FINOPMGT 422: Financial Engineering Fall, 2007

Textbook: Options, Futures and Other Derivatives, 6th Edition (Recommended).
I will provide you with a vast collection of notes and computer programs I have written for this class. You will be able to very well without Hull, but Hull provides another way to view the material. I have placed a copy of Hull on 4-hour/overnight reserve in the SOM library so that you do not feel obliged to purchase it. I have also placed several Mathematica books on 36-hour/weekend reserve for those taking my Wednesday morning Mathematica lab.

Media: USB-2 thumb-drive or other way to store and transfer very large computer files. Friday morning Excel lab members should take note that some files require close to 100 Megs of storage, so you will either need a large USB-drive, or you will need to manage actively its free space.

Examinations: I plan to give examinations, and possibly a major project. I may also give shorter quizzes without notice to monitor the progress of the class. Examinations may be cumulative.

Changes: I reserve the right to change the scope or lectures, labs and also the timing and content of examinations. I shall provide you with at least one week's notice of an examination

Office Hours: I am in my office when I am not teaching. You are welcome to drop-by without formality. I may restrict my office hours before an examination, or otherwise at my own will and pleasure but with due notice to the class thereof. Before examinations, I usually schedule review classes on Sunday afternoons between 1 and 3.

Scope of the Class:

1. Continuous stochastic processes, simulations in Excel and theory
2. Ito's lemma, theory and simulations
3. Introduction to the Fokker-Planck equation
4. Proof of Black and Scholes / Merton evaluation equation
5. Closed-form European Black and Scholes equations
6. Lattice-solutions to the Black and Scholes equation
7. Derivation and use of "Greeks"
8. Advanced term-structure of interest theory
9. Advanced duration
10. Evaluation of vanilla bonds
11. Advanced bond portfolio management using generalized duration
12. Bonds with embedded options

Scope of the Excel Lab:

1. Embedding VBA functions
2. Simulating interest rate processes and common stock processes

3. Simulating the stock market: CAPM consistent, and recovery of market parameters
4. Simulating stochastic term structures
5. Advanced duration models
6. Hedging with options using Greeks--European Options
7. Hedging with Options using Greeks--American Options
8. Structured derivative products and exotic options
9. Evaluating bonds with embedded options

Scope of the Mathematica Lab:
This is similar to the Excel lab, but Mathematical modules and imported notebooks containing procedural code replace VBA

After completing this class, you should have enough understanding to manage a team of financial engineer productively, and many of you will be able to create your own financial models.

Warning
If your Mathematics is a little stale, consider visiting a university provided Math tutor. You don't require a huge amount of mathematics, but you do need to know:

1. Derivatives and properties of the power, exponent, and natural log
2. The chain rule of calculus
3. Properties of the normal distribution, including its density function, cumulative function, mean, and standard deviation
4. Multiplication of matrices and/or vectors, the inverse, transpose, trace and determinant. You will need to be able to compute these for the two-dimensional case.