

Theory of Computation General Exam: Study Guide

The general exam is based on topics covered in the course CSC-4890. The book used in the course is: *Introduction to the Theory of Computation*, by Michael Sipser, second edition, PWS Publishing Company. The topics that will be covered in the examination are:

Basic Math and Languages (Chapter 0)

Regular Languages (Chapter 1)

- Finite Automata
- Nondeterministic Finite Automata
- Regular Expressions
- Properties of Regular Languages
- Pumping Lemma for Regular Languages

Context-Free Languages (Chapter 2)

- Context-Free Grammars
- Grammar Normal Forms
- Compilers & Parsers
- Pushdown Automata
- Properties of Context-Free Languages
- Pumping Lemma for Context-Free Languages

Turing-Recognizable Languages (Chapters 3,4,5,7)

- Turing Machines
- Variations of Turing Machines
- Non-Deterministic Turing Machines
- Universal Turing Machine
- Decidable Languages
- Non-Turing Recognizable languages
- Chomsky's Hierarchy
- Undecidable Problems
- Decidability Reductions
- Post-Correspondence Problem
- Time Complexity
- NP-Completeness – Cook's Theorem
- NP-Complete Reductions
- Properties of Turing-Recognizable Languages