MATH 3006 ABSTRACT ALGEBRA(3 credit hours)

Elmira College

SPRING 2025

Required Text:
Abstract Algebra: Theory and Applications, Thomas W. Judson..

Pre-requisites: MATH 2015 Introduction to Calculus II.

Course Description

This course explores the foundational concepts and structures of abstract algebra, emphasizing integers, sets, groups, and rings. Topics include properties of integers, group theory (with a focus on permutation and cyclic groups), Lagrange's theorem, subgroups, normal subgroups, quotient groups, and the external direct product of groups. Additionally, the course introduces homomorphisms, isomorphisms, rings, and fields. The focus is on understanding these concepts through rigorous proofs and practical applications in mathematics and related fields.

Course Objectives and Goals

- Demonstrate an understanding of the algebraic structures of groups, rings, and fields.
- Apply Lagrange's Theorem to determine subgroup properties and sizes.
- Distinguish between different types of groups (e.g., cyclic, permutation) and identify their properties.
- Construct and analyze proofs involving homomorphisms, isomorphisms, and group properties.
- Explore and use concepts of rings and fields in solving algebraic problems.

Evaluation of Performance

Your grade will be based upon your performance on exams, assignments, and participation.

4 Assignments	20%
4 Quizzes	40%
Midterm Exam	15%
Final Exam	25%
Total	100%

Grades will be assigned as follows:

A	93% and above	B-	80 - 82%	D+	67 - 69%
A-	90 - 92%	C+	77 - 79%	D	63 - 66%
B+	87 - 89%	C	73 - 76%	D-	60 - 62%
B	83 - 86%	C-	70 - 72%	F	59% or below

Withdrawal Policy: Please see Elmira College Bulletin for information on this policy.

Academic Honesty: Please read the section on Academic Honesty in the **Code of Conduct**. Briefly, academic dishonesty includes: cheating, fabrication, facilitating academic dishonesty, and plagiarism. Ask if you have any questions on whether something constitutes as academic dishonesty. All work must be original and new. Past assignments from current or other courses will not be accepted. Academic dishonesty will not be tolerated. It will result in zero on the assignment, and a report will be filed with the school. Continued practice will result in failure of the class. Institutional penalties may also apply with repeated acts of academic honesty.

Student Responsibility:

- It is your responsibility to keep track of assignments and due dates.
- You should ask questions concerning assignments and lectures, if you need any clarifications.
- If you are struggling in class, have concerns, and/or unsure about expectations, please stop by during office hours or make an appointment for another time.

Tentative Schedule of Topics

Topic	Materials	Tasks & Evaluations
The Integers	Chapter 2	
Groups and Subgroups	Chapter 3	Assignment 1
Cyclic Groups	Chapter 4	
Permutation Groups	Chapter 5	Quiz 1
Cosets and Lagrange's Theorem	Chapter 6	
Fermat's and Euler's Theorems	Chapter 6	Assignment 2
Introduction to Cryptography	Chapter 7	
Algebraic Coding Theory	Chapter 8	Quiz 2
Isomorphisms	Chapter 9	
Normal Subgroups and Factor Groups	Chapter 10	Midterm Exam
Homomorphisms	Chapter 11	
Matrix Groups and Symmetry	Chapter 12	Assignment 3
The Structure of Groups	Chapter 13	
The Sylow Theorems	Chapter 15	Quiz 3
Rings	Chapter 16	
Polynomials	Chapter 17	Assignment 4
Vector Spaces	Chapter 20	
Fields	Chapter 21	Quiz 4
Finite Fields	Chapter 22	
Galois Theory	Chapter 22	Final Exam