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

MAT231 – INTRODUCTION TO DISCRETE MATHEMATICS

3 Lecture Hours, 3 Credits

Prerequisites: CSE099, ENA/ENG/ESA099
Pre- or Co-requisite: MAT201 - Calculus I

Catalog Description:

This course introduces students to the foundations of discrete mathematics. The topics of study include propositional logic, methods of proof, set theory, relations and functions, mathematical induction and recursion, and elementary combinatorics.

Instructional Objectives:

1. Familiarize students with the basic principles of mathematical logic.
2. Introduce the concepts of reasoning and formal proof.
3. Provide students with the concepts of set theory.
4. Introduce functions and their properties.
5. Introduce the method of recursion as a way to define mathematical objects and familiarize students with the basics of structural induction.
6. Reinforce basic counting principles, enabling students to employ them in solving a variety of applied problems.

Performance Objectives:

1. Compute truth tables and analyze the consistency of a system of statements expressed in propositional logic.
2. Write formal proofs using different proving techniques such as direct and indirect proof, proof by contradiction, and mathematical induction.
3. Solve problems in set theory involving operations on sets and subsets.
4. Describe different ways to define a function and the notions of surjective, injective, and bijective functions.
5. Define different objects using recursion and establish their properties using structural induction.
6. Solve combinatorial problems using different counting techniques.

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

Evaluation:

Project	20%
Two Exams @20%	40%
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	1.1, 1.2	Propositional Logic	# 2, 4, 6, 8, 14, 16, 22, 26, 28, 32, 36 (p.12-15), # 2, 4, 6, 20, 22 (p. 22-23)
2	1.3	Propositional Equivalences	# 4, 6, 8, 10, 12, 14, 16, 22, 24, 30, 40, 60, 62 (p. 34-36)
3	1.4	Predicates and Quantifiers	# 2, 4, 6, 8, 10, 12, 14, 18, 24, 28, 30, 32, 36 (p. 53-55)
4	1.5	Nested Quantifiers	# 4, 6, 8, 12, 26, 28, 30, 32 (p. 64-67)
5	1.6	Rules of Inference	# 4, 6, 10, 12, 14, 16, 18, 20, 24, 28, 30 (p.78-80)
6 – 7	1.7	Introduction to Proofs	# 2, 6, 8, 10, 14, 18, 22, 24, 26, 28, 32 (p. 91)
8	1.8	Proof Methods and Strategy	# 2, 4, 6, 8, 10, 14, 16, 18, 30, 34, 36 (p.108-109)
9 – 10	2.1, 2.2	Sets. Set Operations	# 2, 4, 6, 8, 10, 14, 16, 20, 22, 24, 30, 32, 36, 38 (p. 125-126), # 4, 6, 8, 12, 14, 16, 20, 24, 26, 28, 32, 34, 36, 48, 50 (p. 136-137)
11 – 12	2.3	Functions	# 2, 4, 8, 10, 12, 14, 16, 22, 30, 36, 38, 42, 50, 54, 58, 60, 62, 64, 68 (p. 152-155)
13	2.4	Sequences and Summations	# 2, 4, 6, 10, 12, 16, 26, 30, 32, 34, 36, 40, 44, 46 (p. 167-170)
14		Review	
15		**Exam #1**	
16 – 18	5.1, 5.2	Mathematical Induction. Strong Induction and Well-Ordering	# 4, 6, 8, 10, 14, 18, 20, 32, 34 (p. 329-330), # 4, 6, 8, 12 (p. 341-342)
19	6.1	Basics of Counting	# 2-16 (even), 20, 22, 26, 28, 30, 32, 36, 46, 52, 56, 58, 60 (p. 396-398)
20	6.2	The Pigeonhole Principle	# 2, 4, 6, 14, 16, 18 (p. 405)
21 – 22	6.3	Permutations and Combinations	# 2, 6, 8, 10, 12, 14, 18, 22, 26, 28, 30, 32, 34, 36 (p. 413-414)
23	6.4	Binomial Coefficients	# 2, 4, 6, 8, 12 (p. 421)
24 – 25	6.5	Generalized Permutations and Combinations	# 2, 4, 6, 8, 10, 14, 16, 18, 20, 30, 32, 34 (p. 432-433)
26		Review	
27		**Exam #2**	
28 – 30	8.1, 8.2	Recurrence Relations. Solving Linear Recurrence Relations	# 2, 4, 8, 14, 18, 24, 26, 28, 30, 32 (p. 524-525)
31	8.5, 8.6	Inclusion-Exclusion Principle	# 2, 4, 6, 8, 10, 12, 16, 20 (p. 557-558), # 2, 4, 6, 8, 10, 12, 16 (p. 564-565)
32 – 33	9.1, 9.4	Relations and Their Properties. Closures of Relations	# 2, 4, 6, 8, 12, 18, 26, 28, 30, 32, 40, 46 (p. 581-583), # 2, 6, 8, 10, 16, 18, 22, 26 (p. 606-607)
34 – 35	9.5, 9.6	Equivalence Relations. Partial Orderings	# 2, 4, 6, 8, 10, 12, 16, 26, 28, 36, 42, 44, 46 (p. 615-617), # 2, 4, 8, 14, 16, 20, 22, 34 (p. 630-631)
36		Review	
Week 13		**Final Exam**	