Math 317 - Number Theory

Course Information

Instructor and Course Meeting Information

Instructor: Lola Thompson
E-mail: lola.thompson@oberlin.edu
MWF 3:30-4:20 PM
Location: King 239
Office: King 200
Office Hours:
   M 2:30 - 3:20
   W 4:30 - 6
   F 11 - 12
   *And by appointment.

Course Objectives

By the end of this course, you will be able to:

- Build up the basic theory of the integers from a list of axioms
- Explore some current research problems in number theory
- Write clear, precise mathematical proofs
- Apply your theoretical knowledge to problems in computer security

Course Structure

This course will be taught using an Inquiry-Based Learning (IBL) model. The format will be very different from that of a typical math course. In particular, there will be very few lectures and no assigned reading. A typical class period in Math 317 will consist of working on problems in small groups or presenting solutions at the blackboard in front of your classmates. Rather than being presented with neatly-packaged theorems and proofs, in this course you will be asked to devise your own conjectures and then prove them for yourself!

Textbook

There is no textbook for this course! Students will write their own number theory textbook over the course of the semester... (for more info, see the "Textbook Project" section)

Grades

The grades in this course will be calculated as follows:

	Weight
Class Participation	20%
Homework	25%
Midterm Exam	20%
Textbook Project	15%
Final Exam	20%

Class participation

Class participation is essential in a course of this nature. When you miss class, you are not only affecting your own progress in the course but you are also causing your working group to be short one member. Your class participation grade (worth 20% of your course grade) will be calculated using the following formula:

- Attendance (5 points)
- Group work (10 points)
- Student presentations (5 points)

Attendance: Each student is granted three "unexcused" absences. After that, students will lose 1 class participation point per missed class (up to a maximum of 5). There is no need to e-mail me to explain an unexcused absence. If you have an legitimate academic reason for missing a class (or a prolonged illness), please e-mail me as soon as possible. All "excused" absences must be cleared with me before the start of the missed class period.

Group work: At the end of the semester, each student will be asked to rate their own contributions to the in-class problem solving groups on a scale from 0 to 10. I will also rate your contributions based on my observations over the course of the semester. The two ratings will be averaged together to compute the "group work" score. If the two ratings differ significantly for a particular student (eg. by more than 2 points), I will meet with the student to discuss the source of the discrepancy and come to an agreement on a reasonable "group work" grade.

Student presentations: Each student is expected to regularly present solutions to the problem sets in front of the class. That said, I will always ask for volunteers before calling on students. The "student presentation" grade is intended to provide an incentive to volunteer regularly. The grade will be based solely on how often a student volunteers and not on the correctness of the solutions.

Homework Assignments

Students will work on problem sets in small groups during class on Wednesdays and Fridays. Each Monday, I will ask for volunteers to present a selection of the problems from the previous week's assignments. Homework will be collected at the end of the class period on Mondays (i.e., after the presentations take place). This means that homework must be written up carefully prior to the start of class on Mondays. Each group must turn in *one* copy of their homework for me to grade. You are welcome to add details to your solutions based on what you learn from your classmates' presentations (this will help with the end-of-semester final project). However, I will only grade the work that was completed prior to Monday's class period.

Exams

There will be one midterm exam and one final exam. The midterm exam will have two components: an in-class portion and a take-home portion. The in-class portion will test your ability to solve routine problems and write some basic proofs. The take-home portion will involve a few more-sophisticated proofs. You will be permitted to complete any missed problems from the in-class portion when you work on the take-home portion (for reduced credit). The final exam will only have an in-class portion.

Textbook Project

The final project will involve revising all of your work from over the course of the semester and compiling it into a textbook. Points will be awarded based on a number of criteria, including: mathematical completeness/correctness, clarity of exposition, organization of content.

Guest Lectures

I have arranged for several guest lectures on topics related to our course (including a weeklong visit by the 2014 Oberlin Math Department Distinguished Visitor, Carl Pomerance). These visitors are accomplished mathematicians who are donating their time to share their knowledge with you. It is my expectation that you will choose to attend all of the guests' talks (except in cases where the talk directly conflicts with your other academic obligations). I will make sure to announce all guest lectures at least one week in advance. Please make these talks a priority – they provide a unique opportunity to supplement our course with research-level mathematics.

Blackboard

Copies of the problem sets can be found on the course Blackboard site. Go to
`http://blackboard.oberlin.edu` to access these materials.

Course Policies

Academic Honesty

Homework

Each week, your homework assignment will be to finish and carefully write up solutions to the in-class problem sets. You are welcome to consult with your class notes, your classmates and the instructor. However, you *may not* consult any textbooks or internet resources – otherwise, you run the risk of ruining the surprise of discovering the course content for yourself. Your experience in Math 317 will be much richer (and your intuition for the subject far greater) if you arrive at the solutions without the aid of a book.

You are encouraged to work with your group members outside of class. You are also welcome to form study groups with other students in the course. In any collaborative efforts (outside of working with your group members), you must abide by the following guideline: you may discuss the general problem-solving techniques for homework problems with other students, but you must write up your solutions independently.

Exams

You are not allowed to use any electronic device or consult any source other than the instructor during the in-class portion of the exams. In particular, this means *no calculators, smartphones, regular cellphones, iPods, eReaders, laptops, notes, textbooks, etc.* For the take-home portion of the midterm, you may only use your class notes and your professor as resources (i.e., all other resources, including fellow humans, are off limits). You are on your honor not to talk to another student about an exam until both students have turned them in.

Note: Information about the Honor System at Oberlin can be found at the following website: http://www.oberlin.edu/students/links-life/honorcode.html. Please familiarize yourself with its content. All students are responsible for maintaining the highest standards of honesty and integrity in every phase of their academic careers. The penalties for academic dishonesty are severe and ignorance is not an acceptable defense.

Disabilities

Students in this course with disabilities, including "invisible" disabilities such as chronic diseases and learning disabilities, and who may need disability-related classroom accommodations, are encouraged to make an appointment to see their instructor as soon as possible.

Make-up Policy

Typically, I will not accept late homework, and a missed midterm exam cannot be made up. That said, I understand that some circumstances are beyond your control. Should you contract a serious illness or find yourself in an emergency situation, please contact me *immediately.* I will be happy to make arrangements with you under these types of extreme circumstances.

Religious Observances

Some students may wish to take part in religious observances that occur during this academic term. If you have a religious observance that conflicts with your participation in the course, please meet with me before the end of the second week of the semester to discuss appropriate accommodations.

Important Dates

Add/Drop Deadline	February 12 (Wednesday)
Spring Break!	March 22nd (Saturday) - March 30th (Sunday)
Withdraw and P/NP Deadline	April 7th (Monday)
Classes End	May 9th (Friday)
Reading Period	May 10th (Saturday) - May 13th (Tuesday)
Final Exam	May 16th (Wednesday)

Course Schedule

The following is an estimated schedule for the course. Please note that the midterm exam date is tentative.

Lectures	Brief Description
2/3	Problem Set #0; Present Problem Set #0
2/5	Problem Set #1
2/7	Problem Set #2
2/10	Present Problem Sets #1, 2
2/12	Problem Set #3
2/14	Problem Set #4
2/17	Present Problem Sets #3, 4
2/19	Problem Set #5
2/21	Problem Set #6
2/24	Present Problem Sets #5, 6
2/26	Problem Set #7
2/28	Problem Set #8
3/3	Present Problem Sets #7, 8
3/5	Problem Set #9
3/7	Problem Set #10
3/10	Present Problem Sets #9, 10
3/12	Midterm Exam (in-class portion)
3/14	Problem Set #11; take-home portion of Midterm Exam due
3/17	Present Problem Set #11
3/19	Special Guest Lecture: Carl Pomerance (3:30 - 5 PM)
3/21	Special Guest Lecture: Carl Pomerance (3:30 - 5 PM)
3/22 - 3/30	No Class – Spring Break!
3/31	Problem Set #12
4/2	Problem Set #13
4/4	Problem Set #14
4/7	Present Problem Sets #12, 13, 14
4/9	Problem Set #15
4/11	Problem Set #16
4/14	Present Problem Sets #15, 16
4/16	Problem Set #17
4/18	Problem Set #18
4/21	Present Problem Sets #17, 18
4/23	Problem Set #19
4/25	Problem Set #20
4/28	Present Problem Sets #19, 20
4/30	Problem Set #21
5/2	Problem Set #22
5/5	Present Problem Sets #21, 22
5/7	Special Set #1
5/9	Special Set #2; Textbook Project Due
5/16	**Final Exam (9 AM - 11 AM)**