# CS 341 COURSE SYLLABUS – FALL 2023

**NJIT ACADEMIC INTEGRITY CODE:** All Students should be aware that the Department of Computer Science takes the University Code on Academic Integrity at NJIT very seriously and enforces it strictly. This means that there must not be any forms of plagiarism, i.e., copying of homework, class projects, or lab assignments, or any form of cheating in quizzes and exams. Under the University Code on Academic Integrity, students are obligated to report any such activities to the Instructor.

## CS 341: Foundations of Computer Science II

**Number of Credits: 3**

**Course Description:** This course provides an introduction to automata theory, computability theory, and complexity theory. Theoretical models such as finite-state machines, push-down stack machines, and Turing machines are developed and related to issues in programming language theory. Also, the course covers undecidability and complexity classes P, NP, and NPC. *Prerequisites*: (CS 241 or MATH 226) and CS 280.

Course Objectives (what you are expected to know to complete this course)

1. Automata Theory: Regular Languages (Finite Automata, Regular Expressions), Context-Free Languages (Context-Free Grammars, Pushdown Automata), etc.
2. Computability Theory: Turing Machines, The Church–Turing Thesis, Decidability, Reducibility, etc.
3. Complexity Theory: Time Complexity (Complexity Classes P, NP, and NP-complete), etc.

**Textbook:** Textbook: Michael Sipser, *Introduction to the Theory of Computation*, Third Edition. Course Technology, 2012.ISBN:113318779X.

## Instructor:

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| **CS 341-001, CS 341-003** | Adrian Ionescu, ionescu@njit.edu |

**Grading Policy:** The final grade in this course will be determined as follows:

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| ▪ **Quizzes (30%) includes Homework/ Projects (5%)** | **30%** |
| ▪ **Midterm Exam:** | **35%** |
| ▪ **Final Exam:** | **35%** |

**University-wide Withdrawal Date:** Please note that the University Withdrawal Date **Monday, November 13, 2023** deadline will be strictly enforced.

**Homework Policy:** Homework problems will be assigned in class. Please try to do as many as possible, and as time permits for everyone.

**Attendance:** Attendance at all classes will be recorded and is **mandatory**. Please make sure you read and fully understand the Department's Attendance Policy. This policy will be **strictly** enforced. Absences from class will inhibit your ability to fully participate in class discussions and problem-solving sessions and, therefore, affect your grade. Tardiness to class is very disruptive to the instructor and students and will not be tolerated. Each student should have contact information of several fellow students to get homework assignments and class notes when absent. You are responsible for everything that happens in class whether you are present or not. All cellular phones must be switched off during class.

**Makeup Exam Policy:** There will be **NO MAKE-UP EXAMS OR QUIZZES** during the semester. In the event the Final Exam is not taken, under rare circumstances where the student has a legitimate reason for missing the final exam, a makeup exam will be administered by the Instructor / CS department. In any case the student must notify the **Dean of Students and the Instructor** that the exam will be missed and present written verifiable proof of the reason for missing the exam, e.g., a doctor's note, police report, court notice, etc., clearly stating the date AND time of the mitigating problem.

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**Accommodation of Disabilities:** Disability Support Services (DSS) offers long term and temporary accommodations for undergraduate, graduate and visiting students at NJIT. If you need accommodations due to a disability, please contact Scott Janz, Associate Director, Office of Accessibility Resources and Services at 973-596-5417 or via email at scott.p.janz@njit.edu. The office is in Fenster Hall Room 260. For further information regarding self-identification, the submission of medical documentation and additional support services provided please visit the Disability Support Services (DSS) website at: https://www.njit.edu/studentsuccess/accessibility

**Important Dates** (See: Fall 2023 Academic Calendar, Registrar)

| Date | Day | Event |
|---|---|---|
| September 4, 2023 | Monday | Labor Day |
| September 5, 2023 | Tuesday | First Day of Classes |
| September 11, 2023 | Monday | Last Day to Add/Drop Classes |
| November 13, 2023 | Monday | Last Day to Withdraw |

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| November 21, 2023 | Tuesday | Thursday Classes Meet |
| November 22, 2023 | Wednesday | Friday Classes Meet |
| November 23 to November 26, 2023 | Thursday and Saturday | Thanksgiving Recess - Closed |
| December 13, 2023 | Wednesday | Last Day of Classes |
| December 14, 2023 | Thursday | Reading Day 1 |
| December 15, 2023 | Friday | Reading Day 2 |
| December 17 to December 23, 2023 | Sunday to Saturday | Final Exam Period |

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| 1 | Chapter 0 | **Introduction**: Automata, Notation, Definitions & Theorems, Types of Proofs (review of CS241)<br>**HW**: 0.1-0.9 |
| 2-4 | Chapter 1 | **Regular Languages:** Finite Automata (DFA), Nondeterminism (NFA), Regular Expressions, Nonregular Languages<br>**HW**: 1.1-1.11, 1.16+1.17 (can use construction in class),1.18,1.19+1.28 (can use construction in class),1.20,1.21,1.29,1.31 |
| 5-7 | Chapter 2 | **Context Free Languages:** Context Free Grammars (CFG), Pushdown Automata (PDA), Non-CFL, Chomsky<br>**HW**: 2.1-2.14, 2.16 |
| 7 | Chapter 3 | **The Church-Turing Thesis:** Turing Machines<br>**HW**: 3.1-3.3, 3.5, 3.8, 3.9, 3.10, 3.11, 3.15, 3.16 |

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| 8 | Midterm | |
| 9-10 | Chapter 4 | **Decidability**<br>**HW:** 4.1-4.8, 4.10-4.14, 4.16, 4.20, 4.21 |
| 10-11 | Chapter 5 | **Reducibility**<br>**HW:** 5.1-5.11 (5.16 see lecture) |
| 12-14 | Chapter 7 | **Complexity Theory**<br>**HW:** 7.1-7.8, 7.12, 7.16 |

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**Prepared By: Prof. Adrian Ionescu**

Revised: September 2, 2023