Capital University of Economics and Business
Overseas Chinese College
Course Syllabus

Year and Semester	2023 Fall					
Course Name	Linear Algebra					
Course Code	MAT221					
Course Type	☑ General Education (Required) ☐ General Education (Elective) ☐ Basic Disciplinary Course ☐ Professional Course (Required) ☐Professional Course (Elective) ☐Professional Course (Expanded) ☐Professional Course (Advanced)					
Course Credits	3					
Course Hours	Total Class Hours	48	Lecture Hours	48	Experiment (Computer) Hours	0
Applicable object	☐ Freshman ☑ Sophomore ☐ Junior ☐Senior					
	☐ Business Administration (Accounting)					
	☐ Information Management and Information Systems (Finance)					
Prerequisites	MAT11, MAT112					
Instructor	Jianming Huang/Leilei Zhu					
Contact Information	Office: C217					
	Tele: 010-83951082					
	Email: huangjianming@cueb.edu.cn/zhuleilei@cueb.edu.cn					
Office Hour	Jianming Huang: T, F: 8:00-9:35 W: 15:25-17:00 Leilei Zhu: TBA					
Learning Centre	Jianming Huang: T: 15:25-17:00 W: 18:00-20:00 Leilei Zhu: TBA					
Grade/Section	2022BA, 2022ACCA1, 2022ACCA2, 2022IT, 2022CFA					
Course Time/Place	2022BA: TH 9:55:12:20/博学楼#204 2022ACCA1: W 9:55:12:20/博学楼#208 2022ACCA2: T 9:55:12:20/A106 2022IT: F 9:55:12:20/博学楼#109 2022CFA: TH 9:55:12:20/博学楼#208					
Textbook	Lee W. Johnson, R. Dean Riess, Jimmy T. Arnold. *Introduction to Linear Algebra,5th Edition*. China Machine Press, ISBN: 7-111-10628-8					

Reference Book

1. Gilbert Strang. *Linear Algebra and Its Applications*, *4th Edition*. Brooks Cole, ISBN: 978-0030105678
2. Carl D. Meyer. *Matrix Analysis and Applied Linear Algebra*. Society for Industrial and Applied Mathematics (SIAM), ISBN: 978-0898714548

Course Description

This is an introductory course on linear algebra, one of the most basic branches of mathematics, with broad range of applications in areas such as physics, engineering, data science, artificial intelligence, economics and management. The course introduces students to both the theory of systems of linear equations, matrices, vector spaces and linear transformations, and the techniques such as matrix reduction and diagonalization. This course also helps students to get to the grips with abstract ideas of linear algebra from a concrete geometric perspective.

Student Learning Objectives

On successful completion of this course, candidates should be able to:

Knowledge	◆ Describe the basic theory of systems of linear equations: Gaussian elimination and echelon form ◆ Summarize the basic properties of matrix: matrix operations, singularity, inverse ◆ Describe the basic theory of vector spaces: subspaces, linear independence, spanning, bases, dimensions, orthogonality ◆ Describe the basic theory of linear transformations: matrix representation, diagonalization, orthogonal diagonalization ◆ Carry out the basic techniques of the following: row-reduction to solve systems of linear equations; calculating determinants; finding eigenvalues and eigenvectors and diagonalizing matrices; orthogonally diagonalizing matrices
Capability	◆ Apply theories and techniques in linear algebra to solve some real-life problems such as least squares and Markov chain ◆ Compose formal mathematical arguments ◆ Use proper terminology to ask right questions and exchange inspiring ideas
Mindset	◆ Recognize that generalization is the main feature of algebra ◆ Recognize the vital role that linear algebra plays in data/dimension reduction in data science and artificial intelligence

Website Source

1. http://planetmath.org/encyclopedia/LinearAlgebra.html
2. http://ocw.mit.edu/OcwWeb/Mathematics/18-06Spring-2005/VideoLectures/index.htm
3. http://mathworld.wolfram.com/topics/LinearAlgebra.html

Teaching Methods

This course contains lectures, class discussions, homework, quizzes, presentation and exams. Textbook content will be introduced first. Then real case and practice questions will be delivered to students as a way to test their understanding of the knowledge. This will require individual or group assignment in or after class.

Grade Criterion

Component	Weight	Description
Final Exam	20%	A cumulative final examination will be given based on all of the contents of the class. A minimum of 25% of the exam (5 of the 20%) will consist of questions utilizing the application of critical thinking.
Mid-Term Test	20%	A cumulative midterm examination will be given based on all of the

		contents of the first half of the class. A minimum of 25% of the exam (5 of the 20%) will consist of questions utilizing the application of critical thinking.
Homework	15%	Homework problems will be assigned throughout the term, including but not limited to: terminologies, research project, and reading assignments.
Quizzes	15%	There will be at least 2 quizzes during the semester. The purpose of the quizzes is to ensure that students keep up with the readings. It may also be used as a way to check the attendance. Quizzes will test your knowledge of both concepts and the application of those concepts.
Presentation	10%	The students will be divided into several groups to prepare a presentation. Each student is required to be involved in the presentation. The topics can be selected from the textbook or lectures. Each group need to finish a PPT related to the topic which is given and hand in the related resources to the teacher before the presentation. The percentage is : content50%+organization10%+language15%+performance25%
Participation	10%	Individuals will be asked to participate individually in questions during the semester. Students are required to meet with their teachers every week. Their performances should be counted in their participation.
Attendance	10%	Refer to attendance policy listed below
Total	100%	

Detailed Grade Computation

	Before Midterm	After Midterm
Attendance	5%	5%
Participation	5%	5%
Homework	5%	10%
Quizzes	5%	10%
Presentation		10%
Mid-Term Test	20%	
Final exam		20%
Total	40%	60%

Assessment of Student Performance

☞ Self-Study and Reading ability Practice

Instructor will give out the chapters or the reference books to read and use class hours to have discussion; students should be able to show a proactive attitude and ability for self-study and reading. Knowledge and oral English will be elements of homework or presentation score.

☞ Homework

Students should finish their homework by themselves. Copying from others will be treated as cheating and the homework scores will be lowered. Students should hand in all assignments on time. Late assignments will be accepted at the discretion of the instructor (i.e., when the student was ill or had an excused absence). Late assignments without reasonable proof will be reduced in score by 50%.

☞ ***Attendance***

Because the course covers a great deal of material, attending every class session is very important for performing well.

- ♦Being late for 15 minutes or more is considered an absence.
- ♦Five hours or above of unexcused absences will result in the lower level of the final grade by one grade band (e.g. from C – to D +). Any excused absence must be discussed directly with the teacher.
- ♦Absence which is more than 1/3 of the total teaching hours will cause an F (a failing grade) directly. but students are welcome to continue attending classes.
- ♦An incomplete grade (I) will be considered in case of medical or family emergencies.

☞ ***Participation***

- ♦Students should participate in classes actively. Half of participation grade is determined by their presentation in class. They are encouraged to ask questions relevant to the subject and express their own opinions. Every student should respect the ideas, opinions, and questions of their classmates.
- ♦ Students should also use office hours to ask questions or talk with the instructor for good communication and effective learning.
- ♦Frequent visiting the instructor and chatting in English during office hours is highly recommended.
- ♦Any misbehavior and non-class related activities in class will result in the lower level of the participation grade, including ringing cell phones.
- ♦All above behaviors will be solely evaluated by the instructor for scoring.

☞ ***Textbook***

Students must bring the textbook to class.

Topical Course Outline（original）

Week	Topics	Platform	Homework
1	● Chapter 1 1. Introduction to matrices and systems of linear equations 2. Echelon form and Gauss-Jordan elimination	Wechat Group Classroom	
2	● Chapter 1 1. Consistent systems of linear equations 2. Matrix operations 3. Algebraic properties of Matrix operations	Zhihu.com Classroom	Homework for CH01
3	● Chapter 1 1. Linear independence and nonsingular matrices 2. Matrix inverses and their properties	Classroom	Homework for CH01
4	● Chapter 6 1. Cofactor Expansions of Determinants 2. Elementary Operations and Determinants 3. Cramer's Rule 4. Inverses	Classroom	Homework for CH06

5	● National Day Holiday		
6	● Chapter 3 1. Introduction to Vector Spaces of R^n 2. Examples of Subspaces	Zhihu.com Classroom	
7	● Chapter 3 1. Bases for Subspaces 2. Dimension	Classroom	Homework for CH03
8	● Chapter 5 1. Linear independence, bases and coordinates 2. Orthogonal Bases for Subspaces	Zhihu.com Classroom	Homework for CH05
9	● Chapter 3, 5 1. Linear transformations 2. Operations with linear transformations 3. Matrix representations for linear transformations	Classroom	Homework for CH03
10	● Chapter 4 Eigenvalues and the Characteristic Polynomials	Zhihu.com Classroom	
11	● Chapter 4 Eigenvectors and Eigenspaces	Classroom	Homework for CH04
12	● Chapter 4 Similarity Transformations	Zhihu.com Classroom	
13	● Chapter 5 1. Change of basis 2. Diagonalization	Zhihu.com Classroom	Homework for CH04
14	● Chapter 5 1. Orthogonal Matrices 2. Diagonalization of real symmetric matrices	Zhihu.com Classroom	Homework for CH04
15	● Chapter 7 Quadratic Forms	Classroom	
16	● Final Review	Classroom	
17	● Students' Presentation	Classroom	

Note: *Some chapters or sections may leave for self-study, this is the students' duty to learn and understand, they may also be included in the quizzes or exams. A review in Chinese may be held during L.C. and O.H. in the semester.*

Teacher's Office Hour

- The instructor's office hour is shown in the front of the office door.
- Students are suggested to use the instructor's office hour and learning center to ask questions or talk with the instructor once at least per week for good communication and effective learning, which is recorded in the students' participation.
- The time can be scheduled by instructors or students, or both.

Cheating and Plagiarism

Cheating is not tolerated. Any student caught cheating on a quiz; test or exam will be given a mark of zero (0) for

the particular work. At the beginning of the semester the definition of plagiarism will be carefully explained, when any thoughts or writings of another person are used, they must be clearly identified (usually one uses quotation marks) and the source notes. **If any student is caught cheating on any homework assignment, the highest score the student can earn in that course is a "C".**

Important Dates

Midterm Test	**Week 9 or 10**
Final Exam	**Week 18 or 19（Refer to the notice of the Academic Affairs Office）**

Note: *This syllabus is tentative and may be changed or modified throughout the semester. All students will be notified and a new syllabus will be given.*

Instructor: Jianming Huang/Leilei Zhu **Department Head: Jingning Li**