UNIVERSITY OF CALGARY

FACULTY OF SCIENCE
Department of Mathematics and Statistics

Applied Mathematics 581 / 681 Stochastic Calculus for Finance

(see Course Descriptions for the applicable academic year: http://www.ucalgary.ca/pubs/calendar/)

Syllabus

Topics	**Time**
Introduction: basics of probability, stochastic processes and math finance	1
Conditional expectation, martingales in discrete and continuous times, examples	2
Discrete-time (B,S0-security markets: capital, portfolio, arbitrage, completeness, self-financing, risk-neutral valuation and measure, options, Cox-Ross-Rubinstein option pricing formula	3
Brownian motion: definition and properties, quadratic variation, Markov property, reflection principle and application to first passage time distribution	6
Stochastic calculus: Ito integral, Ito processes, Ito formula, integration by parts formula, multivariable stochastic calculus, stochastic differential equations, examples	8
Continuous-time (B,S)-security markets: equivalent probability measures and the Girsanov Theorem; financial capital, self-financing portfolios, arbitrage, market completeness; risk-neutral valuation and measure, first and second fundamental theorems of asset pricing, applications to option pricing, Block-Scholes-Merton formulas	8
Stopping times, American options	1
Stochastic interest rates and their derivatives	2
Stochastic models in energy and commodity markets, derivatives	2
Value-At-Risk and risk management	2
Poisson processes, jump diffusions and applications to finance	1
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