

Brooklyn College
Department of Computer & Information Sciences

CISC 7220 [722X] Introduction to Computability and Unsolvability

37½ hours plus conference and independent work; 3 credits

Formal systems, propositional and quantification logic, theorem proving, equivalent characterizations of effective computability. Turing machines, recursive functions, and sets. Other notions of Godel, Herbrand, Kleene, Church, Post, and Markov. Classification of unsolvable problems.

Syllabus:

Week 1: Introduction. Computable. Not Computable.

Weeks 2-4: Computable functions.

Weeks 5-7: Primitive Recursive Functions

Week 8: Midterm

Week 9: Recursive Functions, Turing Machines, Church's Thesis.

Week 10: Numbering Programs. S-M-N Theorem.

Week 11: Universal Programs. Halting Problem.

Week 12: Recursive Sets, Recursively Enumerable Sets.

Weeks 13-14: Advanced Topics. (Logic, Hilbert's 10th Problem, Complexity Theory, etc.)

Textbooks:

N.J. Cutland, "Computability: An Introduction to Recursive Function Theory"
Cambridge University Press. 1980.

Michael Sipser, "Introduction to the Theory of Computation, 2nd Edition"
Thomson. 2006.

Martin D. Davis, Ron Sigal, Elaine J. Weyuker, "Computability, Complexity,
and Languages, 2nd Edition". Academic Press. 1994.