

MATH 336 Combinatorial Mathematics

1. Catalog Description

MATH 336 Combinatorial Mathematics (4)

Methods of enumerative combinatorics: sum, product, and division rules, bijective and recursive techniques, inclusion and exclusion, generating functions, and the finite difference calculus. Advanced topics to be selected from the theory of partitions, Polya theory, designs, and codes. 4 lectures. Prerequisite: Junior standing or consent of instructor.

2. Required Background or Experience

Junior standing.

3. Learning Objectives

The student should gain an understanding of the fundamental concepts of combinatorics.

4. Text and References

Possible texts:

Bóna, Miklós, A Walk Through Combinatorics, World Scientific, 2002.
Grimaldi, Ralph P., Discrete and Combinatorial Mathematics, 5th ed., Addison-Wesley, 2003.
Marcus, Daniel A., Combinatorics: A Problem-Oriented Approach, MAA, 1999.
Tucker, Alan, Applied Combinatorics, 4th ed., Wiley, 2001.

References:

Andrews, George E., The Theory of Partitions, Cambridge Univ. Press, 1998.
Cameron, Peter J., Combinatorics: Topics, Techniques, Algorithms, Cambridge Univ. Press, 1994.
Erickson, Martin J., Introduction to Combinatorics, Wiley-Interscience, 1996.
Pólya, George, Notes on Introductory Combinatorics, Birkhäuser, 1983.

5. Minimum Student Materials

Paper, pencils, and notebook.

6. Minimum University Facilities

Classroom with ample chalkboard space for class use.

7. Content and Method

<u>Topic</u>	<u>Lectures</u>
a. Introduction	1
b. Elementary methods of enumeration - sum, product, and division rules applied to counting permutations, combinations, and functions with specified properties	4
c. Bijections; sets of equal cardinality; sign reversing involutions	3
d. Recursive techniques	4
e. Generating functions; binomial and multinomial theorems and manipulation of formal power series; general (Newton's) binomial theorem	7
f. Principle of inclusion and exclusion	4
g. Classical sequences of combinatorics; their properties and applications	4
h. Classic combinatorics problems: Counting lattice paths, partition identities, subsets of permutations with restricted cycle structure	5
i. Advanced topics selected by instructor	$\frac{5}{37}$
Total	$\frac{5}{37}$

Method

Lecture, discussion, and student participation.

8. Methods of Assessment

Homework assignments, class demonstrations, quizzes and examinations.