

## MATH 605: Stochastic Calculus

### *Fall 2018 Graduate Course Syllabus*

**NJIT Academic Integrity Code:** All Students should be aware that the Department of Mathematical Sciences takes the University Code on Academic Integrity at NJIT very seriously and enforces it strictly. This means that there must not be any forms of plagiarism, i.e., copying of homework, class projects, or lab assignments, or any form of cheating in quizzes and exams. Under the University Code on Academic Integrity, students are obligated to report any such activities to the Instructor.

### COURSE INFORMATION

**Course Description:** This course provides an introduction to stochastic calculus. Topics include conditioning, Poisson processes, martingales, Brownian motion, Ito integrals, Ito's formula, stochastic differential equations, Feynman-Kac formula, Girsanov's theorem, and the martingale representation theorem. Financial applications include pricing, hedging, and interest rate models.

**Number of Credits:** 3

**Prerequisites:** Prior coursework in probability and differential equations as well as departmental approval.

**Course-Section and Instructors**

Course-Section	Instructor
Math 605-101	Professor D. Horntrop

**Office Hours for All Math Instructors:** [Fall 2018 Office Hours and Emails](#)

**Required Textbooks:**

<b>Title</b>	<i>Stochastic Calculus for Finance II: Continuous Time Models</i>
<b>Author</b>	Shreve
<b>Edition</b>	1st
<b>Publisher</b>	Springer
<b>ISBN #</b>	0387401010
<b>Notes</b>	<ul style="list-style-type: none"> <li>• C. Gardiner, <i>Handbook of Stochastic Methods for Physics, Chemistry, and the Natural Sciences</i>, Springer, 2004.</li> <li>• M. Grigoriu, <i>Stochastic Calculus: Applications in Science and Engineering</i>, Birkhauser, 2002.</li> <li>• J. Steele, <i>Stochastic Calculus and Financial Applications</i>, Springer, 2001.</li> </ul>

ExtraInfo

**University-wide Withdrawal Date:** The last day to withdraw with a W is **Monday, November 12, 2018**. It will be

strictly enforced.

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## POLICIES

**DMS Course Policies:** All DMS students must familiarize themselves with, and adhere to, the **Department of Mathematical Sciences Course Policies**, in addition to official **university-wide policies**. DMS takes these policies very seriously and enforces them strictly.

**Grading Policy:** The final grade in this course will be determined as follows:

Homework, Quizzes, and Projects	30%
Midterm Exam	35%
Final Exam	35%

**Attendance Policy:** Attendance at all classes will be recorded and is **mandatory**. Please make sure you read and fully understand the **Math Department's Attendance Policy**. This policy will be strictly enforced. Attendance at and participation in all lectures is expected. If you know in advance that you will be absent from class for a legitimate reason, please tell me prior to your absence so that appropriate arrangements (if any) can be made. Tardiness to class is very disruptive of the classroom environment and should be avoided.

**Homework Policy:** Homework assignments/projects will be given frequently. Each assignment must be turned in at the *beginning* of class. Late assignments are **NOT** accepted. Early assignments are always welcomed and are appropriate for preplanned absences from class. As a standing assignment, you should read the relevant sections of the textbook prior to lecture.

**Quiz Policy:** From time to time, quizzes may be given. Make up quizzes are **NOT** given.

**Exams:** There will be a midterm examination and a final examination. The midterm examination will occur before the "drop" deadline. The final examination date, time, and location will be determined by the university.

Midterm Exam	TBA
Final Exam Period	December 15 - 21, 2018

The final exam will test your knowledge of all the course material taught in the entire course. Make sure you read and fully understand the **Math Department's Examination Policy**. This policy will be strictly enforced.

**Makeup Exam Policy:** To properly report your absence from a midterm or final exam, please review and follow the required steps under the DMS Examination Policy found here:

- [http://math.njit.edu/students/policies\\_exam.php](http://math.njit.edu/students/policies_exam.php)

**Cellular Phones:** All cellular phones and other electronic devices must be switched off during all class times.

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## ADDITIONAL RESOURCES

**Accommodation of Disabilities:** Disability Support Services (DSS) offers long term and temporary accommodations for undergraduate, graduate and visiting students at NJIT.

If you are in need of accommodations due to a disability please contact Chantonette Lyles, Associate Director of Disability Support Services at **973-596-5417** or via email at [lyles@njit.edu](mailto:lyles@njit.edu). The office is located in Fenster Hall, Room 260. A Letter of Accommodation Eligibility from the Disability Support Services office authorizing your accommodations will be required.

For further information regarding self identification, the submission of medical documentation and additional support services provided please visit the Disability Support Services (DSS) website at:

- <http://www5.njit.edu/studentsuccess/disability-support-services/>

**Important Dates** (See: [Fall 2018 Academic Calendar](#), [Registrar](#))

Date	Day	Event
September 4, 2018	T	First Day of Classes
September 10, 2018	M	Last Day to Add/Drop Classes
November 12, 2018	M	Last Day to Withdraw
November 20, 2018	T	Thursday Classes Meet
November 21, 2018	W	Friday Classes Meet
November 22 - 25, 2018	R - Su	Thanksgiving Recess
December 12, 2018	W	Last Day of Classes
December 13 & 14, 2018	R & F	Reading Days
December 15 - 21, 2018	Sa - F	Final Exam Period

## Course Outline

Week	Course Topics
1	<ul style="list-style-type: none"> <li>• Review of Conditioning</li> </ul>
2	
3	<ul style="list-style-type: none"> <li>• Martingales</li> <li>• Brownian Motion</li> <li>• Ito Integrals</li> <li>• Ito's Formula</li> </ul>
4	
5	
6	<ul style="list-style-type: none"> <li>• Stochastic Differential Equations</li> </ul>
7	
8	<ul style="list-style-type: none"> <li>• Girsanov's Theorem</li> <li>• Martingale Representation Theorem</li> <li>• Feynman-Kac Formula</li> </ul>
9	
10	
11	<ul style="list-style-type: none"> <li>• Applications to Pricing and Interest Rate Models</li> </ul>
12	
13	
14	
15	
<b>FINALS</b>	<b>FINAL EXAM WEEK: DECEMBER 15 - 21, 2018</b>