

MATH 9101 - SEMINAR IN ANALYSIS: ERGODIC THEORY - SPRING 2019

Instructor: Jesse Peterson

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Office: SC 1414

Office Hours:

Fridays 12:40pm - 3:10pm

Or by appointment

Prerequisites: No background in ergodic theory is required, but familiarity with real and functional analysis will be assumed.

Course resources: Class notes will be provided. In addition, the following textbooks are all excellent introductory texts.

Eli Glasner. Ergodic Theory via Joinings. American Mathematical Society, Providence, RI, 2003.

David Kerr and Hanfeng Li. Ergodic theory, Independence and Dichotomies. Springer-Verlag, New York, 2016

Karl Petersen. Ergodic Theory. Cambridge University Press, Cambridge, 1989.

Peter Walters. An Introduction to Ergodic Theory. Springer-Verlag, New York, 2000.

Description:

This will be a course on dynamical systems and ergodic theory of abstract groups, with an emphasis towards ergodic theory, and focusing on connections to functional analysis. The first part of the course will consist of general concepts of group actions. Topics will include:

- Von Neumann's and Birkoff's Ergodic Theorems
- Bernoulli shift actions
- (Weak) mixing actions
- (Weakly) Compact actions
- (Stable) Spectral gap
- Actions on homogeneous spaces
- Boundary actions

The latter part of the course will focus on applications of the above ideas. Based on class interest, 3-4 topics will be chosen from the following list:

- Furstenberg's Multiple Recurrence Theorem and Szemerédi's Theorem on arithmetic progressions
- Simplicity and unique trace for reduced group C^* -algebras
- An introduction to measured group theory
- Bi-exact groups, properly proximal groups, and their von Neumann algebras
- Local spectral gap
- Character rigidity, invariant random subgroups, and Margulis' Normal Subgroup Theorem
- Margulis' Superrigidity Theorem and Zimmer's Cocycle Superrigidity Theorem
- Popa's Cocycle Superrigidity Theorem
- Ioana's Cocycle Superrigidity Theorem

Grades:

Grades will be based on class attendance/participation and assignments.

Make-up policy:

There will be no make-up assignments. The attendance and make-up policy will follow the guidelines set forth by the College of Arts and Sciences.

Academic integrity:

You will all be held to the standards set forth in the Student Handbook.