

# MATH-4020 Introduction to Number Theory, Spring 2011

**Instructor:** Bruce Piper, Amos Eaton 309, piperb@rpi.edu, 276-6892

**The Course Web Page** will be at <http://www.rpi.edu/~piperb/nt/> Check this for more information and throughout the semester for updates, office hours, etc.

## Texts and Materials

- **Required** *An Introduction to the Theory of Numbers, fifth edition* by Niven, Zuckerman and Montgomery  
Please bring this book to class every class day. This is an older book, but is more complete and better value than some newer books.
- **Recommended** *iClicker*. These are available for purchase at the store in the VCC. Please register the clicker online using your rcsid and bring it to class. Class participation will be extra credit and based on student response to questions using the iClicker system.

**Difficulty Level and Pre-requisites:** This course will require a mathematical maturity and the ability to quickly learn proof techniques, logic, and basic set theory. Students may wish to consider Foundations of Analysis before attempting this course.

**Course Objectives:** Number theory is primarily the study of integers and their properties. We will cover parts of chapters 1-5 in the textbook.

**Learning Outcomes:** Students will demonstrate

- knowledge of the basic definitions and theorems in number theory
- the ability to think and reason about abstract mathematics
- skills at writing mathematical proofs
- knowledge of some the history and context of number theory

**Activities:** On most class days, there will be lecture with iClicker questions. You will need to read the book to complete your understanding and to prepare for the iClicker questions. Class participation through the iClicker system will be worth extra credit.

**Grades:** All of the learning outcomes listed above will be assessed through the following assessments.

- 8 homework assignments worth 50%
- 2 in-class tests worth 30%
- 1 comprehensive Final Exam worth 20%
- iClicker Class preparation worth 5% extra credit

The items above will be combined to form a number score for the course. Letter grades will be achieved as follows: 90% + is an A; 88%-90% is an A-; 85%-88% is a B+; 80%-85% is a B; 78%-80% is a B-; 75%-78% is a C+; 70%-75% is a C; 68%-70% is a C-; 65%-68% is a D+; 60%-65% is a D; 0%-59% is a F.

**Grade Appeals:** Due to the nature of proofs, you will need to make sense logically AND advance the towards the conclusion to get any substantial partial credit. Appeals will be granted only if something has been overlooked. The appeal must be made within one week of the date the item is returned in class. It is important that you KEEP all the returned material for the entire semester as they will be needed for studying for the final exam, and they will be your only method for correcting any recording errors that may accidentally occur on my part.

**Late Policies:** Late homework is usually not accepted without a legitimate excuse. Missing an exam without a legitimate excuse results in a grade of zero and cannot be made up. If you have an excuse, you should contact me as soon as possible and I may ask for verification.

**Academic Integrity:** Student-teacher relationships are built on trust. For example, students must trust that teachers have made appropriate decisions about the structure and content of the courses they teach, and teachers must trust that the assignments that students turn in are their own. Acts, which violate this trust, undermine the educational process. The Rensselaer Handbook of Student Rights and Responsibilities defines various forms of Academic Dishonesty and you should make yourself familiar with these. Exams and tests are to be done individually. You must ask me before you work or get help on the homework with someone other than myself or the TA or another student taking the class this semester. Before working with other students in this class, you must think over the problems on your own. After you have found relevant definitions and theorems and considered several possible approaches to solving a problem, you may work with others in the class. Before you write up your solutions you must separate and rethink and rewrite your assignments alone. You are not allowed to just copy from a shared set of notes. You are not allowed to copy from another's homework or notes.

First violations will result in a grade of F on the material and a report to the Dean of Students. Subsequent offenses will result in failure in the class.

### **Schedule: Due Dates**

Please check the web page for the complete daily schedule:

1. Homework Due Dates: Feb 3, Feb 10, Feb 17, Feb 24, Mar 31, Apr 7, Apr 28, May 5
2. In-Class Exam Dates: Mar 3, Apr 21
3. Final Exam: As scheduled by the registrar.

All students must take the final exam as scheduled by the Registrar. Please make travel plans accordingly.

### **Homework 1: Due Thursday, February 3rd, in class**

The problems below should be done using only the results in section 1.2. That means that you cannot use the result about the unique factorization into prime numbers and get full credit. Please feel free to contact me or the TA during office hours for help with problems 1-7. Problem 8 may possibly be somewhat harder and no hints will be given. Problems such as number 8 will occur on each problem set. If you don't get these problems, you can compensate in your grade by taking advantage of the in-class extra credit.

1. Section 1.2, problem 1b: Write out the calculations as in example 1
2. Section 1.2, problem 2: Write out the calculations as in examples 1,2 and then make a table as in example 3
3. Section 1.2, problem 3c,d: Just make a table as in example 3
4. Section 1.2, problem 20
5. Section 1.2, problem 26
6. Section 1.2, problem 34
7. Section 1.2, problem 43
8. Section 1.2, problem 46 (This may be a bit more challenging. No Hints or help will be given.)