Course Syllabus Math 181: THE MATHEMATICS OF FINANCE

Winter 2006

1 Background in Finance and Probability

- 1. Introduction and Course Description
- 2. Review of probability
- 3. Discrete Random Walks
- 4. Random walks with Gaussian increments
- 5. Equity models using random walks; the price of risk

2 Financial Derivatives

- 6. Financial derivatives (puts, calls)
- 7. No-arbitrage assumption; self-financing portfolios
- 8. Derivation of discrete Black-Scholes
- 9. Derivation of continuous Black-Scholes
- 10. Black-Scholes (cont.)
- 11. European put and call
- 12. American put and call
- 13. Hedging the greeks
- 14. Hedging (cont.)

- 15. Examples and applications
- 16. MIDTERM

3 Monte Carlo Methods

- 17. Introduction
- 18. Error analysis
- 19. Sampling methods
- 20. Variance reduction
- 21. Variance reduction (cont.)
- 22. Applications
- 23. Applications
- 24. Applications

4 Other Financial Securities

- 25. Exotic options (barriers)
- 26. Exotic options (path-dependent securities)
- 27. Interest rate models
- 28. Interest rate derivatives
- 29. Mortgage-backed securities