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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

Math 6211 (or equivalent strong background in Real Analysis)

## 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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### HOMEWORK ASSIGNMENTS

There will be approximately 6 homework assignment sheets, which will typically contain several fully described problems as well as a list of numbers of textbook problems. Due dates of assignments will announced and set typically a week after the assignments are published

**FINAL PROJECT**

The final project is a more extensive written assignment that will draw on techniques acquired throughout the semester. It will be published about two weeks before the end of classes and will be due at the beginning of finals week.

**CLASS PARTICIPATION AND ATTENDANCE**

Although attendance is not regularly monitored frequent absences are likely to be noted and may factor into the grade in borderline cases.

**Grading****COURSE SCORE**

A course score will be computed from the above assessments. Homework assignments will count 70% towards the grade and the final project 30%.

**LETTER GRADES**

Letter grades will be determined based on the course score. The approximate minimum scores for letter grades are 80% for an "A", 73% for an "A-", 67% for a "B+", 55% for a "B-", and 40% for a "C-". The exact cut-off scores may vary depending on the difficulty of assignments.

**Weekly Schedule**

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****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/>.