Syllabus: MA 529 Stochastic Processes, Spring 2015

Instructor: Zhongqiang Zhang
Office: 302A Stratton Hall   Phone: 508-831-4936 (X4936)
Email: zzhang7@wpi.edu   `http://users.wpi.edu/~zzhang7/`
Office hours: Monday 2:00-4:00pm and by appointment

Teaching assistant: Weijie Pang
Office: 204 Stratton Hall   Email: wpang@wpi.edu
Office hours: Wednesday 1:00-3:00pm at SH 002 (tutor center) and by appointment

Class meetings: Tuesday 5:30-8:20pm SH 304
Conferences: Thursday 1:00-3:00pm (SH 106 in C term and SH 202 in D term)

Required textbook
Hui-Hsiung Kuo, *Introduction to Stochastic Integration*. Springer Universitext, Springer-Verlag, Berlin. 2006

Other References
Jean Jacod and Philip Protter, *Probability Essentials*. Springer-Verlag, Berlin. 2nd edition 2004
David Williams, *Probability with Martingales*. Cambridge University Press, Cambridge. 1991
Bernt Øksendal, *Stochastic Differential Equations*. Springer-Verlag, Berlin. 6th edition 2010

Course description
This course is designed to introduce students to continuous-time stochastic processes. Stochastic processes play a central role in a wide range of applications from signal processing to finance and also offer an alternative novel viewpoint to several areas of mathematical analysis, such as partial differential equations and potential theory. The main topics for this course are martingales, maximal inequalities and applications, optimal stopping and martingale convergence theorems, the strong Markov property, stochastic integration, Ito's formula and applications, martingale representation theorems, Girsanov's theorem and applications, and an introduction to stochastic differential equations, the Feynman-Kac formula, and connections to partial differential equations. Optional topics (at the instructor's discretion) include Markov processes and Poisson-and jump-processes. (Prerequisite: MA 528. Measure-Theoretic Probability Theory, which can be taken concurrently (or, with special permission by the instructor, MA 540)).

Course outline:
Topic 1: Martingales
Topic 2: Markov processes
Topic 3: Brownian motion
Topic 4: Stochastic integration, Itô's formula
Topic 5: Stochastic differential equations and numerical methods
Topic 6: Change of measure: Radon-Nikodým and Girsanov theorems
Topic 7: Feynman-Kac formula and connection to PDEs

Conferences

You will meet with the Teaching Assistant for the class. You will be able to ask the TA questions on the material covered and homework. The TA may also review course material. Homework will be due in conference.

Grading

Quizzes $= 8\% \times (6-1) = 40\%$ (biweekly)

Homework $= 20\%$ (weekly)

Final Exam $= 40\%$ (on April 28th, 5:30pm-8:20pm)

Grading policy

Make sure that your work is legible and done neatly; otherwise you will receive no credits for it. No credits will be given if you have only answers to assignments, quizzes and exams. You need to show both your answer and the work leading to it with proper wording or expressions.

Homework

Problems will be assigned weekly and be posted on myWPI. Make sure that you turn in your homework on time as late homework will not be accepted and will be graded as zero. If you have to miss a conference, you may turn in your homework to me in class or email me your scanned homework.

You are encouraged to discuss homework problems. But you are expected to write your own homework in your own words.

Quizzes

There will be a 30 minute in-class quiz every two weeks- six quizzes in total. Only fives of them will be recorded and the minimum grade will be dropped. For example, you will be scored zero if you miss a quiz once but your grade will not be recorded. However, there are no make-up quizzes.

Some statements

Cell phones and all electric devices should be turned off or muted.

Academic Dishonesty is not tolerated. Please be aware of WPI's Academic Honesty Policy `http://www.wpi.edu/offices/policies/honesty/policy.html`.

Disability services

If you are eligible for course adaptations or accommodations because of a disability or if you have medical information to share with me, about please make an appointment with me as soon as possible. If you are not sure about the eligibility for course adaptions or accommodations, please contact the Disability Services Office (DSO), which is located in the Student Development and Counseling Center, 137 Daniels Hall and the phone number is 508-831-4908, e-mail is Disability-Services@wpi.edu

Academic honesty

Each student is expected to familiarize him/herself with WPI's Academic Honesty policies which can be found at `http://www.wpi.edu/offices/policies/honesty`. All acts of fabrication, plagiarism, cheating, and facilitation will be prosecuted according to the university's policy. If you are ever unsure as to whether your intended actions are considered academically honest or not, please contact me.