Syllabus for Math 523

Text: Introduction to Mathematical Logic, Mendelson, Chapman & Hall
(the text has several editions, and any of them will do)

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The goal is to do chapter 1, and the first 6 sections of chapter 2 (according to the 3'rd edition, section 6 is the completeness thm for predicate calculus, and this is an optional topic).

The topics in the text based part of the class will thus include: paradoxes, e.g. Russell's paradox, truth tables, formal definition of a wff, adequacy of connectives, DNF and CNF, the completeness and compactness theorems for the propositional calculus with formal axioms and rules being those of Mendelson. After these topics the semantics and formal axiomatization of the predicate calculus will be done.

The first non-text topic is recognition algorithms for wffs. This idea is extremely important for understanding the incompleteness theorem, which will be discussed but not proven.

The second non-text topic will be Boolean circuits (and gates, or gates,etc.) with examples of automata, and Karnaugh maps to optimize resulting circuits. Logicworks assignments will enable the software construction of such circuits to verify their correctness.

The last non-text topic will be an introduction to the lambda calculus, which like Turing machines, can be used to carefully define an algorithm. This material is the basis for the logic programming language LISP, and is also necessary for understanding the incompleteness theorem in that a careful definition of an algorithm is necessary there. LISP itself will be demonstrated, but is not part of the syllabus.

There will 3 midterms, counted equally.
Exam dates: March 3rd, April 2nd, and May 14th.

Standard SDS exam taking protocols will be followed to give qualified students extra time.

SLO: the students will learn some mathematical logic, with applications to finite automata, circuit design, and definition of an algorithm.