

Departmental Syllabus
Math 3330 -- Modern Algebra

Textbook: Contemporary Abstract Algebra (Fourth Edition), by Joseph Gallian

Prerequisites: MATH 3230 with a grade of "C" or better

Calculators: No specific calculator required.

Course Description: Study of the structure of abstract algebraic systems through formal proof. Deals primarily with groups, but also examines other algebraic systems including rings and fields.

Topics and sections to be covered:

Chapter 0 -- Preliminaries

- Properties of Integers
- Modular Arithmetic
- Mathematical Induction
- Equivalence Relations
- Functions (Mappings)

Chapter 1 -- Introduction to Groups

- Symmetries of a Square
- The Dihedral Groups

Chapter 2 -- Groups

- Definition and Examples of Groups
- Elementary Properties of Groups

Chapter 3 -- Finite Groups; Subgroups

- Terminology and Notation
- Subgroup Tests
- Examples of Subgroups

Chapter 4 -- Cyclic Groups

- Properties of Cyclic Groups
- Classification of Subgroups of Cyclic Groups

Chapter 5 -- Permutation Groups

- Definition and Notation
- Cycle Notation
- Properties of Permutations

Chapter 6 -- Isomorphisms

Motivation
Definition and Examples
Properties of Isomorphisms

Chapter 7 -- Cosets and Lagrange's Theorem
Properties of Cosets
Lagrange's Theorem and Consequences

Chapter 8 -- External Direct Products
Definition and Examples
Properties of External Direct Products

Chapter 9 -- Normal Subgroups and Factor Groups
Normal Subgroups
Factor Groups
Applications of Factor Groups

Chapter 10 -- Group Homomorphisms
Definition and Examples
Properties of Homomorphisms

Chapter 12 -- Introduction to Rings
Motivation and Definition
Examples of Rings
Properties of Rings
Subrings

Chapter 13 -- Integral Domains
Definition and Examples
Fields
Characteristic of a Ring

Chapter 14 -- Ideals and Factor Rings
Ideals
Factor Rings

Chapter 15 -- Ring Homomorphisms
Definition and Examples
Properties of Ring Homomorphisms
The Field of Quotients

Chapter 16 -- Polynomial Rings
Notation and Terminology
The Division Algorithm and Consequences