Math 231A Course Plan

1/27  Introduction

Chapter 1: Measure theory

2/1   Preliminaries (1)
2/3   Exterior measure (2)
2/8   Measurable sets and the Lebesgue measure (3)
2/10  Borel sets and non-measurable set
2/15  No class
2/17  Measurable functions (4)
2/22  Littlewood's three principles (4.3). Brunn-Minkowski inequality (5, no proof).

Chapter 2: Integration theory

2/24  Lebesgue integral (1)
3/1   Lebesgue integral continued
3/3   The space of integrable functions (2)

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3/8   Fubini's theorem (3.1)
3/10  Applications of Fubini's theorem (3.2)
3/15  Review and exercises

Chapter 3: Differentiation and integration

3/17  Differentiation of the integral. The Hardy-L. maximal function (1.1)
3/22  Lebesgue's differentiation theorem (1.2)
3/24  Good kernels and approximations to the identity (2)

3/29-4/2:  Spring break

4/5   Review. Differentiability of functions. Functions of bounded variation (3.1)
4/7   Func. of bounded variation continued. The Cantor-Lebesgue function (3.2)
4/12  Absolutely continuous functions (3.2)
4/14  Differentiability of jump functions (3.3)

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4/19  Rectifiable curves and the isoperimetric inequality (4).

Chapter 4: Hilbert spaces: an introduction
4/21 Hilbert space \( L^2 \) (1)
4/26 Hilbert spaces (2).
4/28 Fourier series and Fatou's theorem (3)
5/3 Linear transformations (5)
5/4 Compact operators (6)
5/10 No class
5/12 The Fourier transform on \( L^2 \) (Chapter 5, 1)
5/17 Abstract measure and integration theory (Chapter 6, summary)