MATH 7230: Analytic Number Theory
Spring 2018

Lectures: Lockett 111, TTh 10:30 – 11:50

Professor: Karl Mahlburg	**Office:** Lockett 320
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Website All important course information, including lecture information, homework assignments, and other announcements will be found on the course website. Most announcements will also be sent by e-mail. Please check frequently!

Textbook Hugh Montgomery and Robert Vaughan, *Multiplicative Number Theory I. Classical Theory*, Cambridge Studies in Advanced Mathematics **97**, Cambridge University Press, 2007.

We will cover material from Chapters 1 – 9 of Montgomery and Vaughana's book. You will also be provided with a significant amount of supplemental reading sources.

Content This course is an introduction to analytic number theory, the goal of which is to determine precise estimates for arithmetic functions and primes. We will cover classical and modern results, with a particular focus on recent advances in sieve methods (with applications to prime gaps).

Topics will include basic properties of primes and arithmetic functions; combinatorial techniques, including lattice point counting; basic analytic techniques, including Dirichlet series and generating functions; more advanced analytic techniques, including Mellin transforms and Poisson summation; Dirichlet characters and arithmetic progressions; sieve methods, including the Selberg sieve, and applications to prime gaps; the Riemann zeta function and the Prime Number Theorem; asymptotic methods, including Euler-MacLaurin summation and the Method of Steepest Descent.

Prerequisites You must have completed MATH 7210: Algebra I and an undergraduate course in Elementary Number Theory (MATH 4181 or equivalent). You will also need familiarity with Complex Analysis at the undergraduate level (ideally, you will have taken MATH 4036 or equivalent).

Schedule Due to University holidays, class will **not** be held on Tuesday, Feb. 13; Tuesday, Mar. 27; or Thursday, Mar. 29. If you are unable to attend the regularly held office hours, you may also schedule an appointment.

Homework Your grade will be based on weekly homework assignments. Regular attendance and participation during lectures is also expected.

Homework assignments will be due on most Thursdays throughout the semester. There will be approximately 8–10 assignments, containing a total of at least **40** problems. Your course grade will be determined on a scale of **20** problems, with your total grade determined by the number of problems that you have completed satisfactorily:

Grade	Homework Problems completed
A+/A/A-	18 – 20
B+/B/B-	16 – 18
C+/C/C-	14 – 16
D+/D/D-	12 – 14
F	Less than 12

You will therefore have the choice to work on the problems that interest you the most. However, in order to ensure that you make steady progress throughout the semester, you are required to submit **at least one** problem from each assignment in order to receive credit. If you skip an assignment, your grade may be lowered by one step on the plus/minus scale.

Group Work You are allowed, and even encouraged to work in small groups on homework assignments, subject to the following conditions:

1. You must list the names of all of the other students with whom you discussed the problems at the top of your assignment;
2. You must write up your own solutions using your own words and arguments.

Conduct LSU students are expected to maintain high standards of academic integrity. Any incidences of suspected cheating on exams and quizzes will be reported directly to the Judicial Affairs Division in the Dean of Students Office; offenses can result in loss of course credit or expulsion from the university. Instances of direct copying on homework assignments will result in loss of credit for **both** students involved.

Scientific calculators and touchscreen or stylus computers are allowed *solely* for note-taking. Cell phones, MP3 players, and all other electronic devices are not allowed in the classroom at any time.