course Outline

Revised: 5 January 2001

Instructor

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Course Web Site

`http://www.cas.mcmaster.ca/~wmfarmer/CS-773-01`

Lecture Schedule

MR 10:30–12:00 GS 301

Calendar Description

Computer-supported, formalized mathematical reasoning for practical applications. Specification and verification in higher-order logic. Interactive theorem proving systems. Techniques for developing axiomatic theories.

Mission

The mission of this course is to teach students how to use formalized mathematics to specify and analyze complex systems, particularly software systems. Mathematical models will be expressed in higher-order logic and set theory, and mathematical reasoning will be performed with the aid of interactive theorem proving systems.

Required Text

Imre Lakatos, *Proofs and Refutations*, Cambridge University Press, 1976. ISBN 0-521-29038-4

Work Plan

There will be two 75-minute lectures per week by the instructor. Students will be expected to attend the lectures, complete assigned exercises, and give short presentations to the class. Some of the exercises and presentations will be required, but most will be optional. Most of the exercises will require the use of an interactive theorem proving systems. Students are required to learn how to use at least two interactive theorem proving systems, one being the IMPS Interactive Mathematics Proof System.

Tentative Schedule

00. Preliminaries
01. What is Mathematics?
02. The Axiomatic Method
03. Mechanized Mathematics Systems
04. Introduction to IMPS
05. Review of Logic
06. What is Missing from First-Order Logic?
07. Higher-order Logic
08. Set Theory
09. Axiomatic Theory Development
10. Conjecture Proving
11. Computation in Proving
12. Common Mathematical Structures

Policy Statements

1. *Significant study and reading outside of class is required.*
2. *Regular class attendance is expected.*
3. *The student is expected to ask questions during class.*
4. The student is welcome to discuss exercises with other students, but exercises must be the student's own work.

5. "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, the Sexual Harassment/Anti-Discrimination Officer (SHADO), as soon as possible."

6. "Students are reminded that they should read and comply with the Statement on Academic Ethics and the Senate Resolutions on Academic Dishonesty as found in the Senate Policy Statements distributed at registration and available in the Senate Office" (see Senate Secretariat, Gilmour Hall, Room 104, 525-9140 or 529-7070, ext. 24337).

7. *Suggestions on how to improve the course and the instructor's teaching methods are always welcomed.*

Grading

The course grade will be based on the student's performance on the exercises and presentations. The exercises will be worth a total of approximately 150 points. A student's grade for the course will be awarded on the basis of how many points the student receives on the exercises and how many presentations the student gives according to the table below.

Exercise Points	Presentations	Course Grade
110 or more	3 or more	A^+
100–109	3 or more	A
90–99	3 or more	A^-
85–89	2 or more	B^+
80–94	2 or more	B
75–79	2 or more	B^-
70–74	1 or more	C^+
65–69	1 or more	C
60–64	1 or more	C^-
55–59	0 or more	D^+
50–54	0 or more	D
45–49	0 or more	D^-
44 or below	0 or more	F