

## MATH 522: Number Theory

Spring 2014 (MW 5:30-6:45pm, E-201)

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Office hours: Mondays and Wednesdays 10-11:30, and by appointment

### Overview:

Number theory is the study of the divisibility properties of the natural numbers.

“Mathematics is the queen of the sciences and number theory is the queen of mathematics.”

Carl Friedrich Gauss, 1856

“God invented the integers; all else is the work of man.”

Leopold Kronecker, 1893

“Music is part of number theory. Nowadays when a number-theorist applies for a grant, he says that it is good for security, but in those days, way before America, he would say that it’s good for music. I will not comment whether we have progressed...”

Hendrik W. Lenstra Jr., 2002

### Textbook:

*Number Theory, with applications*, by Anderson and Bell, ISBN 0-13-190190-7. This course will cover chapters 1-5, at the rate of one section per day. There are also introductory sections and a chapter 0 that students are expected to read on their own. Students are expected to read the text.

### Portfolio:

Students are expected to keep a portfolio in a three-ring binder or something similar, containing a detailed and complete solution to *every* exercise in the text. These portfolios will not be collected or checked, except upon a student’s request; however, they will be an invaluable resource in preparing for quizzes and the final.

Students are NOT required to personally solve every exercise appearing in their portfolios; they are strongly encouraged to collaborate with classmates. However, before accepting a classmate’s solution into their portfolio, students are expected to carefully check it for completeness and correctness.

### Learning Objectives:

Students will master some major theorems of number theory, including the Fundamental Theorem of Arithmetic, Euler’s Theorem, the Chinese Remainder Theorem, and the Law of Quadratic Reciprocity. Students will be able to prove these theorems, and apply them to solve problems.

### Attendance:

Students are expected to attend every class; otherwise, they are personally responsible for copying notes from a classmate. Makeup quizzes are not given under any circumstances.

**Course Structure:**

Each class day will begin with a brief quiz on the previous class day's material. These will be closed book, closed notes. A calculator is required. Solutions will be graded on a 5-10 scale, where 5 denotes a blank paper and 10 denotes a perfect solution. The remainder of the class meeting, on most days, will consist of lecture on new material. Four class days will be devoted to student presentations, the content of which will be assessed on the next day's quiz. The final exam will be open book, open notes.

**IMPORTANT DATES:**

Mon. Feb. 24	Student Presentations
Mon. Apr. 7 (first day after spring break)	Student Presentations
Mon. Apr. 28	Student Presentations
Wed. May 7 (last day of class)	Student Presentations
Fri. May 9, 3:30-5:30pm	Final Exam

**Student Projects:**

Students will break into 8 groups for this purpose. Each group will choose one of the "Applications" sections in the textbook. Each group will make a 30 minute presentation, and also turn in a written report on that section. All group members will receive the same grade. We will schedule the presentations on Monday January 27. Two groups will go each of the four days designated for this purpose; you may not present material before the class has covered the relevant chapter.

**Grading:**

The lowest quiz score will be dropped, to account for emergencies. The 26 remaining quizzes will be worth 2% of the course grade each. The student project will be worth 15% of the course grade. Class participation will be worth 8% of the course grade. The final exam will be worth 25% of the course grade. The minimal grade requirements are as follows:

A	A-	B+	B	B-	C+	C	C-	D+	D	F
92.0	90.0	88.0	82.0	80.0	78.0	72.0	70.0	68.0	62.0	0

**Classmate Contact Info:**