MATH 540 – Probability

Course Description from Bulletin: Random events and variables, probability
distributions, sequences of random variables and limit theorems. (3-0-3)

Enrollment: Graduate elective

Textbook(s): <u>Required texts</u>: 1. Jean Jacod and Philip Protter, *Probability Essentials*,
Springer (2004)
2. Marek Capinski and Tomasz Zastawniak, *Probability Through Problems*,
Springer (2003)
<u>Complementary text</u>: Marek Capinski and Ekkehard Kopp , Measure, Integral
and Probability, 2nd edition, Springer (2004)

Prerequisites: MATH 400, MATH 475 or consent of an instructor

Objectives:
1. Students will understand the axioms of probability.
2. Students will understand the construction of probability measure on R^n.
3. Students will understand the concept of conditional proability and conditional expectation.
4. Students will understand the concept and applications of characteristic functions.
5. Students will understand the concept and use of multivariate Gaussian distributions.
6. Students will understand some basic asymptotic results in probability.
7. Students will understand the Radon-Nikodym theorem and its use in probability.

Lecture schedule: two 75 minute lectures

Course Outline:

	Hours
1. Introduction: State space, events, probability, random variable	3
2. Axioms of probability, and probability on finite and countable spaces	4.5
3. Construction of a probability measure	6
4. Finite dimensional random variables	6
5. Conditional probability, Independence	6
6. Characteristic function	6
7. Gaussian random variables	1.5
8. Asymptotics	4.5
9. Conditional expectation and martingales	4.5
10. The Radon-Nikodym theorem	3

Assessment:		
	Homework	0-10%
	Quizzes/Tests	45-50%
	Graduate Project	0-10%
	Final Exam	45-50%

Syllabus prepared by: Tom Bielecki and Andre Adler
Date: 06/10/06