



**Catalog Description:**

4580-4581 includes elementary number theory, group theory, vector spaces and linear transformation, and field theory.

**Prerequisite:**

C- or better in Math 4580; or credit for 5590H or 581.

**Exclusions:**

Not open to students with credit for 582 or 592H.

**Purpose:**

Math 4580-4581 constitutes a two-semester sequence on abstract algebra, intended to familiarize students with the principal concepts, mode of thinking, and important theorems in this subject area. Considerable emphasis is placed on connections between this material and the traditional topics of high school mathematics - Euclidean geometry, polynomial equations, and trigonometry. Math 4581 deepens the theory of groups and of polynomial equations, culminating in Galois' theory of equations and the classification of finite symmetry groups in  $\mathbb{R}^3$ .

**Text:**

Notes on Abstract Algebra, by Ron Solomon (in-house notes)

**Topics List:**

1. Permutation groups, orbits, and Lagrange's Theorem
2. The Orbit Counting Formula
3. Imaginaries and Galois fields
4. Gaussian integers and Fermat's two squares theorem
5. Review and Midterm 1
6. Symmetric polynomials and the Fundamental Theorem of Algebra
7. Nonconstructibility and a Lagrange Theorem for fields
8. Galois' Theory of Equations
9. The Galois Correspondence
10. Review and Midterm 2
11. The isometry group of  $\mathbb{R}^2$
12. Linear algebra in  $\mathbb{R}^3$
13. The Platonic solids and their symmetries
14. The finite subgroups of  $SO(3)$