Course Information
Instructor: Dr. Thái Hoàng Lê.
Office: Hume Hall 337.
Office hours: MT 1:00-2:00pm, F 10:00-11:00am, or by appointment.
Email: leth@olemiss.edu.
Time/Place: MW, 10:00am - 11:15am, Hume Hall 321.

Course Description
Fourier analysis is a general philosophy that permeates most of mathematics as well as other sciences (e.g. physics, engineering, computer science). Roughly speaking, the Fourier transform decomposes a function as a sum (or integral) of simpler functions, which allows us to approximate the given function by simpler functions. In this course, we will study the interplay between Fourier analysis and analytic number theory, in particular additive number theory. In additive number theory one seeks to express a given number as a sum of numbers from a given set. For example, Waring’s problem deals with how to express an integer as a sum of $k$-th powers, while in Goldbach’s problem one wants to write a given number as as a sum of primes. Topics to be covered (tentatively) are:

- Basics of Fourier analysis.
- Topics in additive number theory such as Waring’s problem, Vinogradov’s 3-prime theorem, Vinogradov’s mean value theorem.
- Topics in combinatorial number theory such as Roth’s theorem, Sárközy’s theorem.
- Other topics in analytic number theory such as Diophantine inequalities, equidistribution and discrepancy, extremal functions in Fourier analysis and applications, the large sieve inequality and applications.

Prerequisites

- Basics of real analysis.
- Basics of number theory such as divisibility, prime numbers.
- Basics of abstract algebra such as vector spaces, groups, rings and fields.
- Familiarity with complex numbers (knowledge of complex analysis is useful, but not required).
1. First of all, **you shouldn't worry about grades.** If I see that you spend some nontrivial effort on the course then you should pass. (On the other hand, if you spend minimal effort, then that's a different story.) I will try to make the course interactive and beneficial to everyone, and everyone will learn something new regardless of their background.

2. Regardless, understanding only comes with practice and you will have homework assigned weekly. Homework assignments are posted on Blackboard. While grades are not important, it is extremely important that you spend sufficient time thinking about the problems. I will grade your homework, though only some of the problems will be graded. We will spend a significant amount of time working on the problems and you are expected to present solutions on the blackboard. It is strongly recommended that you write up your solutions in LaTeX, since this is a useful skill that you have to learn sooner or later.

3. Besides homework, at the end of the course you will present some topic to the class in the style of a seminar talk. The list of topics will be posted later.

4. Your final grade is determined by homework (40%), class participation (40%, including solution presentation) and topic presentation (20%). There are no exams.