COT-5420 Theory of Computation I

Catalog Description
Mathematical models of computation; regular, context-free, recursive, and recursively enumerable languages; equivalence of models; techniques for proving non-membership of a language in a class: pumping lemmas, diagonalization, reductions. (3 credits)

Prerequisites
MAD 3512 - Theory of Algorithms

Type
Required for MSCS, Ph. D. in CS, MS in CS for current CS undergraduate students (4+1 Program).

Course Objectives
The course provides a thorough description of the mathematical models of computation starting with the regular languages and ending with the undecidable languages. The student will learn to construct a grammar that generates a given language, design a machine that accepts it, and prove that the answers are correct.

Topics
determininistic and non-deterministic finite automata
regular expressions
regular languages
the equivalence of the finite automata, regular expressions, and regular languages
the pumping lemma for regular languages
context free languages
the Chomsky normal form for a context free language
pushdown automata
the equivalence of the context free languages and the pushdown automata
the pumping lemma for context free languages
Turing machines
variants of Turing machines
decidable languages
diagonalization and the halting problem

undecidable languages
reducibility
primitive recursive functions
recursive and recursively enumerable functions

Textbook
Michael Sipser Introduction to the Theory of Computation, Third Edition
(Cengage Learning, 2013)
Last Update
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