

Mathematics MAT 341 : Number Theory
Spring 2008
MF 12:30 pm - 1:45 pm, Room 114

Instructor: Dr. Brad Emmons

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Course Materials

A Friendly Introduction to Number Theory, 3rd Edition, by Silverman (required)

Introduction

Number Theory is the study of the set of integers $\mathbb{Z} = \{\dots, -2, -1, 0, 1, 2, \dots\}$. Because of the basic nature of the object of study (you have been dealing with them your whole life!), it is a very attractive area of mathematics. We can study Number Theory and understand some of the most challenging open problems in mathematics without devoting a great deal of time to the mechanics. Therein lies one of the fundamental features of Number Theory: Number Theory contains some of the simplest problems to state and the hardest to prove. In this course we will cover some elementary techniques which will help us understand the nature of the natural numbers. These include the Fundamental Theorem of Arithmetic, congruences, primitive roots, and quadratic reciprocity.

As this class meets only twice a week, it is your responsibility to make an effort to look over the material at least 30 minutes every day in addition to the time you spend on course work.

Exams

There will be two in-class exams in this class. The exams will test your ability to work through some of the computations, as well as your ability to apply the techniques to certain applications. The first exam is scheduled for Friday, February 22, the second exam is scheduled for Friday, April 4. All exams will count for 20% percent of your final grade. There will be NO make-ups for missed exams. Please look over your schedule as soon as possible. If you see a potential conflict, inform me immediately.

Homework

The best way to learn Mathematics is to solve problems. In addition to assignments to be turned in, there will also be problems to solve which we will consider "moral assignments". The problems on the moral assignments will not be turned in for a grade; however, you are responsible for the material on these assignments. You will always be given at least a week to work on the assignments to be turned in. But I will expect you to work on the problems before the next class period. You should be comfortable enough with the problems to work on them and discuss them in front of the class. Homework will count for 20% of your final grade.

Quizzes

Every other Friday, starting with February 1, we will have an in-class quiz. There will be a total of 6 quizzes throughout the semester. You should treat the quizzes as mini-exams, covering material from approximately 6 days worth of course work. The quizzes will consists of 4 or 5 problems similar to problems from your graded homework, and they are to make sure that you are keeping up with the concepts presented in class, and to identify where you are having problems before you take the exams. The quizzes will count for 20% of your final grade.

Projects

Number Theory provides easy access to some of the most fascinating areas of mathematics. (Perhaps I betray my bias?) Many of the topics can be studied without very much in the way of technical background. Thus they can be studied independently. The purpose of the projects is to get you to explore a concept relating to Number Theory that we might not ordinarily cover in a course. The projects will count for 20% of your final grade. We will discuss the project more in depth the 2nd or 3rd week of the course.

Attendance

While there is no official attendance policy for MAT 341, I strongly suggest you come to class prepared

every day. If you must miss a class for any particular reason, it is your responsibility to get the notes from another student and to turn in your assignment *before* the class period to earn full credit.

Grading

Your grade in this course will be based on three main factors: homework, projects and exams. The exams will be worth 40% of your final grade, the quizzes 20%, the projects 20%, and the homework 20%. In addition to these factors, minor ethereal factors such attendance, attitude, and improvement over the course of the semester can also affect your grade. To determine your final grade, 90–100% = A, 80–89% = B, 70–79% = C, 60–69% = D, 59 and below = F, with the top two percents receiving a + and the bottom two percents receiving a –.

Important Dates

Friday, February 1 – Quiz I
Friday, February 15 – Quiz II
Friday, February 22 – Exam I
Friday, March 7 – Quiz III
Monday, March 17 - Friday, March 21 – Spring Break
Friday, March 28 – Quiz IV
Friday, April 4 – Exam II
Friday, April 18 – Quiz V
Friday, May 2 – Quiz VI
Friday, May 2 – Presentations
Monday, May 5 – Presentations
Monday, May 12 – Presentations

Suggestions

Come to class with your homework assignment completed every day
Study for at least 30 minutes each day in addition to completing your homework assignment
Read the section we will be covering in class *before* arriving to class
Do not fall behind!
Come to office hours to discuss homework and concepts. I am here to help!

Academic Honesty

Please read the *Utica College Catalog* regarding Intellectual Honesty. Any student caught plagiarizing or cheating in the course will receive an "F for cheating" on their transcript. By submitting work in this course you are asserting that the work and conclusions are your own and not from an outside source. However, I do allow and *encourage* collaboration with other classmates on written assignments in this class.

Special Needs

Any student with a disability requiring special needs should contact both me and Academic Support Services, 315-792-3032 or khenkel@utica.edu. If you will be requiring any accommodations due to your documented learning or physical special need, you should notify me within the first two weeks of class. I will make every effort to accommodate you in a manner which will maintain the integrity of the course and its' content.

Syllabus

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Week 1	January 25	Chapter 2 – Pythagorean Triples
Week 2	January 28 February 1	Chapter 3 – Pythagorean Triples and the Unit Circle Chapter 5 – Divisibility and GCD , Quiz I
Week 3	February 4 February 8	Chapter 6 – Linear Equations and the GCD Chapter 7 – The Fundamental Theorem of Arithmetic
Week 4	February 11 February 15	Chapter 7 – (continued) Chapter 8 – Congruences , Quiz II
Week 5	February 18 February 22	Review Exam I
Week 6	February 25 February 29	Chapter 9 – Congruences, Power, and FLT Chapter 10 – Congruences, Power, and Euler’s Theorem
Week 7	March 3 March 7	Chapter 11 – Euler’s Phi Function and the Chinese Remainder Theorem Chapter 11 – (continued) , Quiz III
Week 8	March 10 March 14	Chapter 12 – Prime Numbers Chapter 13 – Counting Primes
Week 9	March 17 March 21	NO CLASS NO CLASS
Week 10	March 24 March 28	Chapter 14 – Mersenne Primes Chapter 14 – (continued), Quiz IV
Week 11	March 31 April 4	Review Exam II
Week 12	April 7 April 11	Chapter 15 – Mersenne Primes and Perfect Numbers Chapter 16 – Powers Modulo m and Successive Squaring
Week 13	April 14 April 18	Chapter 16 – (continued) Chapter 17 – Computing k th Roots Modulo m , Quiz V
Week 14	April 21 April 25	Chapter 17 – (continued) Chapter 18 – Powers, Roots, and “Unbreakable” Codes
Week 15	April 29 May 2	Chapter 18 – (continued) ** Presentations ** , Quiz VI
Week 16	May 5	** Presentations **
Exam Date	May 12	** Presentations **