# Syllabus for Math 4100 <br> Introduction to Number Theory 

## Instructor Information

Instructor
Email
Office
Office hours Mondays, Wednesdays, and Fridays, 12:15pm - 1:15pm.
Other times by appointment.
Course web page http://ccjohnson.org/math4100

## Meeting Times

Class meets every Tuesday and Thursday from $12: 30 \mathrm{pm}$ until $1: 45 \mathrm{pm}$ in Daniel 311. Regular attendance is expected, and students will be responsible for obtaining copies of notes or homeworks in the event of an absence. If the instructor is not present within the first fifteen minuets of class, then class is dismissed.

## Prerequisites

The only formal prerequisite for this course is Math 1080, however Math 3190 is strongly recommended. Students will be expected to have a reasonable amount of mathematical maturity, appreciating the need for proofs of theorems, and a willingness to look up any unfamiliar facts that may be used in class.

## Course Content

We will be using the fourth edition of Joseph Silverman's A Friendly Introduction to Number Theory, ISBN 0321816196. The goal of the class will be to cover the material in the book related to divisibility, congruences, prime numbers, cryptography, quadratic residues \& quadratic reciprocity, primitive roots, continued fractions, and Diophantine approximation.

## Grades

Final letter grades in the course will be assigned according to a traditional 10-point scale based on each student's final numerical average in the course. This final numerical average is the weighted average of two midterms (each contributing to $20 \%$ of the average), one cumulative final exam (contributing to $30 \%$ of the average), and regularly assigned homework ( $30 \%$ of the final average).

## Homework

The only way to learn math is to do math, and for this reason homework will be assigned on a regular basis. Homework in this course will come in two types: traditional written homework, and computerbased assignments which will be completed using the Sage math cloud, http://cloud.sagemath.org. Written homework will be turned in at the start of class, and Sage-based homework will be turned in electronically at midnight on the due date.

## Collaboration Policy

Students may collaborate with one another on homework, but each student is required to turn in their own, independent work for each assignment. Students are responsible for understanding all of the material covered in the homework, and are not permitted to use outside resources (e.g., using notes or homework keys obtained online) unless explicitly approved by the instructor.

## Midterms and final exam

There will be two in-class midterms during the semester. The dates of the midterms will be announced at least one week before the midterm. The final exam will be held on Monday, April 27th from 3:00pm until $5: 30 \mathrm{pm}$. The midterms and the final are cumulative.

## Late homework and make-up exam policies

Late homework will not accepted, and make-up exams will not be given, except under extreme circumstances outside of the student's control (e.g., hospitalization).

## Academic Integrity

As members of the Clemson University community, we have inherited Thomas Green Clemson's vision of this institution as a high seminary of learning. Fundamental to this vision is a mutual commitment to truthfulness, honor, and responsibility, without which we cannot earn the trust and respect of others. Furthermore, we recognize that academic dishonesty detracts from the value of a Clemson degree. Therefore, we shall not tolerate lying, cheating, or stealing in any form.

## Electronic Devices

No electronic devices of any sort (calculators, phones, computers, etc.) are allowed during exams. You are not allowed to use your phone to check the time during an exam! The instructor will periodically inform students of how much time is left during an exam.

## Disability Access

It is university policy to provide, on a flexible and individualized basis, reasonable accommodations to students who have disabilities. Students are encouraged to contact Student Disability Services to discuss their individual needs for accommodation.

## Inclement Weather Policy

In the event that class is cancelled due to inclement weather on the day of an exam, the exam will be given during the next class period. Any written homework due when class is cancelled will be taken up at the start of the next class period. Computer-based assignments completed with Sage will still be due on their original due dates even if class is cancelled.

## Learning Outcomes

By the end of the course, students will be able to do the following:

- Apply basic proof techniques to prove simple number theoretic statements.
- Solve linear congruences and systems of linear congruences with the Chinese remainder theorem.
- Implement number theoretic algorithms on a computer, including the RSA cryptosystem.
- Use the law of quadratic reciprocity to determine if a quadratic equation, modulo a prime, has any solutions.
- Compute the best Diophantine approximations of a real number using that number's continued fraction expansion.

