Math 5052-Spring 2018

Measure theory and functional analysis II

General information

Location: Cupples II L001
Time: MWF 9-10am
Professor: Greg Knese
Office location: Cupples I room 211A
Office hours: to be announced
Email: geknese at wustl dot edu

Course description

Official description of 5051:

An introductory graduate level course including the theory of integration in abstract and Euclidean spaces, and an introduction to the basic ideas of functional analysis. Math 5051-5052 form the basis for the Ph.D. qualifying exam in analysis. Math 4111 and 4171, or permission of the instructor.

Official description of 5052:

Continuation of Math 5051. Topological groups and Haar measure. Topological spaces. Hahn-Banach theorem. Weak topologies. The closed graph theorem. The Banach--Steinhaus theorem. Locally convex spaces and the Krein--Milman theorem. Measures on locally compact spaces. Prerequisite: Math 5051.

Likely description:

Finish up measure theory topics, a little more Hilbert space, fundamental Banach space theorems, locally convex spaces, duality and Krein-Milman. If we have time we'll get into Banach Algebras and Spectral theory. (It is unlikely we will do topological groups and Haar measure.)

Textbook

A course in abstract analysis by John B. Conway published by the AMS

Exams

The midterm exam is in class March 5, 2018. We may adjust the time so that you have longer than an hour on the exam.

The final exam date will be announced. I will assume you want to take the three hour qualifying exam which covers 5051-52 evenly unless you opt to simply take a two hour final covering 5052. Math/Stats Ph.D. students should take the 3 hour exam. I

recommend that undergraduates considering graduate school in math to take the 3 hour exam.

Homework

There will be weekly homework assignments. These should be written up clearly and in detail preferably typed using LaTeX. You may discuss the homework verbally with other students provided you have already given the homework a serious attempt. If you have already solved a problem and someone asks you about it, then any help you provide should consist of hints or suggestions and never complete solutions.

In particular, homework should be written up independently and it should not be possible to tell who worked with whom. Do not search or post requests for solutions to HW. Do not post any course materials online without my permission.

Grade breakdown

Homework: 40%
Midterm exam: 20%
Final exam: 40%

Letter grade breakdown: A+=(97,100], A=(93,97], A-=[90,93], similar for B,C,D, F=[0,60).

Course plan

Completion of chapter 4, then chapters 5-8. More chapters if we have time.

Supplementary References

Real analysis Modern techniques and their applications, by Folland
Real and complex analysis by Rudin
Real analysis: measure theory, integration, and Hilbert spaces by Shakarchi and Stein
Functional analysis: an introduction to further topics in analysis by Shakarchi and Stein
A course in functional analysis by John B. Conway