

MA 407.002 – Introduction to Modern Mathematics, Fall Semester 2004 (MWF 1.30-2.20 HA 266)

**Text:** Contemporary Abstract Algebra by J.A. Gallian, 5th edition Houghton Mifflin.

**Instructor:** R. E. Hartwig, HA 217, tel. 515-2385, email: hartwig@math.ncsu.edu, office hours MW 12.30-1.30 or by appointment.

Your **Grade** is determined by: 4 Tests (60%), (bi) weekly homework (10%) and a cumulative final (30%) on Dec 13, 1-4 pm.

Our **Schedule** will roughly be as follows: (mark your calendar)

Lessons 1-2: Chapter 0. **Preliminaries**

Integers, Modular arithmetic, Induction, RST relations, Functions

Lesson 3: Chapter 1 **Introduction to Groups**

Definitions, Examples, Elementary properties, History

Lessons 4-5: Chapter 2. **Groups**

Definitions, Examples, Elementary properties.

Lessons 6-8: Chapter 3. **Finite Groups** Terminology, Notation, Subgroups, Examples

Lesson 9 (Sep 8): TEST 1

Lessons 10-11: Chapter 4. **Cyclic groups**

Properties, Subgroups, Classification

Lessons 12-13: Chapter 5. **Permutation Groups**

Definition, Notations, Cyclic notation, Properties

Lessons 14-16: Chapters 6 & 10 **Isomorphisms and Homomorphisms**

Motivation, Definition, Examples, Cayley's Theorem, Properties, Automorphisms, First Isomorphism Theorem.

Lessons 17-19: Chapter 7. **Cosets and Lagrange's Theorem**

Definition, Lagrange's Theorem, Applications, Rotation groups

Lesson 20 (Oct 4): TEST 2

Lessons 21-23: Chapter 9. **Normal Subgroups and Quotient Groups**

Definitions, Applications, Internal Direct Product

Lessons 24-25: Chapter 8 **External Direct Products**

Definition, Examples, Properties, Group of units mod  $n$ , Applications

Lessons 26-27: Chapter 11. **Fundamental theorem of Abelian groups**

Statement, Isomorphism Classes, Examples

Lesson 28 (Oct 25) TEST 3:

Lessons 29-30: Chapter 12. **Introduction to Rings**

Motivation, Definitions, Examples, Properties, Subrings

Lessons 31-32: Chapter 13. **Integral Domains**

Definition, Examples, Fields, Characteristic of a ring

Lessons 33-34: Chapter 14. **Ideals and Quotient Rings**

Ideals, Quotient ring, Prime Ideals, Maximal Ideals

Lessons 35-36: Chapter 15. **Ring Homomorphism**

Definition, Examples, Properties, Field of Quotients

Lessons 37-38: Chapter 16. **Polynomial Rings**

Notations, Division Algorithm, Consequences

Lessons 39-40: Chapter 17. **Factorization of Polynomials**

Reducibility, Unique factorization domains.

Lesson 40 (Nov 22): Test 4.

Lessons 42-45: Revision

To qualify for a make-up test, please supply solid documentation.

All special students please see me **in person** at least 2 weeks before the first test.