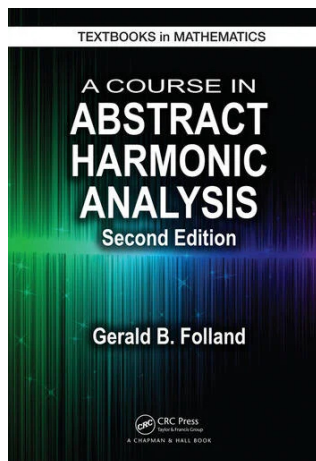


Math 992: Locally Compact Groups

Lecture: Mondays and Thursdays 12:40 - 1:50 pm in A104 Wells Hall.

Instructor: Brent Nelson (brent@math.msu.edu). Office hours in D215 Wells Hall on Thursdays 2:00 - 3:00 pm and by appointment.

Textbook: Though **not** required, we will follow the material in the book: Gerald B. Folland, *A Course in Abstract Harmonic Analysis*, Chapman & Hall, 2nd Edition. Lecture notes will be posted regularly that can substitute for the book.



Course Description: The real numbers are frequently used as an elementary example in topology, group theory, and analysis, and viewed simultaneously through these various lenses they are also an elementary example of a locally compact group. These groups have a rich and beautiful theory that draws from these three areas of mathematics and appears in many others (e.g. ergodic theory or operator algebras).

This course will begin with a study of topological groups, where we will see how the group structure enhances its topological regularity. Analysis will enter the picture when we show the existence of a pair of measures on every locally compact group that are invariant under left and right multiplication, respectively, which are called Haar measures. These measures will prove to be a crucial tool for studying locally compact groups and will be featured heavily in the course. In order to explore the representation theory of these groups, we will take a brief detour into functional analysis to cover the spectral theorem and C^* -algebras. Finally, for locally compact abelian groups we will show the existence of the dual group, define the Fourier transform, and prove the Pontryagin Duality Theorem. This material corresponds to Chapters 1-4 in the textbook. Prerequisites include MTH 818 (Algebra I), 828 (Real Analysis), and 869 (Topology).

In-Class Tone: My aim is to foster an open and inclusive atmosphere in class. Therefore questions, participation, collaboration, and curiosity are strongly encouraged. Math can be hard, especially when we aren't honest with ourselves about whether or not we understand something. Confusion is not a sign of weakness, nor is asking for help. If you need help beyond class time and office hours, please do not hesitate to contact me so that we can work out additional times to meet.

Grading: Course grades will be determined by attendance of and participation in lectures.