

Math 455: Modern Applied Algebra II (Spring 2004)

10 : 00 — 10 : 50 *am*, MWF in CH 5

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Office Hours: 9 : 00 — 9 : 50 *am* and 11 : 00 — 11 : 50 *am*, MWF.

Text: *A Book of Abstract Algebra*, 2nd ed, by Charles C. Pinter.

Summary & Lecture Schedule: This course is intended to provide you with basic group theory and some of its applications. By walking you through some of the exercises, I will try to promote your skills and ability to handle related problems. We intend to cover chapters 17 through 33 except possibly chapters 28 and 30. Tentative schedule for the lecture is to finish chapters 17 — 21 by February 13, chapters 22 — 26 by March 19, and chapters 27, 29, 31 and 32 in the rest of time. If time permits, we may include additional materials in class.

Objectives: By the conclusion of the course students are expected to know and understand the following concepts and/or related theories.

- Concept of rings and fields, and elementary properties of rings.
- Concept of ideals, rings homomorphisms and quotient rings. Relation among them.
- Concept of prime ideals and maximal ideals, and their impact on the corresponding quotient rings.
- Concept of characteristic of an integral domain, and its properties.
- Construction of the field of the quotients of elements in an integral domain.
- Concept of ordered integral domains and well-ordering principle, and related properties.
- Division algorithm and its applications.
- Unique factorization of integers into primes, and its applications.
- Concept of GCD and its properties.
- Concepts of congruence, and its properties.
- Fermat's theorem, Euler's theorem, and Chinese remainder theorem.
- Factorization of polynomials over a field, and comparison with factorization of integers into primes.
- Relation between factorization of a polynomial and its roots.
- Eisenstein's irreducibility criterion.
- Concept of algebraic and transcendental elements.
- Concepts of field extension and degree of extension, and basic theorem on field extension.
- Galois theory: root fields, Galois groups, Galois correspondence, and fundamental theorem of Galois theory.

By the conclusion of the course students are expected to

- Develop skills and acquire ability to handle fundamental problems in or related to the items listed above.
- Promote their level of accuracy, rigor, simpleness and logical reasoning in solutions and/or proofs of mathematical problems.

Methods of Study: Here are some suggestions for study of the course. Due to the abstractness of the course, it is necessary to read the textbook thoroughly before doing homework. Sometimes it may take you a few times to read through certain topics before you understand what means or what it is about. In that sense it is like reading a legal document to understand what it says. Secondly, homework serves as a very important role in the learning process of the course and composition of your grade. Degree of success in accomplishing homework is also a critical index of how well you can master the materials of the course. One should try his/her best in

doing homework. Thirdly, **you are encouraged to discuss, communicate or cooperate in study of materials or even doing homework** (not including taking exams).

Exams: There are three exams, including the final.

Exam 1: Around Feb. 13 (to be announced in the previous week),

Exam 2: Around Mar. 19 (to be announced in the previous week),

The final: 9 : 40 — 11 : 40 *am* on May 15 (Wednesday).

Homework: Problems are suggested in the next page, and collected every other Friday. The exams will be patterned after problems in homework. The assigned homework is a minimum. More practice will benefit you in understanding the material and performance in the exams.

Attendance: Check daily.

Grade Scale: The final weights 32%, each exam weights 26%, and homework 16%. The final letter grade is based on the following scale

[90%, 100%] :	A
[80%, 90%] :	B
[65%, 80%] :	C
[55%, 65%] :	D
[0%, 55%] :	F.

Message for Handicapped: Any student with a documented disability who would like to request accommodations should contact the University Disability Services Office - Campus Center Rm 311, 933-0816 (V), 933-3334 (TTY) - as early in the semester as possible.

Exercises

Chapter 17: A1; C1, 2, 3; D1, 2, 3, 4; E1, 2; H2, 3, 5*; I1, 3, 7*; J5, 6; K1, 2.

Chapter 18: A1, 2; C1, 9; D3, 5; F1, 2, 4; G2; H3, 4; J6*.

Chapter 19: A1; D1, 4; E6; F2, 4; G1*; H1, 2, 3.

Chapter 20: A1, 2, 3, 4; B3, 4*; C1, 2; E6; F1, 2.

Chapter 21:

Chapter 22: A3, 5, 7; B2; C1 — 6; G2*, 3*.

Chapter 9: A2, 3; B3; C1, 2; E1, 2, 3; F1; G1; H3*; I3, 4.

Chapter 23: Skip.

Chapter 24: A3, 5, 7; B2; C3, 5, 7; D1, 6; E4, 5; F3*.

Chapter 25: A1, 3, 4; B1, 4, 7; C2; D2, 3, 4*; F2, 3.

Chapter 26: A1, 4*; B5*; C1, 5, 6, 8; D1, 3*; E1, 2; F2; I1, 2*.

Chapter 27: A1(*bcd*); B2; C1, 2; D1, 2, 7*; E4; F1*, 2, 3*.

Chapter 28: Skip.

Chapter 29: A3; B1, 2, 3*; C5*; D1; E1, 2, 3, 4, 6*.

Chapter 30: Skip.

Chapter 31: A1, 2; B5; C1, 3; E1.

Chapter 32: A1, 2, 3; C3, 4; G5.

Chapter 33: Skip.