Spring 2020

CS 341-102: Foundations of Computing II

Wallace Rutkowski

CS 341 – Foundations of Computing II

Instructor: Wallace Rutkowski, Ph.D.
Office: GITC 4413
email: wallace.rutkowski@njit.edu
phone: 973-596-5483

Textbook: Introduction to the Theory of Computation, 3rd edition

Author: Michael Sipser

Published by Cengage Learning
ISBN-13: 978-1-133-18779-0

Description:

This course presents some of the most fundamental results in theoretical Computer Science. These results attempt to answer, in a precise mathematical sense, the following two questions, which are of practical as well as philosophical interest:

1. Can a given problem be solved by computation?

2. How efficiently can a given problem be solved by computation?

We often focus on problems rather than on specific algorithms for solving problems. To answer both questions mathematically, we will need to formalize the notion of "computer" or "machine." The course outline breaks naturally into three parts:

1. Models of computation (Automata Theory) • Finite automata • Push-down automata • Turing machines

2. What can we compute? (Computability Theory)

3. How efficiently can we compute? (Complexity Theory)

Specifically, the topics covered will include regular languages (finite automata, regular expressions), nonregular languages, context-free languages (context-free grammars, pushdown automata), non-context-free languages, Turing machines and variants, Church-Turing Thesis, undecidability, reducibility, time complexity, and complexity classes P, NP, and NP-complete.

Prerequisites:

Before taking CS 341, you must complete all of the following with grades of C or better: 1. A 100-series general undergraduate required course in CS 2. CS 241 (Foundations of Computer Science I) 3. CS 280 (Programming Language Concepts).

Grading:

Grades will be based on a 2 midterms and a final exam.The point breakdown for the final average will be:

Midterm 1:	30%	
Midterm 2:	30%	(replaced by TM project)
Final:	35%	(replaced by Recursive Descent Parser project)
Discretionary:	5%	

canvas:

In this course we will use a computer-based group-communication system called canvas, which you can access at http://canvas.njit.edu/ The website also provides instructions on using canvas, which requires logging in with your NJIT UCID.

Schedule:

Unless I announce otherwise, the schedule for the semester is as below.

Week	Topic
1	Intro, Languages Chapter 0
2	Regular Languages: DFA, NFA Chapter 1
3	RL: Closure Properties, Reg Exp Chapter 1
4	Kleene's Thm, Nonregular Lang Chapter 1
5	CFG, PDA Chapter 2
6	CFG = PDA, Non-CFL Chapter 2
7	Turing Machines Chapter 3
8	Algorithms, Decidability Chapter 4
9	Decidability, Halting Problem Chapter 4
10	Undecidable Problems Chapter
11	Undecidability Reductions Chapter 5
12	Time Complexity, Class P Chapter 7
13	Classes NP, NP-Complete Chapter 7
14	NP-Complete Reductions, Review Chapter 7

The Provost has asked that we include the following statement:

“Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at: http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf.

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university. If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu”