IEMS 373 Introduction to Financial Engineering Winter 2011

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Class Time: Tuesday and Thursday 9:30-10:50am in M228
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TA office hours: Monday and Wednesday 4:30-5:30pm

This course is as an introduction to the theory and practice of financial engineering. The course is particularly relevant to students interested in financial markets, banking, corporate finance, consulting in finance related areas, and applications of financial concepts in management.

Prerequisites:
1. Multivariate differential and integral calculus (such as Math 215)
2. Probability, statistics, and stochastic models (IEMS 302, 303, 315 or comparable courses in taken Mathematics or Economics departments)
3. An introductory finance course (such as IEMS 326 or Corporate Finance in the Economics Department)
4. Computer skills (some computer programming experience in C/C++ for the team project and good command of Excel for doing homework problem sets)

Textbook and Course Material:
1. Required textbook: John C. Hull, *Options, Futures, and Other Derivatives*, **8th Edition**, Prentice-Hall/Pearson.
2. Lecture notes.

Individual Homework Problem Sets:
There will be a total of five homework problem sets.

Project: There will be a team computer modeling project. Each team should have 3 students. Please try to make sure that each team is well balanced with respect to finance, computer programming, and mathematics skills.

Exams:
There will be a mid-term on **Thursday, February 10th** during the regular class time and a final on **Monday March 14th 3:00-5:00**.

Course Outline

1. Introduction

Introduction to financial markets and financial engineering. Review of prerequisites. Analysis of deterministic cash flows. Interest rates.

2. Forward and Futures Contracts

Forward contracts. Futures contracts. Arbitrage arguments. Pricing by arbitrage. Investing, trading, hedging, and arbitrage applications. Foreign exchange, equity, and commodity markets. Swaps.

3. Introduction to Options

Options basics. Arbitrage relationships. Trading strategies with options.

4. The Binomial Model

The binomial model of asset price dynamics. Dynamic replication and hedging. Risk-neutral valuation. Pricing and hedging options in the binomial model.

5. The Black-Scholes-Merton Model

Brownian motion. The geometric Brownian motion model of asset price dynamics. Lognormal distribution. Convergence of the binomial model to the Black-Scholes-Merton model in the continuous-time limit. Dynamic hedging. Risk-neutral valuation. The Black-Scholes-Merton option pricing formula and its applications in equity, currency, and commodity markets.

6. Market and Credit Risk Management

Market risk management. Risk management of derivatives portfolios. Credit risk: probability of default and loss-given-default.

7. Course Review

Preparation for the final.