
CS 310T-31 - Topics in Computer Science: Automata, Languages, and Theory of Computation
Fall 2004, Northeastern Illinois University

Instructor: Marcelo Sztainberg
E-mail: M-Sztainberg@neiu.edu

Office: CLS 3060 – Ph: (773) 442-5946
URL: <http://www.neiu.edu/~mosztain/>

Meeting: TR 5:40-6:55 PM - CLS 3106

Office hrs: TR 2:30-4:00 PM
W 3:00-4:00 PM

Description: This course discusses several models of computation, including finite automata, pushdown automata, and Turing machines, both deterministic and non-deterministic. Students will be expected to understand and be able to prove statements about the relative power and limitations of each model. We will cover formal languages, regular expressions, and grammars, context-free and context-sensitive. We will examine the notions of undecidability, computational complexity, intractability, and NP-completeness. The course is mainly theoretical in nature, but some applications, such as finite state systems and parsing, will be discussed.

Course Prerequisites: CS 201, CS 207, CS 304

Text: Sipser, Michael. Introduction to the Theory of Computation. ITP, 1997

Optional Readings: Garey, Michael R. and Johnson David S. Computers and Intractability: A guide to the Theory of NP-Completeness, W. H. Freeman, 1979

Course Outline: (subject to change due to time constraints)

1. Introduction (Week 1)

- Automata, Computability, and Complexity
- Mathematical Notions and Terminology
- Definitions, Theorems, and Proofs
- Types of Proofs

2. Regular Languages (Weeks 2-3)

- Finite Automata
- Nondeterministic FA
- Regular Expressions
- Nonregular Languages

3. Context-Free Languages (Weeks 4-5)

- Context-Free Grammars
- Pushdown Automata
- Non-context-free Languages

4. Turing Machines (Weeks 6-8)

- Definition of TMs
- Variants of TMs
- Definition of Algorithm
- Grammars and numerical functions

5. Decidability (Weeks 9-10)

- Decidable Languages
- The Halting Problem

6. Reducibility (Weeks 10-12)

- Undecidable Problems from Language Theory
- A Simple Undecidable Problem
- Mapping Reducibility

7. Time Complexity (Weeks 13-15)

- Measuring Complexity
- The class P
- The class NP
- NP -Completeness
- Some NP -complete problems

Assignments:

- **Homeworks:** Seven, each due the first tuesday after a chapter is finished
- **Quizzes:** Seven, each on the class following a homework due date
- **Exams:** Two Midterms and a Final

There will be no makeup for missed quizzes or exams

Grading Policies:

1. The average over the five best quizzes scores, will be worth 20% of your grade. Each Midterm will be worth 25% of your grade. The final exam will be worth 30% of your grade. Homework submission is optional, and will be counted as extra credit together with in class participation. Students taking the course for graduate credit will be required to submit homeworks.
2. Regular attendance is expected. Any student who misses more than three class meetings will have her/his final course grade reduced by a letter
3. Cheating on exams, quizzes or homeworks will guarantee the student an F grade, and a report according to school's guidelines
4. No Ws, Is will be granted after the school's withdrawal deadline (Fri, March 19th)
5. Your final grade will be based on the following scale:
 - **A** - 90% or above
 - **B** - 75 – 90 %
 - **C** - 60 – 75 %
 - **D** - 50 – 60 %
 - **F** - below 50%

If you have a physical, psychological, medical or learning disability that may impact on your ability to carry out assigned course work, I would urge that you contact the staff in the Accessibility Center office, Room A-118 in the A-Wing, exts. 5495, 5496, and 5497. The Accessibility Center will review your concerns and determine with you what accommodations are necessary and appropriate. All information and documentation of disability are confidential.