

Computing and Software 734

Formalized Mathematics

Fall 2006

Course Outline

Revised: 6 September 2006

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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Tentative office hours: M 14:30–15:30, R 13:00–14:00

Course Web Site

<http://www.cas.mcmaster.ca/~wmfarmer/CAS-734-06/>

Lecture Schedule

TR 14:00–15:30 ITB 222

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 in the specification and analysis of complex systems such as software systems. Mathematical models will be expressed as axiomatic theories in higher-order logic and set theory, and mathematical reasoning will be performed with the aid of interactive theorem proving systems such as ACL2, Coq, IMPS, Isabelle, Mizar, and PVS. The major research issues concerning formalized mathematics will be discussed in depth.

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. Most of the exercises will require the use of an interactive theorem proving system. Students are required to learn how to use at least two interactive theorem proving systems, one being the IMPS Interactive Mathematics Proof System.

Tentative Syllabus

- 00 Preliminaries
- 01 What is Formalized Mathematics?
- 02 Review of Mathematical Logic
- 03 Theory Development Techniques
- 04 The IMPS Interactive Mathematical Proof System
- 05 Other Interactive Theorem Proving Systems
- 06 The Little Theories Method
- 07 Symbolic Computation in Formal Proofs
- 08 Practice-Oriented Logics

Grading

The course grade will be based on the student's performance on the exercises and presentations as follows:

Exercises	75%
Presentations	25%
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/univsec/policy/AcademicIntegrity.pdf>

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, nor may presentations be given late.
4. 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.
5. Suggestions on how to improve the course and the instructor's teaching methods are always welcomed.