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Department of Mathematics

College *of* Liberal Arts *and* Sciences

MAA 6617 Spring 2025

Analysis I
Course number 18710 Section 0101 Spring 2025

Instructor

Scott McCullough

Course Content and Objectives

This year long course treats the fundamentals of measure and integration theory, including Lp spaces and the Radon-Nikodym theorem; and an introduction to functional analysis, including Banach spaces, Hilbert spaces, and the theory of linear operators. Other topics that may be included (depending on time and interest) are harmonic analysis and the Fourier transform, the theory of distributions, the spectral theorem, and an introduction to probability.

Text. *Measure, Integration & Real Analysis* by Sheldon Axler. Text is freely available. There is also a modestly priced print version.

Reference *Real Analysis: Modern Techniques and Their Applications* by Gerald B. Folland

Suggested Problems

Selected problems from the text and the course notes (available through canvas) will be assigned on a daily basis.

Homework

Homework problems, selected to complement each students interests and course of study, will be assigned, collected, and graded.

Grading

Course grades will be based on participation and homework.

See the current UF policy on assigning grade points.

Attendance

Attendance is recommended.

Additional Information:

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

Academic Honesty. The course will be conducted in accordance with the University honor code and academic honesty policy, which can be found in the student guide

Accommodation for students with disabilities. Accommodations for Students with Disabilities: “Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, https://www.dso.ufl.edu/drc/) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.”

Online Evaluations. “Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at https://evaluations.ufl.edu. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at https://evaluations.ufl.edu/results/.”

Contact information for the Counseling and Wellness Center. https://www.counseling.ufl.edu/; 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Tentative weekly schedule

Fall term

Week 1: sigma-algebras.
Week 2: measures, outer-measures and the Caratheodory extension theorem.
Week 3: Lebesgue measure.
Week 4. Premeasures and the Hahn-Kolmogorov Extension Theorem.
Week 5. Lebesgue-Stiltjes measures
Week 6. Measurable functions.
Week 7. Integration of simple and measurable unsigned functions.
Week 8. Integration of signed functions.
Week 9. Convergence theorems.
Week 10 and 11. Product measure.
Week 12. Lebesgue differentiation and the Hardy-Littlewood maximal function.
Week 13. Normed vector spaces.
Week 14. Thanksgiving.
Week 15. Normed vector spaces.

Spring term

Week 1 and 2. Linear Functionals and Hahn-Banach.
Week 3 and 4. Consequences of Baire's Thoerem: The principle of Uniform boundedness; open mapping; closed graph; and Banach isomorphism.
Week 5 and 6. Lp spaces
Week 7, 8 and 9. Hilbert space.
Week 10. Signed measures and the Lebesgue-Radon-Nikodym Theorem.
Week 11. Spring break.
Week 12, 13, 14. Fourier Analysis.
Week 15. A brief introduction to probability.
Week 16. Optional topic(s).