Fall 2020

CS 241-101: Foundations of Computer Science I

Adrian Ionescu

CS 241 COURSE SYLLABUS – FALL 2020

NJIT ACADEMIC INTEGRITY CODE: All Students should be aware that the Department of Mathematical Sciences 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 241: Foundations of Computer Science I (Discrete Mathematics for CS)

Number of Credits: 3

Course Description: This course provides the mathematical and analytical foundations of computer science and its applications to various areas in CS. The course covers the material traditionally known as "discrete mathematics", with special emphasis on CS applications and an analysis of algorithms. The course topics include sets and logic, proof techniques, proof by induction, functions and relations, analysis of algorithms, recursion, recurrence equations, divide-and- conquer design technique, counting methods (permutations and combinations), basic discrete probability, and if time permits, introduction to number theory, and a brief introduction to graphs and trees. Prerequisites: *Prerequisites*: CS 114: Intro to Computer Science; Math 112: Calculus II.

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

1. Know basic mathematical tools and terminologies used in computer science
2. Know set algebra, propositional logic, reasoning, and basic proof techniques
3. know induction, recursion, recurrence equations, and how they are interrelated
4. Know the mathematical tools used to analyze efficiency of algorithms
5. Implement simple programs and run experiments to measure their time complexity
6. Learn permutations/combinations, basic discrete probability and applications

Textbook: Textbook: R. Johnsonbaugh, "*Discrete Mathematics*," Pearson, 8th Ed

Instructor:

CS 241-001, CS 241-101	Adrian Ionescu

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

▪ **Quizzes (30%), Homework + Projects (5%)**	**35%**
▪ **Midterm Exam:**	**30%**
▪ **Final Exam:**	**35%**

University-wide Withdrawal Date: Please note that the University Withdrawal Date **Monday, November 6, 2020** deadline will be strictly enforced.

Homework Policy: Additional homework problems will be assigned in class.

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.

Makeup Exam Policy: There will be **NO MAKE-UP EXAMS** during the semester. 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.

Further Assistance: For further questions, students should contact their Instructor.

Cellular Phones: All cellular phones and beepers must be switched off during class.

CALENDAR

Date	Day	Event
September 1, 2020	T	First Day of Classes
September 7, 2020	M	Labor Day
September 8, 2020	T	Monday Classes Meet
September 8, 2020	T	Last Day to Add/Drop Classes
November 6, 2020	M	Last Day to Withdraw
November 25, 2020	W	Friday Classes Meet
November 26-29, 2020	R-Su	Thanksgiving Recess
December 10, 2020	T	Last Day of Classes
December 11 & 14, 2020	F & M	Reading Days
December 15 - 21, 2020	T - M	Final Exam Period

Accommodation of Disabilities: Disability Support Services (DSS) offers long term and temporary accommodations for undergraduate, graduate and visiting students at NJIT. If you are in need of accommodations due to a disability please

contact Chantonette Lyles, Associate Director of Disability Support Services at 973-596-5417 or via email at lyles@njit.edu. The office is located 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

COURSE OUTLINE

WEEK	Johnsonbaugh	Topics
1 -2	Chapter 1	**Sets and Logic**: Sets, Propositional Logic, Quantifiers **HW**: 1.1 (1-100 blues), 1.2 (23-30 all), 1.3 (63-72 all), 1.5 (53-59 all), 1.6 (48-66 all)
3-4	Chapter 2 Chapter 5	**Proof Techniques:** Direct Proof, Counterexample, Contrapositive, Proof by Contradiction, Enumeration Proof**,** Proof by Induction; Strong Induction **Introduction to Number Theory** (as time permits) **HW**: 2.1 (1-55 blues), 2.2 (1-37 blues), 2.4 (1-28 blues), 2.5 (1-10 blues)
5-6	Chapter 3	**Functions and Relations:** Functions Relations Properties: Reflexive, Symmetric, Transitive**;** Partial Order, Total Order, Equivalence Relations**,** Matrices of Relations Application: Intro to Relational Databases **HW**: 3.1 (1-55 blues – as time permits), 3.2 (1-100 blues – as time permits), 3.3 (1-44 blues), 3.4 (1-37 blues), 3.5 (1-10 blues – as time permits)
7	Chapter 4	**Algorithms:** Analysis of Algorithms, Recursive Algorithms, Use of Recurrences to Analyze Algorithms **HW**: 4.3 (1-99 blues – as time permits), 4.4 (1-30 blues – as time permits) **REVIEW FOR THE MIDTERM**
8	Midterm	**REVIEW and MIDTERM**
9	Chapter 7	**Recurrence Equations:** Divide-and-Conquer Recurrences, Master Theorem**,** Linear Recurrences (Strong Induction)

		HW: 7.1 (1-58 blues – as time permits), 7.2 (1-25 blues)
10-11	Chapter 6	**Counting Methods:** Permutations and Combinations**,** Principle of Inclusion/Exclusion, Introduction to Basic Probability, Binomial Theorem, Pigeonhole Principle**,** **HW**: 6.1 (1-92 blues), 6.2 (1-68 blues), 6.3 (1-7 all), 6.5 (1-44 blues), 6.6 (1-63 blues), 6.7 (1-33 blues) , 6.8 (1-33 blues)
12-13	Chapters 8 (9)	**Introduction to Trees and Graphs:** Graphs, Euler and Hamiltonian Cycles, Dijkstra Algorithm, Isomorphisms of Graphs and Trees **HW**: 8.1 (1-27 blues), 8.2 (1-37 blues), 8.3 (1-15 blues), 8.4 (1-5 all), 8.5 (1-19 blues – as time permits), 8.6 (1-13 blues – as time permits), 9.8 (1-22 blues – as time permits)
14	Review	**REVIEW FOR THE FINAL EXAM**

Prepared By: Prof. Adrian Ionescu

Revised: August 12, 2020