

**Computing and Software 760**  
**Logic for Practical Use**  
**McMaster University, Winter 2010**  
**Course Outline**

Revised: 2 January 2010

*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**

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**Course Web Site**

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

Students should be aware that, when they access the electronic components of this course, private information such as first and last names, user names for the McMaster e-mail accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in this course will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure please discuss this with the course instructor.

**Lecture Schedule**

MW 10:30–12:00 ITB 222

**Calendar Description**

“Attributes of a practical logic. Techniques for improving the practicality of traditional logics. Design, implementation, and use of practice-oriented logics.”

## **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.

## **Recommended Background**

COMP SFWR 701 or a basic knowledge of first-order logic.

## **Work Plan**

The course will consist of lectures by the instructor and presentations by the students. The students will also be required to do a series of exercises outside of class. Most of the exercises will involve expressing ideas in formal logic. Students are required to learn how to use several logics, including both traditional theory-oriented logics like first-order logic and practice-oriented logics developed by the instructor. A student's grade will be based on the quality of his or her presentations and exercises. There will be no midterm tests or final exam.

## **Academic Integrity**

You are expected to exhibit honesty and use ethical behavior in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity.

Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behavior 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 types of academic dishonesty please refer to the Academic Integrity Policy, located at

<http://www.mcmaster.ca/academicintegrity/>

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.

*Your work must be your own.* Plagiarism and copying will not be tolerated! If it is discovered that you plagiarized or copied, it will be considered as academic dishonesty.

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

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

|               |             |
|---------------|-------------|
| Exercises     | 60%         |
| Presentations | 40%         |
| <b>Total</b>  | <b>100%</b> |

## **Tentative Syllabus**

### 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

### 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