MAT 235 Rings, Fields, and Modules

Winter 2024

Course Credits: 4
Contact Hours: 56 hours
Instructor: TBA
Email:TBA

COURSE OBJECTIVES

This course delves into the abstract algebraic structures known as rings and fields. In this course, students will explore the fundamental concepts, properties, and theorems related to these algebraic structures. Rings and fields are essential in various mathematical and scientific disciplines, providing the foundation for linear algebra, number theory, and other branches of mathematics. This course is designed to deepen students' understanding of algebra and equip them with the knowledge and skills to solve complex mathematical problems.

Upon Completion of this Course, students will be able to:

1. Explore the definition and properties of rings, including the existence of additive and multiplicative identities, commutative and non-commutative rings, and subrings;

2. Investigate the concept of fields, which are a specific type of ring with additional properties like the existence of multiplicative inverses for non-zero elements;

3. Develop the ability to recognize and analyze algebraic structures, including integral domains, polynomial rings, and quotient rings;

4. Apply algebraic principles to solve equations and prove theorems within the context of rings and fields;

5. Enhance problem-solving skills and develop a strong foundation in abstract algebra, which is crucial for advanced mathematical studies.

PREREQUISITES

MAT 130 Linear Algebra

GRADING

Grades will be determined by accumulating points, with 100 points being the maximum, as follows:

ITEM	POINTS
3 Assignments	30 Points
2 Exercises	10 Points
Midterm Exam	20 Points
Group Project	10 Points
Final Exam	30 Points
Total	100 Points

Late submissions will be graded at the end of the course. Grades will be assigned according to the following rule:

$A \geq 90 > B \geq 80 > C \geq 70 > D \geq 60 > F$.

We reserve the right to make adjustments to the overall grading policy.

COURSE MATERIALS

Required Texts:

Marlow Anderson, Todd Feil, ***A First Course in Abstract Algebra: Rings, Groups, and Fields***, 3th Edition, CRC Press, 2013.

Recommended (Optional) Texts or Other Materials:

None

COURSE TOPICS

MODULE	TASKS

Module 1	**Topics:** Topic 1: The Integers Topic 2: The Division Theorem Topic 3: The GCD identity for integers Topic 4: Polynomials **Assessments:** Assignment#1
Module 2	**Topics:** Topic 5: Factors of a Polynomial Topic 6: Factorization of Polynomials Topic 7: Modular Arithmetic Topic 8: Rings, Domains, and Fields **Assessments:** Assignment#2
Module 3	**Topics:** Topic 9: Principal Ideals Topic 10: Ring Homomorphisms and Ideals Topic 11: Euclid's Algorithm produces a GCD Topic 12: Greatest Common Divisors **Assessments:** Midterm Exam Exercise#1
Module 4	**Topics:** Topic 13: Euclidean Domains Topic 14: Unique Factorization Theorem for Integers Topic 15: The Field of Complex Numbers Topic 16: Finite Fields **Assessments:** Assignment#3 Exercise#2
Module 5	**Topics:** Topic 17:Integral Domains and Fields Topic 18: The Field of Complex Numbers Topic 19: Ring Isomorphisms Topic 20: Cycle Factorization of Permutations **Assessments:** Group Project Final Exam

ATTENDANCE

1) Class attendance is required. Missing classes without permission will lead to

decrease in overall grade.

Missing less than two classes: no penalty.

Missing more than two classes: 7% will be taken off from the overall grade.

If the instructor reports a student's frequent missing of class to the Soochow University Academic Administration Office, the student might get a written warning and might be prohibited from attending final exam.

2) Participants in this course are expected to arrive in class promptly and adequately prepared. The primary objective of this course is to critically engage with the readings and the subject matter. Therefore, course participants are expected to have completed the reading prior to class and prepare thoughtful reflections/commentaries to share with fellow colleagues.

LEARNING REQUIREMENTS

1) Late assignments are not acceptable and are subjected to grade deductions.
2) Assignments submitted in the wrong format will be counted as not submitted.
3) Failure to submit or fulfill any required course component results in failure of the class.
4) Make-up for midterm and final exams only with valid excuses, as defined by the University.
5) In order to earn a Certificate of Completion, participants must thoughtfully complete all assignments by stated deadlines and earn an average quiz score of 50% or greater.

TECHNOLOGY POLICY

The use of electronic devices in class is distracting, both for the user and for the rest of the class. Only non-programmable calculators can be used in the tests and exam. Any attempts to use cell phones and other electronic communication devices will be seemed as cheating. Laptops are discouraged, unless you use them for activities DIRECTLY related to the course (eg., note taking, reading course documents).

ACEDEMIC INTEGRITY POLICY

Soochow University highly values the academic integrity and aims to promote the

academic fairness, honesty and responsibility. Any academic dishonesty behaviors and any attempts to cheats and plagiarism will be reported to the university administration office. A written warning and the relevant penalties will be imposed. The record might be shown on the official university transcript.

DISABILITY ACCOMMODATION

Soochow University is committed to maintaining a barrier-free environment so that students with disabilities can fully access programs, courses, services, and activities at Soochow University. Students with disabilities who require accommodations for access to and/or participation in this course are welcome.

Note:

Please contact the University Administrative Office immediately if you have a learning disability, a medical issue, or any other type of problem that prevents professors from seeing you have learned the course material.