

**Comp Sci 2MJ3  
Theory of Computation  
Fall 2009**

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**Web page:** <http://www.cas.mcmaster.ca/~soltys/cs2mj3-f09>

**Lectures:** Tu, Th, Fr, 14:30-15:20 in ABB/136  
(starting Friday September 18 all lectures in ITB-137)

**Tutorials:** T01: Mo, 11:30-13:20, JHE/210  
T02: We, 11:30-13:20, HH/102

**Textbook:** *Models of Computation: An introduction to computability theory*,  
by Maribel Fernández, Published by Springer, 2009

**Outline:**

First month:

This course is about models of computation. We start with automata and Turing machines: we define the notion of a formal language, and the fundamental notions of determinism & non-determinism. We expand automata to push-down automata, and define regular and context-free languages. We introduce the universal Turing machine, and show how it relates to imperative programming. We discuss the halting problem.

Second month:

We introduce lambda calculus, and related basic notions such as substitution, normal forms and reductions. We give examples of arithmetic functions, Booleans and recursion, and show how lambda calculus, while equivalent in power to computation, corresponds to the notion of functional programming.

Third month:

We present recursive functions: primitive recursion, partial recursive functions, and show that this third model of computation is also equivalent to the previous two. We move on to logic-based models of computation, and give some rudimentary propositional and predicate logic, in order to discuss the Herbrand universe.

**Marking Scheme:** Three tests, worth 10% each, three assignments, also worth 10% each, and a final exam worth 40%. Missed work, if properly documented (e.g., doctor's note presented to the Registrar's Office), will be moved to the final exam (e.g., if test 1 is missed, the final exam will be worth 50%).

Please visit the course's web page to read the *McMaster Academic Integrity Statement*.

**Important Note:** The instructor and university reserve the right to modify elements of the course during the term. The university may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes. It is the responsibility of the student to check their McMaster email and course websites weekly during the term and to note any changes.