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21-881: Advanced Stochastic Calculus-II Spring 2009

Course Description and General Information

I. GENERAL INFORMATION

Instructor	Kavita Ramanan
Office	Wean Hall 6204
Phone	412 268 8485
E-mail	kramanan@math.cmu.edu
Office hours	3:30–4:30 p.m. Tuesday
Time and venue	MW 3:30–4:50 Porter Hall A20A
Course website	www.math.cmu.edu/users/kramanan/teaching/scalc.html

Modifications in the Schedule.

There will be no class on Jan 26, Jan 28 (and possibly March 25)

There will be extra classes on the *Fridays* of Jan 23, Jan 30, Apr 10 or 17

Extra Classes will be held in Doherty Hall, 4303, 3:30–4:50 p.m.

II. COURSE DESCRIPTION

Objective. Advanced Stochastic Calculus-II is a course on the theory of stochastic processes, with a special emphasis on continuous processes, and their applications to analyze real-world phenomena.

Prerequisites. Basic measure theory, probability and real analysis, the theory of continuous-time martingales, basic properties of Brownian motion, stochastic integration, including Ito's formula, Tanaka's formula, local time.

Syllabus. The course will cover the following topics.

1. Representations of continuous-time martingales
2. Girsanov's theorem
3. Stochastic differential equations, martingale problems
4. Connections between Markov processes and PDEs
5. Optimal stopping and applications
6. Stochastic control and applications
7. Filtering and applications
8. Other topics, from one of ergodicity of diffusions, Poisson random measures, multiple Ito integrals, jump Markov processes and large deviations

Text and Reference books. *Brownian Motion and Stochastic Calculus* by Karatzas and Shreve (for topics 1–4)

Stochastic Differential Equations by Oksendal (for topics 5–7)

Additional handouts and supplementary reading will be provided as required

Exams and Grading.

- Mid-term exam (to be held Wednesday, March 4th, 3:30–5:00) - 30 %
- Final exam (to be held on Wednesday, May 6, 1:00–4:00) – 45 %
- Homework assignments – 10%
- Two Sets of Class Presentations (first set March 18, March 30, April 6; next set April 27+29) – 15 %

General Remarks. Homework assignments (with the corresponding due dates) will be put up on the website approximately once a fortnight. Due dates will be strictly adhered to – in particular, late homeworks will not be corrected.

Students are encouraged to come to office hours to clarify doubts. Feedback on any other aspect of the class is also always welcome.
