MTHSC 952 Syllabus
Spring Semester 2013

Time: 10:10 - 11:00 ; M,W,F.
Location: E-5 Martin Hall.
Instructor: Kevin James
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1 Office Hours:

Office hours are by appointment. Please email me for an appointment.

2 Required Text

"Problems in Analytic Number Theory" by M. Ram Murty

3 Course Description

The theory of Fourier analysis and complex analysis are essential to modern number theory. This course focuses on applications of this theory to number theory such as the proof of the prime number theorem and the connection of complex L-series to the distribution of primes and to arithmetic geometry.

4 Goals and Objectives

Students will develop a fundamental understanding of various analytic techniques and their application to number theory. More precisely students will gain the following.

1. Solid understanding of arithmetic and multiplicative functions.
2. Ability to give estimates on the growth rate and average growth rate of arithmetic functions.
3. Familiarity with basic summation techniques and their applications to estimates on arithmetic functions.
4. Understanding of Dirichlet L-series and their connection to estimating the number of primes in arithmetic progressions

5. Familiarity with concepts from Fourier analysis and their applications in number theory, especially the proof of the prime number theorem.
6. Understanding of contour integration in complex analysis and applications to number theory which gives a second proof of the prime number theorem
7. Familiarity with zero-free regions of L-series and their connection with number theory, especially the Riemann hypothesis
8. Understanding of basic sieve methods.

5 Course Contents

- Mobius Inversion (2 hours)
- Formal Dirichlet Series (1 hour)
- Orders and Average orders of arithmetic functions (3 hours)
- Partial Summation (2 hour)
- Euler-Maclaurin summation (2 hour)
- Characters and Dirichlet's Theorem on primes in arithmetic progressions (2 hours)
- Dirichlet's hyperbola method (2 hours)
- Fourier Analysis in number theory and the Riemann zeta function (4 hours)
- A first proof of the prime number theorem (1 hour)
- Contour Integration in number theory (4 hours)
- A second proof of the Prime Number Theorem (1 hour)
- Riemann hypothesis (1 hour)
- Poisson Summation formula (2 hour)
- Functional equation for the Riemann zeta function and other L-functions (4 hours)
- Hadamard Products and zero free regions for L-functions (6 hours)
- Sieve Methods (6 hours)
- Total = 44 hours

6 Time Requirements

Please be sure to devote at least six hours per week outside of class to this course.

7 Grading Policies

The grading in this class will be as follows:

Homework	35%
Notes (in LaTeX)	35%
Class Presentation	30%

Homework and notes will be completed as a class. Each student will evaluate their fellow students' contributions to the homework and notes. These evaluations will be considered in determining each student's grade for the notes and homework. The following grading scale will be used:

A	90-100
B	80-99
C	70-79
D	60-69
F	<60

8 Attendance Policy

You are expected to be regular and punctual in your class attendance. You are expected to be in your seat at the beginning of the period and to remain through the period until dismissed.

If the instructor is late, the class should begin a review of homework problems. After 25 minutes, the class may leave.

9 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.