# Master of Science in Financial Engineering Program (MFE)

# Banking and Finance Department

# Faculty of Commerce and Accountancy

# Chulalongkorn University

# Course Syllabus

## Full Time and Flexible Program

| | |
|---|---|
| 1. Course Number | 2104661 |
| 2. Course Credit | 2 |
| 3. Course Title | Statistical Methods for Financial Engineering / |
| | วิธีทางสถิติสำหรับงานวิศวกรรมการเงิน / STAT METH FIN ENG |
| 4. Faculty / Department | Commerce and Accountancy / Banking and Finance |
| 5. Semester | 1 |
| 6. Academic Year | 2017 |
| 7. Instructor | Name: Assist. Prof. Jitkomut Songsiri, Ph.D. |
| | Office: 410, 4th Floor Electrical Engineering Building |
| | Department of Electrical Engineering, |
| | Faculty of Engineering, Chulalongkorn University |
| | Office Hours: Mon 2-4 PM |
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8. Condition          Prerequisite                    Co-requisite

                      Conrequisite                   Consent of Faculty

                     <u>None</u>

9. Status             <u>**Compulsory Courses**</u>          Elective course

10. Curriculum        Master of Science in Financial Engineering Program

11. Degree            Master Degree

12. Hours / Week      3 Hours (Monday: 6 - 9 pm.)

13. Course Description

       basic asymptotic properties; sample statistics; linear regression; nonlinear least-squares estimation; m-estimator; maximum likelihood estimator; hypothesis testing; model selection and validation

## 14. Course Outline

### 14.1 Objectives

| No. | Course Objectives | Learning Outcome* | Teaching Approach | Evaluation Approach |
|-----|-------------------|-------------------|-------------------|---------------------|
| 1 | Explain and characterize the properties of estimators | 1.1, 1.2, 4.4 | lecture and discussion | assignment/exam |
| 2 | Explain and formulate statistical estimation problems | 3.1, 4.4, 5.1, 5.2 | lecture and discussion | assignment/exam |
| 3 | Explain and select appropriate hypothesis testings | 3.1, 3.3, 4.4 | lecture and discussion | assignment/exam |
| 4 | Explain and verify a model using model selection criterion and tests | 3.3, 4.4 | lecture and discussion | assignment/exam |

### 14.2 Contents

| Week | Description | Course Objectives | Student Assignment |
|------|-------------|-------------------|--------------------|
| 1 | Linear algebra, Probability and Statistics background review | no. 1 | HW 1 |
| 2 | Basic asymptotic theory and sampling statistics | no. 1 | |
| 3 | Sampling Statistics | no. 1 | HW 2 |
| 4 | Linear Regression | no.2 | |
| 5 | Linear Regression | no. 2 | HW 3 |
| 6 | Nonlinear least-squares estimation, M-estimator | no. 2 | |
| 7 | Maximum likelihood estimation | no. 2 | HW 4 |
| 8 | Maximum likelihood estimation | no. 2 | HW 5 |
| 9 | Hypothesis tests | no. 4 | |
| 10 | Model selection | no. 4 | HW 6 |

### 14.3 Teaching Aids

Textbooks, Lecture handouts, MATLAB software

### 14.4 Course Evaluation: Homework 30%  Midterm 35%  Final 35%

## 15. List of Materials

### 15.1 Required

- Cameron and P.K. Trivedi, Microeconometrics: Method an d Applications, Cambridge, 2005

- J.M. Wooldridge, Econometric Analysis of Cross Section and Panel Data, the MIT Press, 2010

- W.H. Greene, Econometric Analysis, 7th Edition, Pearson, 2012

### 15.2 Optional

- Defusco, R., McLeavey, D., Pinto, J., and Runkle, D. Quantitative Investment Analysis, 2nd edition, Wiley, 2007

- Rupert, D. Statistics and Data Analysis for Financial Engineering, Springer, 2012

- Keller, G. Managerial Statistics, 9th edition. South-Western, Cengage Learning, 2012

- Black, K. Applied Business Statistics, 7th edition. John Wiley and Sons, Inc. 2012

- Anderson, D., Sweeney, D., and Williams, T. Statistics for Business and Economics,11th edition.South-Western, Cengage Learning, 2011

- Mendenhall, W., Beaver, R.J., and Beaver, B.M. Introduction to Probability and Statistics, 12th edition. Thomson, 2006

- Abraham, B. and Ledolter, J. Introduction to Regression Modelings, Duxbery, 2006

- Kutner, Nachtsheim, Neter, and Li. Applied Linear Statistical Models, 5th edition. McGraw-Hill / Irwin, 2005

- Kohler, H. Statistics for Business and Economics. South-Western, 2002

### 15.3 Electronic / Web sites

http://jitkomut.eng.chula.ac.th/fe661.html

## 16. Teaching Evaluation

### 16.1 Type of Evaluation

CU-CAS

### 16.2 Changes made in accordance to previous teaching evaluation

More focus on proof and analysis

### 16.3 Discussion or Analysis which develops Desired Characteristics of Chulalongkorn University

- Graduates
- Knowledge
- Skills
- Ethics
- Social

**\*Notes**

| Desired Characteristics of Chulalongkorn University Graduates | | | | |
|---|---|---|---|---|
| Outcomes | | | | |
| 1 | Being knowledgeable<br><br>**AACSB: Disciplinary** | 1.1 | Possessing well-rounded knowledge | |
| | | 1.2 | Possessing in-depth knowledge | |
| 2 | Having good morals<br><br>**AACSB: Ethical Understanding** | 2.1 | Being moral and ethical | |
| | | 2.2 | Having an awareness of etiquette | |
| 3 | Having higher order thinking skills | 3.1 | Being able to think critically<br><br>**AACSB: Analytical Thinking** | |
| | | 3.2 | Being able to think creatively | |
| | | 3.3 | Having skills in problem solving<br><br>**AACSB: Problem Solving** | |
| 4 | Possessing essential capabilities | 4.1 | Having professional skills | |
| | | 4.2 | Having communication skills<br><br>**AACSB: Oral and Written Communication** | |
| | | 4.3 | Having skills in information technology<br><br>**AACSB: Technology Literacy** | |
| | | 4.4 | Having mathematical and statistical skills | |
| | | 4.5 | Having management skills<br><br>**AACSB: Teamwork** | |
| 5 | Having an inquiring mind and<br><br>knowing how to learn<br>**AACSB: Information Literacy** | 5.1 | Having an inquiring mind | |
| | | 5.2 | Knowing how to learn | |
| 6 | Having leadership qualities<br>**AACSB: Teamwork** | | | |
| 7 | Maintaining well-being | | | |
| 8 | Being community-minded and possessing social responsibility | | | |
| 9 | Sustaining Thainess in a globalized world<br>**AACSB: Multicultural** | | | |

| Teaching Methods | |
|---|---|
| 1 | Lecture |
| 2 | Discussion |
| 3 | Seminar |
| 4 | Deductive |
| 5 | Inductive |
| 6 | Case |
| 7 | Role playing |
| 8 | Field work |
| 9 | Field trip |
| 10 | Simulation |
| 11 | Dramatization |
| 12 | Demonstration |
| 13 | Learning center |
| 14 | Game |
| 15 | Experiment |
| 16 | Programmed instruction/Computer-aided instruction/Blended learning/Online learning |
| 17 | Practice |
| 18 | Practicum (including teaching practicum) |
| 19 | Research-based instruction |
| 20 | Problem-based instruction |
| 21 | Reflective thinking |
| 22 | Inquiry-based instruction |
| 23 | Independent study |
| 24 | Self-directed learning |
| 25 | Project-based instruction |
| 26 | Learning from model persons/learned persons |
| 27 | Micro teaching |
| 28 | Supervision |
| 29 | Cooperative learning |
| 30 | Individual advice |
| 31 | Tutorial group |
| 32 | Brain storming |
| 33 | Summary of main topics, or presentation of reading assignment |

| 34 | Apprentice |
|----|-----------|
| 35 | Activities |
| 36 | Clinical bed-side teaching or patient-based learning |
| 37 | Practice in behavior manifestation |
| 38 | Observation trip |
| 39 | Self study |
| 40 | Others (Please specify) |

| Evaluation Methods | |
|----|-----------|
| 1 | Written examination |
| 2 | Oral examination |
| 3 | Skills examination |
| 4 | Behavior observation |
| 5 | Assessment of work processes/activity roles |
| 6 | Assessment of output/lessons based on students' experience |
| 7 | Homework assessment |
| 8 | Report/Project assessment |
| 9 | Diary/Journal assessment |
| 10 | Performance testing |
| 11 | Assessment of report criticism/presentation |
| 12 | Assessment of result of team-work effort |
| 13 | Self assessment |
| 14 | 360 Degrees assessment |
| 15 | Peer assessment |
| 16 | Oral presentation |
| 17 | Class attendance |
| 18 | Others (Please specify) |