Measure Theory and Probability

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At its heart, measure theory outlines the principles behind assigning quantities to sets. This makes it one of the cornerstones of modern mathematics, with direct application to the theory of integration, probability theory and analysis.

This is an introductory course, outlining the basic tools, concepts and results of the subject. In particular this includes null sets, the Cantor Set, outer measure, measurable sets and Lebesgue measure, sigma-fields, measurable functions, Lebesgue integration, Fatou's Lemma, Monotone and Dominated Convergence Theorems and the Beppo-Levi Theorem. The relation to Probability Theory and Riemann Integration will also be highlighted during the course and the existence of non-measurable sets demonstrated. Extra topics may possibly include the Radon-Nikodym Theorem, Riemann-Lebesgue Lemma and convergence of random variables.

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Capi*nski, M., & Kopp, P. E. (2004). Measure, integral and probability: Vol. Springer undergraduate mathematics series (2nd ed). Springer.

Rudin, W. (1987). Real and complex analysis: Vol. McGraw-Hill series in higher mathematics (3rd ed). McGraw-Hill.

Tao, T. (n.d.). An introduction to measure theory: Vol. Graduate studies in mathematics. American Mathematical Society.