

**King Fahd University of Petroleum & Minerals**  
**Department of Mathematics**

**Syllabus Math 463- Combinatorics - T 252**

**Prof. Dr. Othman Echi (Office 5-403, Tel:1802)**

<b>Description:</b>	Strings, sets, permutations and combinations, the pigeonhole principle, the binomial coefficients, the inclusion-exclusion principle and applications, recurrence relations and generating functions, special counting sequences.
<b>Prerequisite:</b>	MATH 201
<b>Textbook:</b>	M.T. Keller and W.T. Trotter. Applied Combinatorics. Edition 2017 Online Edition: <a href="https://appliedcombinatorics.org/book-pdf/app-comb-2017.pdf">https://appliedcombinatorics.org/book-pdf/app-comb-2017.pdf</a>

<b>Assessment Task*</b>	<b>Week Due</b>	<b>Proportion of Total Assessment Score</b>
Homework	Weekly	7% (HW (2%)+ Attendance (5%))
Exam1	Week 7	20%
Exam 2	Week 11	20%
Projects/Presentations	Week 14	18%
Final exam	Week 16	35%

**Learning Outcomes:** Upon completion of this 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

## Schedule

Weeks	Chapter	Topic
1-4	<b>B.</b> Background material for combinatorics + Chapters 3 and 6	Preliminaries: Review of set theory, multisets, partially ordered sets, Dilworth's theorem, Sperner's theorem, the monoid of strings over an alphabet, mathematical induction
5-7	2	Basic counting principles: additive rule, multiplicative rule, pigeonhole principle, binomial coefficients, multinomial coefficients
8-9	7	Inclusion-Exclusion theorem and its applications
10-11	8	Generating Functions
12	9	Recurrence Relations
13	--	Review of Group Theory
14-15	15	Burnside counting theorem and Pólya's enumeration theorem

➤ Cheating in Exams: Cheating or any attempt of cheating by use of illegal activities, techniques and forms of fraud will be reported to the higher university administration.

Cheating in exams includes (but is not limited to):

- looking at the papers of other students
- talking to other students
- using mobiles or any other electronic devices.

**Exam Issues:**

- No student will be allowed to take the exam if not having his/her KFUPM ID or National/Iqama ID.
- Students are not allowed to carry mobiles, smart watches, or electronic devices to the exam halls/rooms
- Missing an Exam: In case a student misses an exam (midterm or the Final Exam) for a legitimate reason (such as medical emergencies), he/she must bring an official excuse from Students Affairs. Otherwise, he/she will get 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.
- A DN grade will be awarded to any student who accumulates more than 20% (09) unexcused absences or 33% (15) excused and unexcused absences.

**Note:** The student will be warned twice by his instructor before he/she is assigned a DN grade

**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 get 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.