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: MATH 248 or Junior standing.

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

   Possible texts:

   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

   References:

   Andrews, George E., The Theory of Partitions
   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**

**Topic**

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**

Homework assignments, class demonstrations, quizzes, and examinations.

Homework exercises should be engineered to guide learning outside of the classroom (this may include writing small computer programs, reading combinatorics literature, or applying combinatorics to other disciplines).