MATH 531 Discrete Mathematics with Applications II

1. **Catalog Description**

MATH 531. Discrete Mathematics with Applications II 4 units

Prerequisite: MATH 435 or MATH 530. Corequisite: MATH 482 or graduate standing in Mathematics.

Methods of discrete mathematics with applications. Polya theory, codes, designs, matroids, the combinatorics of symmetric functions, and tableaux combinatorics. Additional topics including transversals and Latin squares, asymptotics, and discrete probability theory. 4 lectures. Not open to students with credit in MATH 436.

2. **Required Background or Experience**

Prerequisite: MATH 435 and MATH 482 or concurrent enrollment in MATH 482, or consent of instructor.

3. **Learning Objectives**

Upon completion of MATH 531, a student should be able to:

a. Account for symmetry when counting objects by using Polya theory.

b. Understand the definitions and basic facts concerning symmetric functions and their uses in connection with Young tableaux and tableaux algorithms such as RSK.

c. Understand and apply the standard techniques of discrete mathematics to solve problems from probability theory, combinatorics, and number theory.

4. **Text and References**

Text to be specified by instructor. Suggested texts include:

- Graham, Ronald, *Concrete Mathematics*
- Hardy, G. H. and E. M. Wright, *An Introduction to the Theory of Numbers*
- J.H. Van Lint and R.M. Wilson, *A course in Combinatorics*
- P. Goulden and D.M. Jackson, *Combinatorial Enumeration*

5. **Minimum Student Materials**

Paper, pencils and notebook.

6. **Minimum University Facilities**

Classroom with ample chalkboard space for class use.
7. **Content**

**Topics:**

a. Polya theory  
b. Codes and designs  
c. Matroids  
d. The combinatorics of symmetric functions  
e. Tableaux combinatorics  
f. Discrete probability theory and/or asymptotics and/or transversals/Latin squares and/or other advanced topics selected by instructor (time permitting)

8. **Methods of Assessment**

Exams, homework, and possibly student presentations.