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# Ergodic Theory 1

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## Instructor and Class Information

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Lecturer:	Course Num.:
Office:	Lecture Room:
Phone:	Lecture Times:
Email:	Office Hours:

## About Course Goals

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### FORMAT

The course will meet three times a week for 55 minutes each meeting. Instruction will be mainly by lecture delivered by the instructor. It may also include occasional in-class discussions as well as short student presentations, particularly, by post-candidacy students.

### DESCRIPTION & GOALS

This course sequence is aimed at providing students with a solid working knowledge in the basic concepts, important techniques and examples in Ergodic Theory, and constitutes a natural continuation of the Math 6211-6212 sequences in Real Analysis. The course should be of interest to all students with research interests in various flavors of Ergodic Theory and dynamical systems, and its applications to study problems in Combinatorics, Number theory, Homegeneous Dynamics, Differential equations, Probability theory etc.

### PREREQUISITES

This section is open only to mathematics post-candidacy students and requires, in addition, the permission of the instructor.

## Textbook

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### MAIN REFERENCE

Peter Walters, *"An Introduction to Ergodic theory"*. Graduate Texts in Mathematics **79**, Springer 2000, ISBN-13: 978-0387951522.

### ADDITIONAL REFERENCES

Karl E. Petersen, *"Ergodic Theory"*. Cambridge Studies in Advanced Mathematics **2**, Cambridge University Press 1990, ISBN-13: 978-0521389976.

M. Einsiedler and T. Ward: *"Ergodic theory: with a view towards Number Theory"*. Graduate Texts in Mathematics **259**, Springer 2010, ISBN-13: 978-0857290205.

## Assessments

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### READING, PARTICIPATION, AND ATTENDANCE

Students are required to read scheduled textbook materials and actively participate in class room discussions that arise from lecture material. Students are expected to attend all classes.

## RESEARCH ORIENTED PRESENTATION

Post-candidacy students in this section are required to deliver a half hour presentation that both synthesizes lecture material and connects it to relevant research questions, more advanced theoretical topics, or applications in other fields of mathematics. The topic and required independent reading will be determined by the instructor individually in negotiation with the student. Presentations may also be replaced by respective research papers upon the request of the student.

## Grading

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### COURSE GRADE

The grades for this course section are "satisfactory" (S) or "unsatisfactory" (U). A satisfactory outcome requires continued active participation in class (weighed about 20%) and is further based on the student's performance during the presentation (weighed about 80%).

## Weekly Schedule

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Week 1	Review of $\sigma$ -algebras, measure theory, function spaces, Spectral theorem etc.
Week 2	Measure preserving transformations, Recurrence, Variety of examples
Week 3	Basic constructions, Ergodicity criteria, Verification techniques in examples
Week 4	The Ergodic theorems –Maximal ergodic theorem, Pointwise ergodic theorem, Mean Ergodic Theorem
Week 5	Applications of ergodic theorems and examples
Week 6	Mixing and weak mixing criteria, Verification techniques, and Examples
Week 7	Isomorphism, conjugacy, spectral isomorphism, discrete spectrum
Week 8	Basics of Entropy theory
Week 9	Methods of calculating entropy and examples
Week 10	Topological Dynamics
Week 11	Invariant measures for Continuous transformations
Week 12	Topological Entropy and Information, Calculation of topological entropy
Week 13	The variational principle, Entropy of affine transformation,
Week 14	Miscellaneous topics

## General Policies

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### ACADEMIC MISCONDUCT

It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct ([http://studentaffairs.osu.edu/info\\_for\\_students/csc.asp](http://studentaffairs.osu.edu/info_for_students/csc.asp)).

**DISABILITY SERVICES**

Students with disabilities that have been certified by the Office for Disability Services will be appropriately accommodated and should inform the instructor as soon as possible of their needs. The Office for Disability Services is located in 150 Pomerene Hall, 1760 Neil Avenue; telephone 292-3307, TDD 292-0901; <http://www.ods.ohio-state.edu/>.