# NATIONAL TAIWAN UNIVERSITY <br> Department of International Business 

Mathematics for Management

Associate Professor Jr－Yan Wang<br>Fall 2015<br>Room 305，Building 2，College of Management<br>Wednesday 14：20－17：20<br>jryanwang＠ntu．edu．tw<br>02－33664987

## COURSE DESCRIPTION

This course is essentially designed to learn linear algebra，which is a branch of mathematics concerned with the study of vectors and matrices．Linear algebra is a basic but important subject since linear applications arise in many fields such as engineering，chemistry，ecology，biology，psychology，and economics and business．

This course has two layers of objectives．For the first layer of objectives，students will study basic knowledge of linear algebra．More specifically，systems of linear equations（線性系統），matrix operations（矩陣運算），vector spaces（向量空間）， linear transformations（線性轉換），and eigenvalues and eigenvectors（特徵值與特徵向量）will be taught in this course．

For the next layer of objectives，students will learn how to employ the knowledge of linear algebra to deal with the least squares regression（最小平方迴歸），the linear programming（線性規劃），the principal component analysis（主成分分析），the Monte Carlo simulation（蒙地卡羅模擬），etc．It is worth noting that these techniques are highly applicable and useful for many management－related courses in the future．

## TEXT AND LECTURE NOTES

Lecture Notes：http：／／homepage．ntu．edu．tw／～jryanwang／$\rightarrow$ Course Information $\rightarrow$ Mathematics for Management（undergraduate level）
（The modified PowerPoint files for each week lecture are available after 9：00 p．m．every Tuesday．）
（Note：DO NOT access CEIBA for the syllabus and lecture notes．）
Required Text：Elementary Linear Algebra，by Larson，2012， $7^{\text {th }}$ ed．
（The representative bookstore of this book in Taiwan is 高立圖書．If you decide to purchase the text book together，you can contact Mr．郭吉祥 via（02）2290－0318 ext．231．）

## EXAMS AND GRADINGS

Midterm Exam $40 \%$ (on Nov. $11^{\text {th }}$ )
Homework 1 (CAPM) 10\%
Homework 2 (Portfolio frontier) 10\%
※ The exam dates are regulated by NTU. Please ensure that you will be available to attend these two exams before you decide to take this course.
※ If you cannot attend the exams due to other reasons, you need to notify me in advance and show me the evidence, e.g., a medical diagnosis. Any late notification is not acceptable.
※ The range for each exam depends on the speed of my lecture. The range is not accumulative for the final exam.
※ The format of both exams: $100 \%$ for calculation problems. Most calculation problems are collected from the exercises at the end of each section and chapter in the required text with minor modifications.
※ Students should prepare your personal calculators for the two exams. However, calculators which can implement matrix operations or vector calculations are forbidden.
※ To maintain the fairness in the class, there are no make-up exams or other alternatives for the two exams. I will ignore all e-mails asking for any alternative way to make up your grades.
※ The rule of ALTERNATE SEATING is enforced if possible. Any dishonesty in the exams will lead to a failed result.
※ Homework 1 (2) will be assigned when I finish teaching Chapter 5 (9), which will occur in the bottom half of this semester.
※ I will curve your final grades such that the average of the grades in this class is comparable to other classes offered by College of Management of NTU.

## 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 OUTLINE

| Week | Date | Topic | Reading |
| :---: | :---: | :---: | :---: |
| 1 | Sept. 16 | Introduction of Mathematics for Management | Syllabus |
| 2 | Sept. 23 | Solving Systems of Linear Equations (Polynomial curve fitting) | Ch. 1 |
| 3 | Sept. 30 | Matrix Operations | Ch. 2 |
| 4 | Oct. 7 | Matrix Operations (Least squares regression) | Ch. 2 |
| 5 | Oct. 14 | Determinants | Ch. 3 |
| 6 | Oct. 21 | Determinants (Cramer's rule to solve systems of linear equations) | Ch. 3 |
| 7 | Oct. 28 | Vector Space | Ch. 4 |
| 8 | Nov. 4 | Vector Space (Change of basis and rotation) | Ch. 4 |
| 9 | Nov. 11 | MITERM EXAM |  |
| 10 | Nov. 18 | Inner Product Space | Ch. 5 |
| 11 | Nov. 25 | Inner Product Space (Least squares approximation) (HW 1) | Ch. 5 |
| 12 | Dec. 2 | Linear Programming Problem | Ch. 9 |
| 13 | Dec. 9 | Linear Programming Problem (Optimization problems) (HW 2) | Ch. 9 |
| 14 | Dec. 16 | Eigenvalues and Eigenvectors | Ch. 7 |
| 15 | Dec. 23 | Eigenvalues and Eigenvectors (Principal component analysis) | Ch. 7 |
| 16 | Dec. 30 | Linear Transformations | Ch. 6 |
| 17 | Jan. 6 | Linear Transformations (Rotation) | Ch. 6 |
| 18 | Jan. 13 | FINAL EXAM |  |

※ The topics in the parentheses are the examples of the applications based on the knowledge of linear algebra learned in that chapter.
※ Note that the above schedule is an estimated version, I will dynamically adjust the speed of my lecture according to the feedback of students.

## OFFICE HOURS

Tuesday 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 e-mails. The face-to-face communication is the best way to make me understand your questions and give you
the most accurate instruction to solve your problems．
※ If you have difficulties in solving exercise questions at the end of each chapter， please ask the teaching assistant first．It is preferred to make an appointment with the teaching assistant rather than ask her questions in e－mails．
※ Try to fully utilize my office hours before making an individual appointment．

## TEACHING ASSISTANT

莊雅筑 r03724056＠ntu．edu．tw

