



**Catalog Description:**

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

**Prerequisite:**

{C- or better in 3345, and C- or better in 2568 or 5520H} or {credit for 345; and credit for 568, 571, or 520H}.

**Exclusions:**

Not open to students with credit for 581 or 591H.

**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 4580 begins with a brief review of elementary number theory. Groups are introduced in the context of geometrical symmetry. There is a study of number systems along with an introduction to the theory of polynomial equations. Finally, this is all applied to the constructibility problem for regular polygons.

**Text:**

*An Introduction to Abstract Algebra*, by Ronald Solomon (in-house notes).

**Topics List:**

0. Equivalence Relations and the Integers
1. Isometrics
2. Congruences and Groups
3. The Isometrics of  $\mathbb{R}^2$  and Symmetry Groups
4. The Integers, Polynomials, and their Generalizations
5. Rational Numbers, Real Numbers and Decimals
6. Roots and the Complex Numbers
7. The Cyclotomic Polynomials
8. Fermat and the Gaussian Integers
9. Constructible Numbers
10. Some Linear Algebra and a Nonconstructibility Criterion
11. The Method of Mr. Gauss