

**Instructor** Amites Sarkar

**Text** Contemporary Abstract Algebra (7<sup>th</sup> ed.)  
Joseph A. Gallian

### Syllabus

Parts 3 and 4 of the book.

### Overview

A *ring* is, roughly speaking, a set with two operations (usually denoted  $+$  and  $\times$ ). Two basic examples are the integers, and the set of polynomials with real coefficients (with the usual addition and multiplication). A *field* is a ring whose nonzero elements have multiplicative inverses. Basic examples of fields include the rational, real and complex numbers.

We will spend most of the course developing and understanding basic properties of rings and fields. Much of the material on rings we will cover is analogous to the material in the second half of the group theory course you have just completed. The field theory will be somewhat different. For instance, one of the key ideas will be to view a field as a vector space over one of its subfields. Towards the end of the course, we will see some applications of the general theories. Three of these applications are: finite fields (useful in cryptography), ruler and compass constructions (we will prove that it is impossible to trisect an angle using a ruler and a compass), and Fermat's last theorem for  $n = 3$  (we will examine an interesting, but incorrect, argument of Euler, in the light of ring theory).

### Exams

**Midterm** Friday 30 April

**Final** Monday 7 June 1–3 pm

### Grading

The midterm is worth 25% and the final is worth 35%. There will also be weekly homework, which will be worth 40% in total. The only way to learn mathematics is to spend a lot of time thinking and talking about it, and I hope that the homework facilitates this.

If you feel too ill to take an exam, don't take it, but bring a doctor's certificate to me when you feel better and I will make arrangements.

### Office hours

My office hours are 10–11 on Mondays, Tuesdays, Wednesdays, Thursdays and Fridays, in 216 Bond Hall. My phone number is 650 7569 and my e-mail is amites.sarkar@wwu.edu