

## MATH 336 Combinatorial Math

### 1. Catalog Description

#### **MATH 336 Combinatorial Math**

**4 units**

Prerequisite: MATH 248 or junior standing.

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.

### 2. Required Background or Experience

Math 248 or Junior standing.

### 3. Learning Objectives

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

### 4. Text and References

To be chosen by instructor. Suggested texts include:

- Bóna, Miklós, A Walk Through Combinatorics
- Grimaldi, Ralph P., Discrete and Combinatorial Mathematics
- Marcus, Daniel A., Combinatorics: A Problem-Oriented Approach
- Tucker, Alan, Applied Combinatorics
- Brualdi, Richard, Introductory Combinatorics

References:

- Cameron, Peter J., Combinatorics: Topics, Techniques, Algorithms
- Erickson, Martin J., Introduction to Combinatorics

### 5. Minimum Student Materials

Paper, pencils, and notebook.

### 6. Minimum University Facilities

Classroom with ample chalkboard space for class use.

7. Content and Method

- a. Elementary methods of enumeration - sum, product, and division rules applied to counting permutations, combinations, etc.
- b. The principle of inclusion and exclusion.
- c. Recursions.
- d. Classical sequences and counting problems (lattice paths, partitions, Stirling and Catalan numbers, etc.).
- e. Counting by bijections or involutions
- f. Generating functions, binomial and multinomial theorems, formal manipulation of series.
- g. Advanced topics selected by instructor (time permitting).

8. Methods of Assessment

The primary methods of assessment are: essay examinations, quizzes and homework. Typically, there will be one or more hour-long examinations during the quarter, and a required comprehensive final examination. Students are required to show their work and are graded not only on the correctness of their answers, but also on their understanding of the concepts and techniques.