King Fahd University of Petroleum and Minerals, Department of Mathematics

Math 463 Syllabus, Term 232 (fa2023-2024), Dr. Nika Salia (**nika.salia@kfupm.edu.sa**)

Course Code and Title: Math 463- Combinatorics

Course Credit Hours: 3-0-3

Textbook: Richard A. Brualdi, Introductory Combinatorics, Fifth Edition, Prentice Hall, 2017

Course Description: Permutations and Combinations, The Pigeonhole Principle, The Binomial Coefficients, The Inclusion-Exclusion Principle and Applications, Recurrence Relations and Generating Functions, Special Counting Sequences.

Course Learning Outcomes: Upon completion of the course, students should be able to

1. Recognize the fundamental concepts and techniques of Combinatorics
2. Explain combinatorial proofs
3. Apply enumerative techniques in combinatorics
4. Use recurrence relations and generating functions for sequences

Office Hour:

Sunday, Tuesday, Thursday, 14:00-15:00

Grading Policy:

Exam I	**Date: March 28**	**Place: Usual Classroom**	30%
Final Exam	**Date: TBA**	**Place: TBA**	40%
		All Covered Material	
Homework	**Biweekly**		25%
Project			5%
		TOTAL	**100%**

Letter Grades: The letter grades will follow a grading curve, which depends on the average of all students enrolled in the course.

Exam Questions: The questions of the exams are similar to the examples and exercises in the textbook.

Cheating in Exams: Cheating or any attempt of cheating by use of illegal activities, techniques and forms of fraud will result in a grade of DN in the course along with reporting the incident to the higher university administration for further action. Cheating in exams includes (but is not restricted to):

- Looking at the papers of other students.
- Talking to other students.
- Using mobiles, smart watches or any other electronic devices.

Missing an Exam: In case a student misses an exam (Exam I, or the Final Exam) for a legitimatereason (such as medical emergencies), he/she must bring an official excuse from Students Affairs. Otherwise, he/she will get a score of zero in the missed exam.

Attendance: Students are expected to attend all lecture classes.

- If a student misses a class, he/she is responsible for any announcement made in that class.
- After warned **twice** by the instructor, a DN grade will be awarded to any student who accumulates:
    - 10 unexcused absences in lectures
    - 15 excused and unexcused absences in lectures.

The Usage of Mobiles in Class: Students are not allowed to use mobiles for any purpose during class time. Students who want to use electronic devices to take notes must take permission from their instructor. Violations of these rules will result in a penalty decided by the instructor.

Academic Integrity: All KFUPM policies regarding ethics apply to this course. See the Undergraduate Bulletin in the Registrar's website.

Pacing Schedule

Week	Dates (2024)	Section	Topics (26 sections)
1	Jan. 14-18	**2.1**	Four Basic Counting Principles
		2.2	Permutations of Sets
2	Jan. 21-25	**2.3**	Combinations (Subsets) of Sets
		2.4	Permutations of Multisets
3	Jan. 28- Feb. 1	**2.5**	Combinations of Multisets
		2.6	Finite Probability
4	Feb. 04-08	**3.1**	Pigeonhole Principle: Simple Form
		3.2	Pigeonhole Principle: Strong Form
5	Feb. 11-15	**3.3**	A Theorem of Ramsey
		5.1	Pascal's Triangle
6	Feb. 18-21	**5.2**	The Binomial Theorem
		5.3	Unimodality of Binomial Coefficients
Thursday, Feb. 22, 2024: Saudi Foundation Day			
7	Feb. 25-29	**5.4**	The Multinomial Theorem
		5.5	Newton's Binomial Theorem
8	March 03-07	**5.6**	More on Partially Ordered Sets
		6.1	The Inclusion-Exclusion Principle
9	March 10-14	**6.2**	Combinations with Repetition
		6.3	Derangements
10	March 17-21	Review	
11	March 24		**Exam I**
11	March 26-28	**6.4** **6.5**	Permutations with Forbidden Positions, Another Forbidden Position Problem
March 29- April 18: Eid Al-Fitr Holidays			
12	April 21-25	**7.1**	Some Number Sequences
		7.2	Generating Functions
13	April 28-May 02	**7.3**	Exponential Generating Functions
		7.4	Solving Linear Homogeneous Recurrence Relations
14	May 05-09	**7.5**	Partially ordered sets
		7.6	Nonhomogeneous Recurrence Relations
15	May 12-16	**7.7**	A Geometry Example
16	May 19		
Final Exam Comprehensive			