CAS 760 Winter 2010

00 Preliminaries

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Instructor

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Mission

Traditional logics, like first-order logic, are designed for theoretical purposes, not for practical use. The mission of this course is to investigate techniques for (1) improving the practicality of traditional logics and (2) designing, implementing, and using new logics that are oriented towards practice instead of theory. By the end of the course the student should:

1. Understand the impracticalities of traditional logics, particularly first-order logic.
2. Be able to utilize various techniques for making logical reasoning more practical.
3. Know what to look for when choosing a logic or a computerized reasoning system for a practical application.
4. Be familiar with the leading practice-oriented logics.

Mechanics

- Lectures: MW 10:30–12:00 in ITB 222
- Course web site:

  `http://imps.mcmaster.ca/courses/CAS-760-10/`

- Course outline: Read it closely!
- Textbook: None required

Work Plan

- Lectures given by the instructor
- Exercises outside of class
  - Most will require expressing ideas in a formal logic
- Student presentations in class
  - Each should be about 20 minutes long
- Students are required to learn how to use several logics
- No tests or exams

Academic Dishonesty

- Students are expected to exhibit honesty and use ethical behavior in all aspects of the learning process
- Academic dishonesty consists of misrepresentation by deception or by other fraudulent means
- Academic dishonesty includes:
  - Plagiarism
  - Copying
  - Improper collaboration
- Academic dishonesty can result in serious consequences
- Your work must be your own. Plagiarism and copying will not be tolerated!
- Students may be asked to defend their written work orally

Discrimination

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.

Other Policy Statements

1. Each student is strongly urged to submit a completed Questionnaire and Biographical Sketch which is available on the course web site.
2. Significant study and reading outside of class is required.
3. Students are expected to regularly attend the lectures and to ask questions.
4. Exercises that are submitted late and presentations that are given late will be penalized 2% for each late day. For example, if an exercise was given a mark of 80 but was turned in one week late, the actual mark will be $80 - 7 \cdot 2 = 66$.
5. Suggestions on how to improve the course and the instructor's teaching methods are always welcomed.

Marking Scheme

Exercises	60%
Presentations	40%
Total	**100%**

Syllabus (1/2)

00 Preliminaries

01 Review of logic

1. Syntax
2. Semantics
3. Proof systems
4. Theories
5. Definition principles
6. Computational mechanisms
7. Theory interpretation
8. Theories as modules
9. Attributes of a practical logic

02 Three traditional logics

1. First-order logic
2. Church's type theory
3. Zermelo-Fraenkel set theory

Syllabus (2/2)

03 Techniques for enhancing traditional logics

1. Basic types
2. Functions
3. Tuples, sequences, and sets
4. Partial functions and undefined terms
5. Definite and indefinite description
6. Polymorphism
7. Generalized operators
8. Advanced types
9. Quotation and evaluation

04 Practice-oriented logics

1. Based on first-order logic
2. Based on simple type theory
3. Based on set theory
4. Chiron