Course control number: 54393
Instructor: Michael Christ, 809 Evans Hall, mchrist@berkeley.edu, 642-2143.
Office hours: M 10:30-11:30 and T 10-11.
Course reader/assistant: Thanh Vu, vqthanh@berkeley.edu, 1042 Evans Hall.
Assistant’s office hours: T 1-2, F 11-12.
Course meets: MWF 9:10-10:00 in 70 Evans Hall
Prerequisite: Math 202A or equivalent.
Final exam: Monday May 12, 7-10 PM, location TBA.
Midterm exam: Monday March 10, 9-10 AM in 70 Evans.
Other texts for supplementary/alternative reading: Real Analysis by H. Royden; Real and Complex Analysis by W. Rudin; Functional Analysis by W. Rudin; Real Analysis by E. M. Stein and R. Shakarchi; Real Analysis by A. Knapp.

Topics: This semester’s course focuses on Lebesgue integration in spaces more general than \( \mathbb{R}^1 \) and on an introduction to functional analysis, with a bit of Fourier series. Topology is a tool and provides a conceptual basis, but is not the primary object of study.

Products of measure spaces, and Fubini’s theorem. Lebesgue measure on \( \mathbb{R}^d \) for \( d > 1 \). Riesz representation theorems for \( C_0(X) \) and \( C_c(X) \). Hilbert spaces. Banach spaces; dual spaces. Subspaces; Hahn-Banach Theorem. Weak and weak-star topologies; Banach-Alaoglu theorem. Baire category theorem. Applications of Baire’s theorem to functional analysis: Uniform boundedness principle, Closed graph theorem, Open mapping theorem. Fourier series and the Riesz-Fischer theorem. Applications of applications of Baire’s theorem.

As time permits: Convexity and the Krein-Milman theorem. Compact and Fredholm linear operators. Lightning introduction to probability. Introduction to distributions.

Required work: Readings from the text, weekly problem sets, one midterm exam, final exam.
Grading: Midterm exam 15%, problem sets 40%, final exam 45%. The grading scale will be based on the graduate level system.

This is a graduate course. Not all details will be treated in class; comprehensiveness may sometimes be sacrificed for the sake of clarity. Students are expected to study the text, and are responsible for the content of assigned readings.

- Problem sets will be assigned most weeks and will ordinarily be due on Wednesday mornings in class. Only selected problems will be graded each week.
- The course teaching assistant’s office hours are a resource for advice concerning problem sets.
- Course web page: http://math.berkeley.edu/~mchrist/Math202B/202Bcoursepage.html. Problem sets and any other course materials will be posted on this page. Bookmark!
- I am investigating adoption of bcourses. Course materials may migrate to a bcourses site.