CAS705: Computability and Complexity
Fall 2004

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Lectures: TWF12:30–1:20 in ITB/222

Web Page: `http://www.cas.mcmaster.ca/~soltys/cas705-f04`

Text Book: "Introduction to the Theory of Computation" By Michael Sipser

Course Outline: The relationship between problems, algorithms, and languages.
Computability: finite automata, rewriting systems, Turing machines (linear speedup, robustness, and the Universal Turing machine). Recursive functions and Cobham's Theorem. Determinism and non-determinism. Recursive and recursively enumerable languages. The Halting problem and the diagonalization technique. Church-Turing thesis, and Rice's theorem.
Complexity: classes defined in terms of time, space, and circuits. Uniformity. The reachability method (Savitch's theorem, and the Immerman-Szelepscenyi theorem). The P versus NP problem (and Cook's Theorem), reductions and completeness. The Time and Space Hierarchy Theorems. Randomized and parallel computations. NP and co-NP, propositional proof systems, and Horn clauses. Kolmogorov complexity, and the Shannon principle.

Marking Scheme: Three (3) tests, worth 20% each, a final exam, worth 30%, and 10% for attendance & participation. No aids will be allowed for the tests and the final exam. Missed work will be given a mark of zero, unless proper justification is provided. The instructor reserves the right to conduct missed tests orally.
A list of suggested exercises is going to be given. These exercises are an integral part of the course, and even though they will *not* be submitted for grading, they will be crucial for the understanding of the material and preparation for the tests.

Academic Integrity: 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/senate/academic/ac_integrity.htm`
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.