

SPRING 2019 - ACMA 850 G200

**ACTUARIAL SCIENCE: SELECTED TOPICS (4)**  
**Applied Probability Model***Class Number: 8498 Delivery Method: In Person***COURSE TIMES + LOCATION:**

Tu, Th 10:30 AM – 11:20 AM

AQ 5025, Burnaby

**INSTRUCTOR:**

Jean-Francois Begin

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## Description

**COURSE DETAILS:**

This course is divided into fourteen chapters. The three last chapters will be covered if time allows.

Chapter 1, Probabilistic Foundations : Sample Space, Random Variable, Probability Measure, Distribution, Sigma-Algebra, Measurable Space, Probability Triple.

Chapter 2, Stochastic Processes : Stochastic Process, Filtration, Stopping Time.

Chapter 3, Expectations : Independence, Conditional Probability, Expectation, Moments, Conditional Expectation.

Chapter 4, Martingales : Definition, Examples, Stopped Process, Optional Stopping Theorem, Markov Process.

Chapter 5, Introduction to Discrete-Time Market Models : Price Processes, Measurable Space, Arbitrage, Pricing, Two-Period Generalization.

Chapter 6, Advanced Discrete-Time Market Models : Price Systems and Martingale Measures, Self-Financing Strategy and Arbitrage, Arbitrage and Martingale Measures, Attainable Claims and Price Uniqueness, Admissible Strategy and Martingales, Relationship Between Replication and Pricing, Risk-Neutral and Martingale Measures, Market Completeness.

Chapter 7, Convergence : Metric Spaces, Almost Sure Convergence, Convergence in Probability, Convergence in Mean, Convergence in Distribution

Chapter 8, Brownian Motion : Normal Distribution Review, Scaled Random Walks, Brownian Motion, Construction of the Brownian Motion.

Chapter 9, Stochastic Integral : Riemann Integration, Ito Integration.

Chapter 10, Stochastic Differential Equations and Ito's Lemma : Ordinary Differential Equations, Ito's Lemma, Product Rule, Multidimensional Ito's Lemma, Solutions of Stochastic Differential Equations.

Chapter 11, Girsanov's Theorem and Change of Measures : Change of Measure, Radon-Nikodym Theorem, Girsanov's Theorem, Multidimensional Girsanov's Theorem.

Chapter 12, Replication Strategies and Martingale Representation Theorem : Self-Financial Strategies, Martingale Representation Theorem, Asset Replication.

Chapter 13, Introduction to Jump Processes : Poisson Process, Compound Poisson Process, Jump Processes and Their Integrals, Stochastic Calculus for Jump Processes, Asset Driven by a Jump Model.

Chapter 14, Simulation : Exact Methods, Discretization, Market Models.

## Grading

In-Class Activities	20%
Midterm Exam	40%
Final Exam	40%

**NOTES:**

***Above grading is subject to change.***

## Materials

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**RECOMMENDED READING:**

Hull, J. C. (2015). Options, Futures, and Other Derivatives, 9th ed. Pearson.

Lyaso, A. (2017). Stochastic Methods in Asset Pricing. The MIT Press.

McDonald, R. L. (2015). Derivatives Markets, 3rd ed. Pearson.

Shreve, S. (2004). Stochastic Calculus for Finance I : The Binomial Asset pricing Model. Springer Science & Business Media.

Shreve, S. (2004). Stochastic Calculus for Finance II : Continuous-Time Models. Springer Science & Business Media.

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**GRADUATE STUDIES NOTES:**

Important dates and deadlines for graduate students are found here: [http://www.sfu.ca/dean-gradstudies/current/important\\_dates/guidelines.html](http://www.sfu.ca/dean-gradstudies/current/important_dates/guidelines.html). The deadline to drop a course with a 100% refund is the end of week 2. The deadline to drop with no notation on your transcript is the end of week 3.

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**REGISTRAR NOTES:**

SFU's Academic Integrity web site <http://www.sfu.ca/students/academicintegrity.html> is filled with information on what is meant by academic dishonesty, where you can find resources to help with your studies and the consequences of cheating. Check out the site for more information and videos that help explain the issues in plain English.

Each student is responsible for his or her conduct as it affects the University community. Academic dishonesty, in whatever form, is ultimately destructive of the values of the University. Furthermore, it is unfair and discouraging to the majority of students who pursue their studies honestly. Scholarly integrity is required of all members of the University. <http://www.sfu.ca/policies/gazette/student/s10-01.html>

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