# MATH 7245 SYLLABUS
## FALL 2008

**Course Number:**   Math 7245

**Course Title:**   Stochastic Processes and Stochastic Calculus II

**Lecture Time:**   TTh 12:05–13:25PM

**Lecture Room:**   Skiles 170

**Instructor:**   Dr. Yuri Bakhtin
Office: Skiles 267
Office Phone: 404-894-9235
Email: *bakhtin@math.gatech.edu*
Office hours: by appointment

**Course Web Page:**   *http://www.math.gatech.edu/~bakhtin/2008-fall-7245.html*

**Contacting me:**   The best way to contact me is by email.

**Prerequisite:**   Math 7244 (Stochastic Processes and Stochastic Calculus I)

**Brief Description:**   An introduction to continuous-time martingales, Markov processes, stochastic calculus and stochastic differential equations.

**Book:**   The official textbook is [KS]:*I.Karatzas, S.E.Shreve: Brownian Motion and Stochastic Calculus, 2nd edition.* Among other useful books are: *L.Koralov,Ya.Sinai Theory of probability and random processes* and *B.Oksendal, Stochastic Differential equations.*

**Material that will be covered:**
- CHAPTER 3 OF [KS]: Stochastic integration with respect to a continuous local martingale. The martingale characterization of the Wiener process. Representations of continuous martingales via the Wiener process. Girsanov's theorem. Local time.

- CHAPTER 4 OF [KS]: Probabilistic approach to PDEs including the Dirichlet equation, Poisson equation, heat equation. The Feynman–Kac formula. Introduction to nonlinear PDEs.

- CHAPTER 5 OF [KS]: Stochastic differential equations: strong and weak solutions. Related PDEs. Martingale problems.

- ADDITIONAL MATERIAL: If time allows I will also talk about ergodic theory of stochastic differential equations.

**Honor code:** All students are expected to comply with the Georgia Tech Honor Code. Any violations of the Georgia Tech Honor Code will be submitted directly to the Dean of Students. The Georgia Tech Honor Code is available at

`http://www.deanofstudents.gatech.edu/integrity/policies/honor_code.php`

**Grading:** There will be 4 homework assignments (each one is worth 15%, which amounts to total of 60%), and the final exam (40%).

Letter grades will be based on the accumulated points according to the standard 90%, 80%, 70%, 60% cutoffs: A: 90–100, B: 80–89, C: 70–79, D: 60–69, F: 0–59.

At the end of the course I shall evaluate the class distribution and decide if a curve is needed which may result only in lowering the above cutoffs.

**Homework:** Homework assignments will be given approximately once every four weeks, and will usually be due one week after they are handed out. All homework assignments will appear online at the URL given above. Since [KS] contains a lot of problems with answers, a substantial fraction of the homework problems will not be graded. So, each assignment will contain two lists of problems:

A. Problems to be graded (selected from the book or made up by myself).

B. Other problems from the book that will not be graded.

It is strongly recommended to solve problems from list B before reading the solutions given in the book.

You are allowed to work together with other students on the homework as long as you each independently write up your own solution. You are encouraged to ask me questions.

Please staple the homework and print your name on the front page of each assignment you submit. All homework is due by 5pm on the due date or it will be considered to be late and will not be accepted.

**Final exam:** You are required to write a report on a paper related to the material of the course and give a 50 minute presentation of the paper. I will post the list of papers online by November, 1. You must let me know the topic you choose by November, 10. No two students are allowed to write their reports on the same paper. So, the papers will be distributed on first-come-first-serve basis. You are encouraged to ask questions on the papers and submit drafts of your reports. The reports are due by December 8, and we shall choose the presentation dates and times in November or December. These dates and times will be chosen carefully to avoid conflicts with other classes and exams.

**Some special dates:** There will be no class on October, 14 (Recess) and November, 27 (Thanksgiving). October, 10 is the Drop Day.