

**NATIONAL TAIWAN UNIVERSITY**  
**Department of International Business**  
**Financial Calculus**

Assistant Professor Jr-Yan Wang

Spring 2008

管院貳館 203

Friday 14:20 ~ 17:20

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02-27301272

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## **COURSE DESCRIPTION**

This course of Financial Calculus is the combination of three fields: finance, computer science, and mathematics. It is the major goal of this course that students will practice to solve many finance-related problems by computer programming. Although this course is designed for students who major in Business, the students are required to have prior knowledge in financial theory (especially about the derivatives). In addition, basic ability of computer programming is needed (or can be learned yourself via assigned homework). Nevertheless, some background knowledge will still be reviewed in the class, such as the option pricing theory, the term structure of interest rates, the stochastic process, some basic numerical methods, the concept of data structure in computer programming, etc.

The pricing algorithms or methods for various exotic options will be emphasized in this course, for example, Asian options, Barrier options, Lookback options, Convertible Bonds, Rainbow options, etc. It is my hope that you will learn many financial theories, good programming practices, advanced mathematics, and most importantly, the true meaning of the financial engineering in this course.

## **TEXT AND READINGS**

Lecture Notes: <http://www.fin.nchu.edu.tw/~jywang/> → Course Information → Financial Engineering or Financial Computation (graduate level)

Required: Options, Futures, and Other Derivatives, by J. C. Hull, 6<sup>th</sup> ed, 2005.

Reference:

1. Financial Engineering and Computation: Principles, Mathematics, Algorithms, by Yuh-Dauh Lyuu, 2002.
2. Derivatives: The Theory and Practice of Financial Engineering, by P. Wilmott, 1998.
3. Monte Carlo Methods in Financial Engineering (Stochastic Modelling and Applied

- Probability), by Paul Glasserman, 2005.
4. Introduction to Stochastic Calculus with Applications, by Fima C. Klebaner, 2005.
  5. Financial Calculus: An Introduction to Derivative Pricing, by Martin Baxter and Andrew Rennie, 1996.
  6. Numerical Recipes in C: The Art of Scientific Computing, by William H. Press, Brian P. Flannery, Saul A. Teukolsky, and William T. Vetterling, 1992.
  7. 金融工程學: 金融商品創新與選擇權理論, 陳松男, 2002.
  8. C++財務程式設計, 戴天時, 2005.

## **OFFICE HOUR**

NTUST International Building 1002

After class or by appointment.

## **EXAMS AND GRADINGS**

Homework (6 computer programs at least) 90%      Class Participation 10%

## **COURSE OUTLINE**

1. Introduction
2. Overview of Options (Ch 3)
3. Stochastic Process (Ch 1)
4. Option Pricing Methods (Ch 2\*, Ch 5\*)
5. Monte-Carlo Simulation and Rainbow Options (Ch 6\*)
6. Barrier Options (Ch 9)
7. Lookback Options (Ch 10\*)
8. Asian Options (Ch 11\*)
9. Non-constant Volatility (Ch 7\*)
10. The Greek Letters (Ch 8)
11. Monte-Carlo Simulation for American Options (Ch12\*)
12. Interest Rate Models (Ch 13)
13. Ch25, Ch26, Ch28, Ch29 in Options, Futures, and Other Derivatives

\* Homework supposed