Hunter College
Spring 2019
Math 313/623: Theory of Numbers 3 hrs, 3 cr.
Tu Th 4:10pm-5:25pm, Hunter East 921
Instructor: David Meretzky
Email: dm594@hunter.cuny.edu
Office Hours: Th 3-4pm Dolciani Math Learning Center (7th floor library)

REQUIRED TEXTS: *Disquisitiones Arithmeticae*, by Carl Gauss, translated by Arthur Clarke
A Classical Introduction to Modern Number Theory, by Kenneth Ireland and Michael Rosen
Elementary Number Theory and its applications, by Kenneth H. Rosen

Course Discription: Number Theory is one of the oldest areas of Mathematics. It is also one of the most active research areas in modern Mathematics. This class will develop Number Theory simultaneously from classical and modern perspectives. The subject was intensively studied in the ancient world and in 1798 a young German Mathematician named Carl Fredrich Gauss consolidated, distilled, and extended the state of the art into the text we will be using, the *Disquisitiones Arithmeticae*. Gauss's was so careful and brilliant that this text is still the state of the art as an introduction to the subject. The translation by Arthur Clarke is from the 80s and is supremely clear and readable. I will provide additional notes which supplement the text with examples and connect it to the modern text *A Classical Introduction to Modern Number Theory*.

We will for the most part be following the *Disquisitiones Arithmeticae*. Each class I will assign reading for the next class. All students are expected to read both the text and my notes pretaining to that section of text. Classes where we discuss the *Disquisitiones Arithmeticae* will be held in a round table discussion format. Two students will be randomly selected at the begining of class to mediate and guide the discussion. This will include reading aloud the articles from that week's portion of the text. Class participation and attendence will count heavily in your grade.
Periodically we will have classes in the usual lecture format where we discuss the modern texts.

Prerequisites: Linear Algebra, Math 260. Some experience with Abstract Algebra (Math 311) will go a long way. If you have not taken Abstract Algebra it would be a good idea to read independently about groups and rings. I suggest Charles Pinter's classic and readable introduction *A book of Abstract Algebra*.

Homework: I will assign exercises in the notes and during class. Homework will not be collected but the problems will indicate what exam problems will be like.

Exams: There will be two midterms and a final exam. The final will be cumulative. The final time will be announced later in the course. On an exam, one might be asked to state definitions, state and prove theorems, and solve problems similar to the homework.

Attendance: Attendance is mandatory. If you do miss a class due to an emergency, you should get the notes and topics discussed from a classmate and **you must email me**. Attendance will be taken for record keeping. You will have three excused absences. Each additional absence will result in the deduction of a half letter grade from your final grade.

Grading Policy: Participation is 30%. This includes both participation when you are called as a mediator (20%) and participation when you are not the mediator (10%). There will be a rubric for your participation as a mediator. There will be two midterms and a final exam. The final exam will count as two exam grades. Thus there are 4 total exam grades. The lowest will be dropped. So the remaining 70% is split evenly among the three exam grades.

Tentative Class Schedule until the second exam:

Class	Date	Format	Topic	Source	Section
Class 1	01/29	Lecture	Syllabus and Congruences	Gauss and Notes 1	Section 1 Article 1
Class 2	01/31	Discussion	Congruences	Gauss and Notes 1	Section 1 Articles 1-4
Class 3	02/05	Discussion	Congruences	Gauss and Notes 1	Section 1 Articles 5-12
Class 4	02/07	Discussion	Prime Factors	Gauss and Notes 2	Section 2 Articles 13-16
	02/12	College Closed	College Closed	College Closed	College Closed
Class 5	02/14	Lecture	Unique Factorization	Ireland and Rosen and Notes 2	Chapter 1 Section 1
Class 6	02/19	Discussion	Prime Factors	Gauss and Notes 3	Section 2 Articles 17-25
Class 7	02/21	Lecture	Rings	Notes 3	Pages 4-7
Class 7	02/21	Lecture	Rings	Notes 3	Pages 4-7
Class 8	02/26	Lecture	Unique Factorization in k[x]	Ireland and Rosen and Notes 4	Chapter 1 Section 2
Class 9	02/28	Midterm 1			
Class 10	03/05	Lecture	Unique Factorization in k[x]	Ireland and Rosen and Notes 4	Chapter 1 Section 2
Class 11	03/07	Lecture	Möbius Inversion	Ireland and Rosen and Notes 6	Chapter 2 Section 1 and 2
Class 12	03/12	Lecture	Euler ϕ function	Ireland and Rosen and Notes 6	Chapter 2 Section 1 and 2
Class 13	03/14	Lecture	π-day Analytic Number Theory	Ireland and Rosen	Chapter 2 Section 3 and 4
Class 14	03/19	Discussion	Groups and the Group of Units	Notes 5	Notes 5
Class 15	03/21	Lecture	CRT and RSA Encryption	RSA Encryption Notes	RSA Encryption Notes
Class 16	03/26	Discussion	Euler ϕ, group of units, CRT	Gauss, I + R, Notes	Sources given in Notes 7
Class 17	03/28	Midterm 2			