

**MACF 402 (MAST 729/881), Sec. A**  
Mathematical & Computational Finance II  
*Fall 2021*

**Instructor:** Dr. F. Godin, Office: LB 921-05 (SGW), Phone: (514) 848-2424, Ext. 3494  
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**Office Hours:** Tuesdays, 10:30-11:30 and Thursdays, 15:00-16:00.

**Class Schedule:** Tuesdays and Thursdays, 16:15-17:30. Regular in-class teaching.

**Text:** **There is no required text. Lecture notes, slides and exercises are self-containing.**

**Outline:** This course focuses on computational aspects, implementation, continuous-time models, and advanced topics in Mathematical and Computational Finance. Multiple assignment problems will require programming in R. We shall cover the following topics:

- Elements of advanced probability theory;
- Brownian motion and stochastic calculus;
- Continuous-time finance and the Black-Scholes model;
- Monte-Carlo simulation methods for option valuation, variance reduction techniques;
- Partial Differential Equation (PDE) valuation methods: heat equation, numerical solution;
- Volatility: historical volatility, implied volatility surfaces and stylized facts, non-Gaussian option pricing models;
- Risk management, risk measures, Greek letters, hedging;
- American options valuation (PDEs, simulation & regression, dynamic programming);
- Interest rate models;
- Other topics (time permitting).

**Course Evaluation:** **Undergraduates:** Assignments (40%), Midterm Examination (20%), and the Final Examination (40%).  
**Graduates:** Assignments (20%), Midterm Examination (20%), the Final Examination (40%) and a Project (20%).

If the grading scheme for this course includes graded assignments, a reasonable and representative subset of each assignment may be graded. Students will not be told in advance which subset of the assigned problems will be marked and should therefore attempt all assigned problems.

### **Academic Integrity and the Academic Code of Conduct**

This course is governed by Concordia University's policies on Academic Integrity and the Academic Code of Conduct as set forth in the Undergraduate Calendar and the Graduate Calendar. Students are expected to familiarize themselves with these policies and conduct themselves accordingly. "Concordia University has several resources available to students to better understand and uphold academic integrity. Concordia's website on academic integrity can be found at the following address, which also includes links to each Faculty and the School of Graduate Studies: [concordia.ca/students/academic-integrity](http://concordia.ca/students/academic-integrity)." [Undergraduate Calendar, Sec 17.10.2]

### **Behaviour**

All individuals participating in courses are expected to be professional and constructive throughout the course, including in their communications.

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### **Extraordinary circumstances**

In the event of extraordinary circumstances and pursuant to the [Academic Regulations](#) the University may modify the delivery, content, structure, forum, location and/or evaluation scheme. In the event of such extraordinary circumstances, students will be informed of the change.