NATIONAL TAIWAN UNIVERSITY
Department of International Business
Financial Computation

Associate Professor Jr-Yan Wang   **Spring 2016**

Room 103, Building 2, College of Management   **Thursday 9:10-12:10**

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COURSE DESCRIPTION

The discipline of Financial Computation or Financial Engineering combines four fields: finance, computer science, mathematics, and statistics. The major goal of this course is to learn how to solve many pricing problems for derivative contracts by developing **analytic formulae** or **computer programs**. More specifically, the pricing methods and their mathematical fundamentals for various exotic options will be introduced in this course, such as **Asian options**, **barrier options**, **lookback options**, **convertible bonds**, and **rainbow options**.

To ensure the fluency of my lecture, I assume that students are equipped with the basic knowledge in Finance, especially that about derivatives. Therefore, students should already learn the courses of **Futures and Options** or other similar courses before. Extended from the basic knowledge, several topics will be fully studied in this course, such as the stochastic process, the option pricing models, various numerical techniques, the option hedging strategies, etc.

In addition, the basic ability of computer programming is needed to implement the assigned homework (or can be learned yourself via completing homework). DO NOT worry about the lack of the computer programming skill. According to my experience to teach this course for more than ten years, at least 90% of students never wrote a computer program before this course, but less than 1% of students failed this course.

It is my hope that students can learn many financial theories, good programming practices, advanced mathematics, and most importantly, the true meaning of the financial engineering in this course.

LECTURE NOTES AND REFERENCES

Lecture Notes: http://homepage.ntu.edu.tw/~jryanwang/ → Course Information → Financial Computation or Financial Engineering (graduate level).

(The modified lecture notes for each week lecture are available after 9:00 p.m. every Wednesday.)

(DO NOT access CEIBA for the syllabus and lecture notes)

References:

1. Options, Futures, and Other Derivatives, by John C. Hull, 9th ed., 2014.
2. Financial Engineering and Computation: Principles, Mathematics, Algorithms, by Yuh-Dauh Lyuu, 2002.
3. Derivatives: The Theory and Practice of Financial Engineering, by Paul Wilmott, 1998.
4. Monte Carlo Methods in Financial Engineering (Stochastic Modelling and Applied Probability), by Paul Glasserman, 2003.
5. Introduction to Stochastic Calculus with Applications, by Fima C. Klebaner, 2005.
6. Financial Calculus: An Introduction to Derivative Pricing, by Martin Baxter and Andrew Rennie, 1996.
7. Numerical Recipes in C: The Art of Scientific Computing, by William H. Press, Saul A. Teukolsky, William T. Vetterling, and Brian P. Flannery, 1992.
8. The Complete Guide to Option Pricing Formulas, by Espen G. Haug, 2nd ed., 2006.
9. 金融工程學：金融商品創新與選擇權理論, 第三版, 陳松男, 2008.
10. C++財務程式設計, 戴天時, 2005.

HOMEWORK AND GRADINGS

Homework (5 computer programs)   100%

※ For each homework, you have two weeks to accomplish it.

※ On the due date, the demonstration of your program takes place in the third hour of the lecture.

※ The basic requirement is worth 80 points. The delay of each one week results in a deduction of 5 points.

※ For each homework, there are at most 3 bonuses, each of which is worth 5 additional points.

※ It is highly encouraged to discuss the homework with classmates, but DO NOT COPY programs from others. The copying behavior will result in a reduced score according to my discretion.

※ In addition to these 5 pieces of homework, there are two or three extra bonuses,

each of which is worth 5 additional points for your final grades.

RULES IN CLASS

※ DO NOT DISTRACT other students from listening to my lecture, e.g., do not chat with other students when I am talking.

※ If you have any questions during my lecture, FEEL FREE to INTERRUPT me by raising your hand.

COURSE SCHEDULE

Week	Date	Topic	Reading
1	Feb. 25	Introduction of Financial Computation	Syllabus and reference books
2	Mar. 3	Overview of Options	Ch 3
3	Mar. 10	Stochastic Process	Ch 1
4	Mar. 17	Stochastic Process	Ch 1
5	Mar. 24	Stochastic Process and Black-Scholes Model	Ch 1 and 2
6	Mar. 31	Black-Scholes Model	Ch 2
7	Apr. 7	Black-Scholes Model* and Binomial Tree model	Ch 2 and 4
8	Apr. 14	Binomial Tree Model*	Ch 4
9	Apr. 21	Binomial Tree Model†	Ch 4
10	Apr. 28	Monte-Carlo Simulation* and Finite Difference Method	Ch 5
11	May 5	Monte-Carlo Simulation and Finite Difference Method†	Ch 5
12	May 12	Lookback Option*	Ch 9
13	May 19	Lookback Option and Asian Option	Ch 9 and 10
14	May 26	Asian Option*	Ch 10
15	June 2	Monte Carlo Simulation for American Options	Ch 11
16	June 9	No lecture (Dragon boat festival)	
17	June 16	元大寶來期貨實務演講	
18	June 23	元大寶來期貨實務演講, demo HW5 and bonus HW	

* Homework assignment supposed   † Extra bonus assignment supposed

※ Note that the above schedule is an estimated version, I will dynamically adjust the speed of my lecture according to the feedback of students.

※ If time is enough, I will also introduce barrier options (Ch 8), non-constant volatility models (Ch 6), and the Greek letters of options (Ch 7).

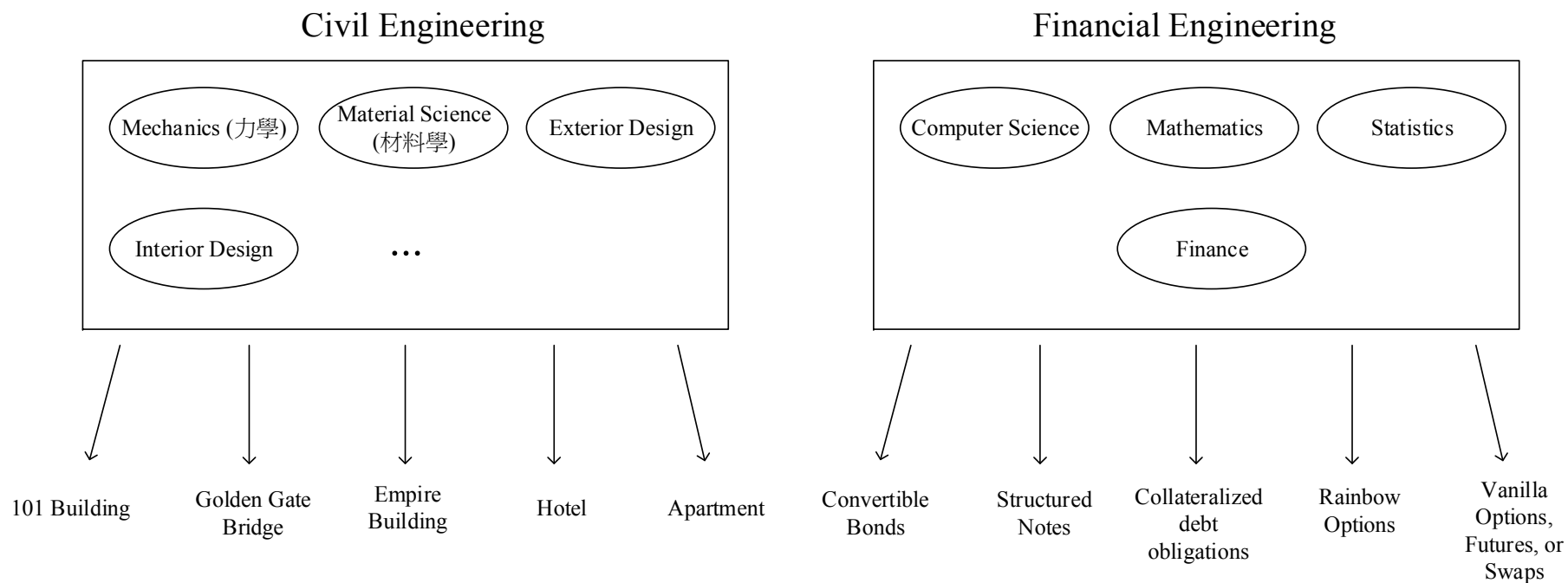## OFFICE HOURS

Wednesday 10:00-11:00 and Thursday 15:00-16:00
Room 513, Building 2, College of Management

※ It is not suggested to ask academic questions in emails. The face-to-face communication is the best way to make me understand your questions and give you the most appropriate instruction to solve your problems.
※ Try to fully utilize the office hours before making an individual appointment.

TEACHING ASSISTANT

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The reason for the name of "Financial Engineering"

Civil Engineering

Financial Engineering

Mechanics (力學)

Material Science (材料學)

Exterior Design

Interior Design

...

Computer Science

Mathematics

Statistics

Finance

101 Building

Golden Gate Bridge

Empire Building

Hotel

Apartment

Convertible Bonds

Structured Notes

Collateralized debt obligations

Rainbow Options

Vanilla Options, Futures, or Swaps

※ Common business model: Produce or create products with least costs, and sell these products with highest prices