Course Description:

The International Association of Financial Engineers (IAFE) defines financial engineering as: "… the development and the creative application of financial technology to solve problems in finance and to exploit financial opportunities," according to The Journal of Financial Engineering, 1, 1 (June 1992). The cost of obtaining any desired set of payments can be computed directly, and a strategy that will replicate the payments using existing securities can be constructed. The technology for doing this provides the backbone of the profession of financial engineering. Students need to understand the determinants of security prices, which form the input for financial engineering. Furthermore, you can reshape future contingencies into many different patterns. Hence, you as investors are faced with larger and larger menus from which to choose.

This course will introduce asset pricing techniques and simulation methods commonly used in securitization, project evaluation, and risk management. Financial engineering is by no means the only area in which financial technology can be employed. In fact, it can address fundamental issues of corporate finance and investment analysis. This course studies the fundamentals of innovations in quantitative finance: valuation theory, numerical methods, and statistical/econometric methods.

In addition to introducing futures, options, fixed income derivative, exotic derivative, and stochastic volatility models, valuation techniques such as PDE techniques and martingale methods will be explored. This analysis will be built on an extended introduction to basic stochastic calculus. To implement PDE and martingale models, numerical methods such as Monte Carlo techniques (including MCMC) will be utilized. We will also investigate how to exploit Bayesian analysis and basic statistical/econometric techniques to evaluate and validate models.

Policies:

- Academic dishonesty will not be tolerated.
- There will be no make-up work for extra credit to improve your grade.
- Students are responsible for the grade they earn. It is not considered professional to beg for a grade which has not been earned.
- No late assignments will be accepted.

Course Materials:

(1) *Options, Futures, and Other Derivatives*, 5th edition, by John C. Hull

(2) *An Introduction to the Mathematics of Financial Derivatives,* by Salih N. Neftci, Academic Press

(3) *Statistical Decision Theory and Bayesian Analysis,* 2nd edition, by James O. Berger

(4) *Quantitative Methods in Derivatives Pricing: An Introduction to Computational Finance,* by Domingo A. Tavella.

Class notes and other readings are available through *http://qf.nthu.edu.tw/~jtyang*.

Grading:

Item	Midterm Exam	Written Reports	Matlab Assignments	Oral Presentation	Class Contribution
Weight	20%	30%	15%	25%	10%