

Lectures	<i>Tuesdays & Thursdays</i> from 11:00–13:00 (room to be announced)
Instructor	Fatih Ecevit <i>Office</i> TB-210 <i>Office Hours</i> ... by appointment <i>E-mail</i> fatih.ecevit@boun.edu.tr <i>Url</i> http://web.boun.edu.tr/fatih.ecevit
Textbook	Folland: <i>Real Analysis: Modern Techniques & Their Applications</i> , 2 nd ed., Wiley, 1999.
Contents	We will mainly cover chapters 0, 1, 2, 3 of the text. Please see the next page for more detail.
References	Cohn: <i>Measure Theory</i> , 1994. Friedman: <i>Foundations of Modern Analysis</i> , 1982. Halmos: <i>Measure Theory</i> , 1978. Kolmogorov & Fomin: <i>Introductory Real Analysis</i> , 1975. Royden: <i>Real Analysis</i> , 1988. Rudin: <i>Real and Complex Analysis</i> , 1986. Stein & Shakarchi: <i>Real Analysis: Measure Theory, Integration, and Hilbert Sp.</i> , 2005. Wheeden & Zygmund: <i>Measure and Integral: An Int. to Real Analysis</i> , 1977.
Homeworks	There will be several homework assignments throughout the semester. Late homeworks will not be accepted.
Exams	There will be one midterm exam , and one final exam . Make-up exams will almost never be given, and only for cases of extreme personal tragedy. There will be no E-exam .
Assessment	<i>Homeworks</i> 30% <i>Midterm</i> 30% <i>Final</i> 40%
Class Website	http://web.boun.edu.tr/fatih.ecevit/Fall109Math531.html Announcements regarding the course and any supplementary material will be posted on the course web-page. You are strongly encouraged to check the class website frequently to get updated information such as new problem sets, exam dates etc.

CONTENTS

1. Preliminaries

- 1.1 Sets and mappings
- 1.2 Axiom of choice
- 1.3 Extended real number system $\overline{\mathbb{R}}$
- 1.4 Metric spaces (a short review)

2. Measure

- 2.1 Algebras & σ -algebras
- 2.2 Measures & outer measures
- 2.3 Construction of measures
- 2.4 Borel measures on \mathbb{R}

3. Measurable Functions and Integration

- 3.1 Measurable functions & their properties
- 3.2 Construction of integral
- 3.3 Integration of non-negative functions: Monotone convergence theorem, Fatou's lemma
- 3.4 Integration of complex functions & the space L^1 : Dominated convergence theorem
- 3.5 Riemann integral vs. Lebesgue integral

4. Modes of Convergence

- 4.1 Almost everywhere convergence
- 4.2 Almost uniform convergence: Egoroff's theorem
- 4.3 Convergence in measure
- 4.4 Convergence in norm

5. Product Measures

- 5.1 Integration with respect to a product measure
- 5.2 Fubini-Tonelli theorem
- 5.3 The n -dimensional Lebesgue integral
- 5.4 Integration in polar coordinates

6. Signed & Complex Measures

- 6.1 Hahn decomposition theorem
- 6.2 Singular measures: Jordan decomposition theorem
- 6.3 Absolutely continuous measures: Radon-Nikodym theorem
- 6.4 Lebesgue decomposition: Lebesgue-Radon-Nikodym theorem
- 6.5 Lebesgue-Radon-Nikodym theorem for complex measures

7. Differentiation

- 7.1 Hardy-Littlewood maximal function: The Maximal theorem
- 7.2 Lebesgue set of a function in L^1_{loc} : Lebesgue differentiation theorem
- 7.3 Differentiation of monotone functions
- 7.4 Functions of bounded variation
- 7.5 Absolutely continuous functions