Department of Mathematics & Statistics
Concordia University

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MACF 491 (MAST 679/MAST 881), Sec. D
Topics in Mathematics & Computational Finance
Topic: *Stochastic Calculus & Finance*
Winter 2016

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Instructor: Dr. J. Ortmann, Office: LB 1041-22 (SGW), Phone: 514-848-2424, Ext. 5466
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Office Hours: TBA

Class Schedule: Monday and Wednesday, 16:15-17:30, location TBC.

Texts: *Stochastic Calculus for Finance II: Continuous-Time Models,* by Steven Shreve, Springer Finance Textbook.

Outline: This course is an introduction to stochastic calculus and its applications to mathematical finance. On the mathematical side we will cover a solid foundation in stochastic integration theory. We will see how this can be applied to asset pricing. Topics covered include:

- Probability: integration, convergence theorems, the Radon-Nikodym derivative, conditional expectation, filtrations, martingales
- Brownian motion: martingale and Markov property, path-wise behavior
- The Ito integral. Ito's formula.
- Girsanov's theorem, Levy's theorem and the martingale representation theorem
- Black-Scholes equation. Pricing European options. Put-call parity.
- SPDEs, the Markov property and Feynman-Kac representation
- The risk-neutral measure.
- Multimarket models, Fundamental theorems of asset pricing
- Interest rate model. Asian options.
- Knock-out and look-back options
- Jump models

Evaluation: The course mark will be determined by problem sheets, a mid-term and a final exam. The average will be weighted as follows:
- Problem sheets: 20%
- Midterm: 35%
- Final exam: 45%