

Ergodic Theory:  
Spring 21

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Lecture Notes

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2020

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## Ergodic Theory: Spring 21

**Course Numbers:** MTG6402

**Time and Location:** on-line, asynchronous except for the mandatory in-person session (see below)

**Office Hours** 3:00 Wednesday drop-in office hours via zoom. Zoom address on course Canvas page. Other zoom meetings by appointment.

**Course Description:** The year-long Dynamical Systems and Ergodic Theory will be offered in the academic year Fall 2020-Spring 2021. The two parts may be taken separately. The Spring term will focus mainly on Ergodic Theory which is the measure theoretic/statistical branch of dynamics.

The course material, broadly speaking, studies the time-evolution from topological/analytical and/or statistical/measure theory points of view. These areas constitute an active research area on their own and have applications in a wide range of subjects including biomath, number theory, numerical analysis, logic and physics. Topics for the Spring term will include: Measure preserving transformations, Poincare Recurrence Theorem, ergodicity and the Ergodic Theorems, mixing, metric and topological entropy, invariant measures for continuous maps, Hamiltonian dynamics, spaces of invariant measures, and unique ergodicity.

**Mandatory Physical Presence Component:** As of now, the course is scheduled to be mostly on-line, but the course will have a mandatory physical presence component: which will be at least one in-person problem session which is required for all students.

**Course Materials:** Lectures will be posted on youtube with a link on my home pages. Pdf versions of the lectures will be posted on my home page. HW will be available as pdf files through Canvas under the "Files tab" and should be turned in as a **single** pdf file in "Assignments" in Canvas.

**Prerequisites:** MAA 5228-9 or comparable introduction to metric spaces and measures. However, MTG 5317 and MAA 6617 are also in the system and apparently can't be easily removed. If you have trouble registering because of the false prerequisites, let me know and I will have Margaret add you manually.

**Resources:** Most of the course will be based on lecture notes. The following are useful resources

- For the Spring: *An Introduction to Ergodic Theory* by Walters and *Introduction to Dynamical Systems* by Brin and Stuck;
- For the Fall: *Introduction to Dynamical Systems* by Brin and Stuck; *A First Course in Dynamics: with a Panorama of Recent Developments* by Katok and Hasselblatt, *Dynamical Systems: Stability, Symbolic Dynamics, and Chaos* by C. Robinson.
- In general: More elementary: *An Introduction to Chaotic Dynamical Systems* by Devaney. More advanced: *Introduction to the Modern Theory of Dynamical Systems* by Katok and Hasselblatt

**Homework:** Homework will be assigned very other week on a Friday and due the next Friday by 5:00pm, so there will be about 6 total assignments. All homework is due by submission to Canvas 5:00 PM. The homework will foster mastery over the material covered in class in the previous two weeks. You may turn in the homework by the next Monday for 2/3 credit. No submissions will be accepted after that.

**Honor Code and Collaboration:** In this course authorized aid on projects and hw consists of talking to me, other students, and looking at the notes for this course. This means that you are not allowed to look on-line, in other books for solutions to the hw, or at the written solutions of other students. You can collaborate with fellow students but must write up solutions individually.

**Exam or Final Project:** There will be two options for evaluation at the end of the course. You may choose to take a Final Exam (recommended for people who plan to take the Dynamical Systems and Ergodic Theory PhD exam) or a final project concerning dynamics in your chosen field of research. Project can be a 3-5 page report or a video lecture.

**Grades:** The HW's are 75% of the grade and the Final project/Exam is 25%. The grade ranges for the total scores are 93-100% A, 90-92% A-, 88-89% B+, 83-87% B, 80-82% B-, 78-79% C+, 73-77% C, 70-72% C-, 60-69% D, <60% F.

**Announcements:** You are responsible for all announcements made in class which could include changes in exam dates and material covered.

**Excused Absences:** In certain circumstances a student will be able to make up a missed exam or late hw. These circumstances could include medical situations, family emergencies, travel for University activities (eg. band, debating club, etc), and religious observances. In these cases the student must inform me before or within one week after the missed work and **provide written documentation**.

**Grading Disputes:** Any issues or questions about the grading of hw must be brought to my attention within one week after the exams or homework are returned to the class

**Diversity Statement:** I am committed to diversity and inclusion of all students in this course. I acknowledge, respect, and value the diverse nature, background and perspective of students and believe that it furthers academic achievements. It is my intent to present materials and activities that are respectful of diversity: race, color, creed, gender, gender identity, sexual orientation, age, religious status, national origin, ethnicity, disability, socioeconomic status, and any other distinguishing qualities.

**Statement on on-line class recording:** Our class sessions may be audio visually recorded for students in the class to refer back and for enrolled students who are unable to attend live. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the “chat” feature, which allows students to type questions and comments live. The chat will not be recorded or shared. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.

### Additional Information:

**Grades:** Grading will be in accord with the UF policy stated at <https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>.

**Honor Code:** “UF students are bound by The Honor Pledge which states, “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: “On my honor, I have neither given nor received unauthorized aid in doing this assignment.” The [Honor Code](#) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.”

**Class Attendance:** “Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies that can be found at: <https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>.”

**Accommodations for Students with Disabilities:** “Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center by visiting <https://disability.ufl.edu/students/get-started/>. It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.”

**Online Evaluations:** “Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students/>. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.”

**Contact information for the Counseling and Wellness Center:**

<https://counseling.ufl.edu/>, 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

**U Matter, We Care:** If you or someone you know is in distress, please contact [umatter@ufl.edu](mailto:umatter@ufl.edu), 352-392-1575, or visit [umatter.ufl.edu/](http://umatter.ufl.edu/) to refer or report a concern and a team member will reach out to the student in distress.



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