



Calendar Description: Probability spaces, integration, expected value, laws of large numbers, weak convergence, characteristic functions, central limit theorems, limit theorems in R^d , conditional expectation, introduction to martingales

Prerequisites: Statistics [321](#) or Mathematics 321, and Mathematics 353 or [367](#) or [381](#).

Textbook: *Probability: Theory and Examples*, 4th edition, Rick Durrett, Cambridge University Press, Cambridge, England, 2010.

(see Course Descriptions under the year applicable: <http://www.ucalgary.ca/pubs/calendar/>)

Syllabus

<u>Topics</u>	<u>Number of hours</u>
Measure theory foundations: Axioms of probability, random variables; Integration with respect to a measure, properties of the integral; Expected value, inequalities, monotone and dominated convergence theorems, computing integrals; Product Measures, Fubini's theorem	9
Limits and Laws of Large Numbers: Independence, distribution and expectation; Sums of independent random variables; Convergence in probability, L^2 convergence, triangular arrays, truncation; Almost-sure convergence, Borel-Cantelli lemmas; Strong law of large numbers	11
Central Limit Theorems: Weak convergence, examples and theory,; Characteristic functions, inversion formula, weak convergence, moments and derivatives; Central limit theorems, iid sequences, triangular arrays; Limit theorems in R^d	9
Conditional Expectations and Martingales: Conditional expectation, definition, examples, properties; Filtrations, martingales, almost sure convergence	5

TOTAL HOURS

34

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Date: April 2014

Creator: MB/rs