Spring Semester 2006

Tue-Thu 10:35 – 11:50 in 1025 SSW, 1255 Amsterdam Ave.

Professor Ioannis Karatzas

G8243: TOPICS IN ADVANCED PROBABILITY

Suggested topics include:

. Notion and properties of Local Time, for Brownian Motion and for Semimartingales. The formulae of D. Williams; the theorems of Ray & Knight. Elements of Excursion Theory.

Study of Stochastic Differential Equations: Weak and strong solutions, pathwise uniqueness and unique-ness in law, the Yamada-Watanabe theory. Comparison and approximation theorems. Martingale problems, the theory of Stroock & Varadhan; strong Markov property. The support theorem for solutions of SDE’s. Time-reversal of diffusions.

. One-dimensional diffusions: scale function and speed measure, the Engelbert-Schmidt theory, the Feller and Khas’minskii tests for explosion, detailed study of the Bessel SDE. Properties of Bessel processes: the Pitman theorem, the D.Williams path decomposition.

. Special topics: Zvonkin and Tsirel’son examples, the Doss-Sussmann pathwise construction. Pure and conformal martingales. The “most probable path” of Brownian motion with drift.

. Martingales depending on a parameter; the Ito-Wenzell formula. Stochastic Flows of Diffeomorphisms.


Introduction to the **Malliavin Calculus**: multiple Wiener integrals, the Skorohod integral and the Malliavin derivative, the Clark-Ocone formula, Hörmander’s hypoellipticity condition. The Ornstein-Uhlenbeck semigroup; hypercontractivity.

- Introduction to **Stochastic Control** and to **Optimal Stopping**. Probabilistic and analytical approaches.

- Additional topics will reflect the interests of the audience.

**RECOMMENDED TEXTS AND MONOGRAPHS:**


