PRELIMINARY EXAM TOPICS.

Abstract and Lebesgue integration.

(i) The concept of measurability

(ii) Simple functions, elementary properties of measures, regularity properties of Borel measures, Lusin's theorem, Egorov's theorem.

(iii) Riesz representation theorem

Differentiation of measures and integration on product spaces.

(i) Absolute continuity and the Radon-Nikodym theorem.

(ii) Product measures and Fubini theorem

L^p spaces

(i) Holder's and Youngs inequalities, Relation between L^p spaces on finite and sigma-finite measure spaces.

(ii) Convex functions

Hilbert space theory.

(i) Inner products, linear functionals, orthonormal sets and orthogonal decomposition. Bessel/Parseval theorem.

(ii) Trigonometric series

Elementary Banach space techniques.

(i) Banach spaces, Baire's theorem and consequences, bounded linear functionals on L^p

(ii) Fourier series

(iii) Hahn Banach theorem

Fourier transforms.

(i) L^1 theory of Fourier transform. The inversion theorem and Plancherel theorem

(ii) Convolution

NOTE: Metric space theory, as in Math 4331 (Introduction to Real Analysis), is assumed knowledge for the preliminary exam.

References

Real Analysis: Modern Techniques and their Applications, Gerald B. Folland, John Wiley and Sons.

Real Variables, A. Torchinsky, Addison Wesley.

Real and Complex Analysis, W. Rudin, 3rd Edition, McGraw Hill.

Measure and Integral: An Introduction to Real Analysis, Wheeden and Zygmund, Pure and Applied Mathematics.

Lebesgue Integration on Euclidean Space, Frank Jones, Jones and Bartlett.

Real Analysis, H. L. Royden, McMillan and Co.

Principles of Mathematical Analysis, W. Rudin, 3rd Edition, McGraw Hill.

Modern Real Analysis, Gariepy and Ziemer, PWS publishing.