DEPARTMENT OF MATHEMATICS
UNIVERSITY OF TEXAS AT AUSTIN

M385C/CAM384K: Theory of Probability II

First-day Handout
Spring, 2010

Unique course number: 57225/64290

Class meets: MWF 2pm-3pm, RLM 10.176

Instructor: Gordan Žitković

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Office Hours: by appointment

Grader: Jin Hyuk Choi

Course web-site: www.ma.utexas.edu/∼gordanz/teaching

Course Description: M385D/CAM384L "Theory of Probability II" is the continuation of "Theory of Probability I" and is intended to prepare the student for the preliminary examination in probability. It builds on and complements the theory of discrete-time martingales started in the first part (M385C/CAM384K) and its first goal is to develop the theory of continuous time martingales, the prime example being the Brownian Motion. What follows is a rigorous treatment of stochastic calculus (also known as Itô Calculus) and, in general, the theory of continuous-time stochastic processes. Among topics covered are:

1. Advanced discrete martingales
2. Continuous-time martingales
3. Brownian motion: construction and properties
4. Stochastic Integration and Itô's formula
5. Changes of measures (Girsanov's theorem) and representations of martingales

Prerequisites: Theory of Probability I (M385C/CAM284K) or a thorough knowledge of measure-theoretic probability, including martingale theory.

Grading: In addition to bi-weekly homework assignments (worth 20% of the grade) there will be two exams: a midterm (worth 30%) and a comprehensive final (worth 50%). The grades A and B+ in M385D will be reserved for exceptional performance only, since they may lead to an exemption from a prelim exam.

Exam schedules: The final exam will (most likely) take place on Monday, May 17, 2pm-5pm. The midterm exam is scheduled during the regular class time on Fri, Mar 12.

Homework: A problem set will be assigned (more or less) every two weeks. Problems (and, later, solutions) will be posted on the course web-site. The grader will grade a random subset of the assigned problem.

Literature: Both [Dur96] and [KS91] should be considered required. Supplementary recommended texts include [RY99] and [RW00a, RW00b]. It is possible, but not promised, that a set of lecture notes will be prepared by the instructor.

Students with disabilities: The University of Austin provides upon request appropriate academic accommodations for qualified students with disabilities. For more information, contact the Office of the Dean of Students at 471- 6259, 471-6441 TTY.

References

[Dur96] Richard Durrett, *Probability: theory and examples*, second or third ed., Duxbury Press, Belmont, CA, 1996.

[KS91] Ioannis Karatzas and Steven E. Shreve, *Brownian motion and stochastic calculus*, second ed., Graduate Texts in Mathematics, vol. 113, Springer-Verlag, New York, 1991.

[RW00a] L. C. G. Rogers and David Williams, *Diffusions, Markov Processes, and Martingales. Vol. 1*, Cambridge University Press, Cambridge, 2000, Foundations, Reprint of the second (1994) edition.

[RW00b] _____, *Diffusions, Markov Processes, and Martingales. Vol. 2*, Cambridge University Press, Cambridge, 2000, Itô Calculus, Reprint of the second (1994) edition.

[RY99] Daniel Revuz and Marc Yor, *Continuous martingales and Brownian motion*, third ed., Grundlehren der Mathematischen Wissenschaften [Fundamental Principles of Mathematical Sciences], vol. 293, Springer-Verlag, Berlin, 1999.

The schedule of classes:

Date	Weekday	Topic
01/20	Wed	Discrete Martingales
01/22	Fri	Discrete Martingales
01/25	Mon	Discrete Martingales
01/27	Wed	Discrete Martingales
01/29	Fri	Discrete Martingales
02/01	Mon	Discrete Martingales
02/03	Wed	Discrete Martingales
02/05	Fri	Discrete Martingales
02/08	Mon	Brownian Motion
02/10	Wed	Brownian Motion
02/12	Fri	Brownian Motion
02/15	Mon	Brownian Motion
02/17	Wed	Brownian Motion
02/19	Fri	Brownian Motion
02/22	Mon	Brownian Motion
02/24	Wed	Brownian Motion
02/26	Fri	Brownian Motion
03/01	Mon	Brownian Motion
03/03	Wed	Brownian Motion
03/05	Fri	Brownian Motion
03/08	Mon	Brownian Motion
03/10	Wed	Brownian Motion
03/12	Fri	**Midterm exam**

Date	Weekday	Topic
03/15	Mon	Spring Break
03/17	Wed	Spring Break
03/19	Fri	Spring Break
03/22	Mon	Continuous Martingales
03/24	Wed	Continuous Martingales
03/26	Fri	Continuous Martingales
03/29	Mon	Continuous Martingales
03/31	Wed	Continuous Martingales
04/02	Fri	Continuous Martingales
04/05	Mon	Stochastic Calculus
04/07	Wed	Stochastic Calculus
04/09	Fri	Stochastic Calculus
04/12	Mon	Stochastic Calculus
04/14	Wed	Stochastic Calculus
04/16	Fri	Stochastic Calculus
04/19	Mon	Stochastic Calculus
04/21	Wed	Stochastic Calculus
04/23	Fri	Stochastic Calculus
04/26	Mon	Stochastic Calculus
04/28	Wed	Stochastic Calculus
04/30	Fri	Stochastic Calculus
05/03	Mon	Stochastic Calculus
05/05	Wed	Stochastic Calculus
05/07	Fri	Stochastic Calculus