Syllabus

MAIT 679M / AMSC 698M , Spring 2008

Special Topics in Applied Mathematics: Introduction to Financial Mathematics

1. Introduction to Financial Derivatives
   - Market components: money market, underlying asset, derivative
   - Basic hypotheses: no-arbitrage, efficient market, stochastic volatility
   - Program outline

2. The binomial No-Arbitrage Pricing Model:
   - One Period Binomial Model
   - Multiperiod Binomial Model

3. Path Dependent Security Derivatives
   - Path-independent theory of American Derivatives
   - Stopping Time
   - Path-dependent American Derivatives

4. Stochastic Processes
   - Random Walk
   - Brownian Motion

5. Stochastic Calculus
   - Ito's Integral and Stochastic Calculus
   - Black-Scholes Equation
   - Risk-Neutral Measure and Girsanov's Theorem

6. Time Series Analysis and Modeling:
   - AR, MA, ARMA Processes
   - PCA and ICA

Textbooks:

1. *Stochastic Calculus for Finance I: The Binomial Asset Pricing Model*, Steven E. Shreve, Springer Verlag 2005.
2. *Stochastic Calculus for Finance II: Continuous-Time Models,* Steven E. Shreve, Springer Verlag 2005.

Additional Reading Material:

3. *Options, Futures, and Other Derivatives***,** John C. Hull, 6th Edition Prentice Hall, 2006
4. *An Introduction to the Mathematics of Financial Derivatives,* Salih N. Neftci, 2nd Edition Academic Press 2000
5. *Options Markets,* John C. Cox, Mark Rubinstein, Prentice Hall 1985
6. *Methods of Mathematical Finance,* Ioannis Karatzas, Steven E. Shreve, Springer Verlag 1998