



**University of International Business and Economics
International Summer School**

MAT 260 Abstract Linear Algebra

Term: December 19th, 2022 – January 13th, 2023

Instructor: Gexin Yu

Home Institution: William & Mary

Email: gyu@wm.edu

Class Hours: Monday through Friday, 120 minutes each day (2,400 minutes in total)

Office Hours: TBD

Discussion Session: 2 hours each week

Total Contact Hours: 64 contact hours (45 minutes each, 48 hours in total)

Credit: 4 units

Location: WEB

Course Description:

This course introduces students to a rigorous and abstract study of linear algebra, which is an extension of introduction to linear algebra course. Topics covered include matrix algebra, vector space, eigenvalues and eigenvectors, orthogonalization, diagonalization, linear transformation, inner product space, and applications.

Prerequisite:

Linear Algebra

Course Goals:

Upon successful completion of this course, students will be conversant with

- understanding concepts of linear algebra and matrix algebra
- understanding linear independence, span, and basis
- developing problem solving skills, such as solving systems of linear equations using multiple methods
- applying principles of matrix algebra to linear transformation
- understanding examples, theorems, algorithms, and applications

Required Textbook:

Linear Algebra: A Modern Introduction (4th Edition) By David Poole

ISBN-13: 978-1285463247; ISBN-10: 9781285463247

Grading Policy:

Grades for this course will be based on the following:

Homework	30%
Middle Exam	30%
Final Exam	40%

Grading Scale:

Assignments and examinations will be graded according to the following grade scale:

A	90-100	C+	72-74
A-	85-89	C	68-71
B+	82-84	C-	64-67
B	78-81	D	60-63
B-	75-77	F	below 60

Academic Integrity:

Students are responsible for knowing policy regarding academic honesty. The University of International Business and Economics expects students to be honest in their academic work. Academic dishonesty is viewed as a serious violation of university rules and such misconduct is not accepted by academic community. In particular, students must refrain from plagiarism, cheating and collusion in connection with examinations, submitting substantially the same piece of work to different classes and must fully acknowledge all the sources of ideas and all assistance received in work submitted to the instructor for evaluation. Violation of the rules of academic honesty may lead to suspension or disqualification of the student from further study at the University.

Course Schedule:

Date	Lecture
Day 1	1.0: Introduction: The Racetrack Game 1.1: The Geometry and Algebra of Vectors 1.2: Length and Angle: The Dot Product
Day 2	1.3: Lines and Planes 1.4: Applications 2.0: Introduction: Triviality
Day 3	2.1: Introduction to Systems of Linear Equations 2.2: Direct Methods for Solving Linear Systems

Day 4	2.3: Spanning Sets and Linear Independence 2.4: Applications
Day 5	2.5: Iterative Methods for Solving Linear Systems 3.0: Introduction: Matrices in Action
Day 6	3.1: Matrix Operations 3.2: Matrix Algebra
Day 7	3.3: The Inverse of a Matrix 3.4: The LU Factorization
Day 8	3.5: Subspaces, Basis, Dimension, and Rank 3.6: Introduction to Linear Transformations
Day 9	3.7: Applications 4.0: Introduction: A Dynamical System on Graphs 4.1: Introduction to Eigenvalues and Eigenvectors
Day 10	4.2: Determinants 4.3: Eigenvalues and Eigenvectors of $n \times n$ Matrices
Day 11	Midterm Exam Review
Day 12	Midterm Exam
Day 13	4.4: Similarity and Diagonalization 4.5: Iterative Methods for Computing Eigenvalues
Day 14	4.6: Applications and the Perron-Frobenius Theorem 5.0: Introduction: Shadows on a Wall
Day 15	5.1: Orthogonality in \mathbb{R}^n 5.2: Orthogonal Complements and Orthogonal Projections
Day 16	5.3: The Gram-Schmidt Process and the QR Factorization 5.4: Orthogonal Diagonalization of Symmetric Matrices
Day 17	5.5: Applications 6.0: Introduction: Fibonacci in (Vector) Space 6.1: Vector Spaces and Subspaces
Day 18	6.2: Linear Independence, Basis, and Dimension 6.3: Change of Basis 6.4: Linear Transformations
Day 19	Final Exam Review



Day 20	Final Exam
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