LAGUARDIA COMMUNITY COLLEGE
CITY UNIVERSITY OF NEW YORK
MATHEMATICS, ENGINEERING, AND COMPUTER SCIENCE DEPARTMENT

MAC281 – DISCRETE STRUCTURES

3 Lecture Hours, 3 Credits

Prerequisites: MAC101, MAT231

Catalog Description:

This course covers the mathematical concepts essential for continued study in computer science and related fields. The topics include algorithms, complexity of algorithms, introduction to number theory and its applications, mathematical induction and recursion, relations and functions, graphs and trees, and applications.

Instructional Objectives:

1. Familiarize students with the basic properties of algorithms used in a variety of mathematical contexts.
2. Introduce the theory of complexity of algorithms.
3. Present basic concepts of number theory and teach students how to apply them to computer arithmetic.
4. Reinforce the method of recursion and the use of structural induction.
5. Introduce fundamental concepts of graph theory and present different graph models.
6. Familiarize students with shortest-path problems.

Performance Objectives:

1. Design algorithms for solving different computational problems.
2. Analyze the complexity of algorithms.
3. Obtain a linear decomposition of the gcd of two positive integers using the Euclidean Algorithm and perform such a computation for a pair of large integers.
4. Apply structural induction to prove properties of recursively defined structures.
5. Construct and analyze graph models for problems in different areas.
6. Solve shortest-path problems using Dijkstra's algorithm.

Text: *Discrete Mathematics and Its Applications* (Seventh Edition) by Kenneth H. Rosen
Published by McGraw-Hill (2012), ISBN: 0073383090

Evaluation:

Quizzes	15%
Project	15%
Two Exams @15%	30%
Final Exam	40%
Total	100%

Comments:

The specific topics and suggested homework problems listed in the course outline and the principles of evaluation listed above are all subject to modification. Each student is strongly encouraged to complete homework assignments to the best of his or her ability consistently throughout the semester. Generally speaking, the student that follows this recommendation will maximize his or her understanding of the subject matter and achieve optimal performance on examinations.

COURSE OUTLINE

LESSON	SECTION	TOPIC	SUGGESTED HOMEWORK
1-3	3.1-3.3	Algorithms. The Growth of Functions. Complexity of Algorithms	# 2, 4, 6, 8, 12, 16, 18, 20 (p. 202-203), # 2, 4, 10, 12, 14, 22, 24, 26, 30, 32 (p.216-217), # 2, 4, 12, 14, 18, 22 (p. 230-231)
4-5	4.1, 4.4	The Integers & Division	# 6, 8, 10, 14, 16, 22, 24, 26, 28, 30, 32 (p. 244-245), # 2, 6, 10, 12, 20, 34, 36, 38 (p. 284-285)
6	4.2	Integers & Algorithms	# 2, 4, 6, 8, 12, 22 (p. 254-255)
7-8	4.3, 4.5	Primes & Greatest Common Divisors	# 2, 4, 14, 16, 24, 26, 28, 30, 32, 40 (p. 272-273), # 2, 4, 12, 18, 20 (p. 292-293)
9	5.1, 5.2	Mathematical Induction	# 4, 6, 8, 10, 14, 18, 20, 32, 34 (p. 329-330), # 4, 6, 8, 12, 14, 26, 28, 34 (p. 341-344)
10-11	5.3	Recursive Definition and Structural Induction	# 2, 4, 6, 8, 12, 24, 28(p. 357-358),
12-13	5.4, 5.5, 8.3	Recursive Algorithms. Divide-&- Conquer Algorithms	# 2, 4, 6, 8, 10, 12, 16, 18, 32, 33, 34, 44, 46, 50 (p. 370-371), # 2, 4, 6 (p. 377), # 8, 10, 14, 16, 18, 20 (p. 535)
14		Review	
15		**Exam #1**	
16	2.3, 9.1	Relations and Functions	# 2, 4, 8, 10, 12, 14, 16, 22, 30, 36, 38, 42, 50, 54, 58, 60, 62, 64, 68 (p. 152-155), # 2, 4, 6, 8, 12, 18, 26, 28, 30, 32, 40, 46 (p. 581-583)
17	9.3	Representing Relations	# 2, 4, 6, 8, 10, 12, 14, 18, 20, 22, 24, 26, 28, 32 (p. 596-597)
18	9.4	Closure of Relations	# 2, 6, 8, 10, 16, 18, 22, 26, 28 (p. 606-607)
19	9.6	Partial Orderings	# 2, 4, 8, 10, 14, 16, 20, 22, 26, 28, 32, 34 (p. 630-631)
20-21	10.1, 10.2	Graphs & Graph Models. Graph Terminology & Special Types of Graphs	# 4, 6, 8, 10, 16, 20, 22 (p. 650-651), # 2, 4, 8, 10, 12, 18, 20, 22, 24, 28, 48, 50, 54, 60 (p. 665-667)
22	10.3	Representing Graphs & Graph Isomorphism	# 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 34, 36, 38, 40, 46, 56, 58, 62, 64 (p. 675-678)
23	10.4	Connectivity	# 2, 4, 6, 12, 14, 20, 22, 26 (p. 689-691)
24	10.5	Euler & Hamilton Paths	# 2, 4, 6, 8, 10, 14, 18, 20, 22, 30, 32, 34, 36, 38, 40, 42 (p. 703-705)
25-26	10.6	Shortest- Path Problems	# 2, 4, 6, 8, 14, 17, 18, 26, 28 (p. 716-718)
27	10.7	Planar Graphs	# 2, 4, 6, 8, 12, 14, 20, 22, 24 (p. 725-726)
28		Review	
29		**Exam #2**	
30-31	11.1, 11.2	Introduction to Trees. Applications of Trees	# 2, 4, 6, 8, 10, 18, 20, 22 (p. 755-756), # 2, 4, 20, 22, 24, 26 (p. 769-770)
32	11.3	Tree Traversal	# 2, 4, 6, 8, 10, 12, 14, 16, 18 (p. 783-784)
33-34	11.4, 11.5	Spanning Trees. Minimum Spanning Trees	# 2, 4, 6, 8, 10, 14, 16, 28, 36, 38 (p. 795-796), # 2, 4, 6, 8 (p. 802)
35-36		Review	
Week 13		**Final Exam**	