



University of International Business and Economics International Summer School

MAT210 Linear Algebra

Term: July 8 – August 2, 2019

Instructor: SEMA SALUR

Home Institution: UNIVERSITY OF ROCHESTER

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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

Course Description:

In the course, the student will gain a familiarity with the theory of linear algebra and its applications. At the same time, more broadly, the student will be introduced to pure (i.e., theoretical) mathematics. That is: the student will increase his/her ability to absorb effectively abstract theory, to read and write mathematically rigorous argument, to extrapolate from fundamental principles, and to attempt creative answers to unfamiliar problems. The student will develop an intuition for theoretical constructs and familiarity with the mathematical style of rigorous argument with which to substantiate that intuition; as well as practice the patience needed to deal with sophisticated mathematical concepts.

Course Goals:

Students who satisfactorily complete this course will:

1. Be familiar with the statements and meanings of the definitions of the fundamental concepts of linear algebra, e.g., vector space, null space, linear independence, basis, dimension, linear transformation, one-to-one, onto, kernel, eigenvector, eigenvalue, orthogonal complement, diagonalizability, etc.
2. Have facility with basic calculational skills, e.g., Gaussian elimination; calculating the determinant, row space, null space, etc. of a matrix; conversion of coordinate vectors between bases; finding the matrix representation of a linear transformation with respect to given bases; determining the eigenspaces of a matrix; etc.
3. Be able to justify, with mathematical rigor, the fundamental theoretical statements of linear algebra (e.g., the fact that a matrix is invertible if and only if its determinant is nonzero; the Rank Theorem; etc.).

4. Have developed the ability to rigorously write mathematical arguments to justify (possibly previously unseen) claims based on their expanding theoretical knowledge.

Required Textbook:

Leon, Steven. Linear Algebra with Applications, 8th edition

Grading Policy:

There will be daily quizzes, two midterms and one final exam in this class. All exams will be closed-book. No notes, calculators, or other electronic devices will be allowed, and having such a device in view during the exam is an academic honesty violation.

Grading Scale:

The course grades will be calculated based on the following percentages:

- Quizzes: 20%
- Midterm 1: 20%
- Midterm 2: 20%
- Final Exam: 40%

The final exam will be cumulative. There will be no make-up exams.

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

Class Rules:

All academic work should be done with the high level of honesty and integrity. Academic misconduct of any kind may result in a grade penalty or the assignment of a failing grade.

Course Schedule:

Week of July 8

Topics

Section 1.1: Systems of Linear Equations
Supplementary Problems: 6gh, 8, 9, 10, 11
Section 1.2: Row Echelon Form
Supplementary Problems: 5dkl, 6, 7, 8, 17
Section 1.3: Matrix Arithmetic
Supplementary Problems: 6, 7, 13a, 15, 17
Section 1.4: Matrix Algebra



Supplementary Problems: 3, 7, 12, 20, 21, 26, 29

Section 1.5: Elementary Matrices

Supplementary Problems: 8a, 10c, g, 15, 17, 18, 24, 27

Section 2.1: Matrix Determinant

Supplementary Problems: 1, 3dg, 6, 8 (use proof by induction), 10

Section 2.2: Properties of Determinants

Supplementary Problems: 3df, 5, 6, 12, 14, *15, 16

Section 2.3: Matrix Adjoints

Supplementary Problems: 1bd, 6, 10, *12

Week of July 15

Midterm 1: Date TBD

Topics

Section 3.1: Vector Spaces

Supplementary Problems: 6, 8, 10, 15

Section 3.2: Subspaces

Supplementary Problems: 5, 8, 13, 17, 19, 20

Section 3.3: Linear Independence

Supplementary Problems: 2b, 5b, 6, 15, 16, 20

Section 3.4: Basis and Dimension

Supplementary Problems: 10, 13, 17, 19

Section 3.5: Change of Basis

Supplementary Problems: 2, 3, 4, 6, 7, 9, 10

Section 3.6: Row Space and Column Space

Supplementary Problems: 1, 3, 4ef, 8, 10, 14, 17, 19, 24, 26

Week of July 22

Midterm 2: Date TBD

Topics

Section 4.1: Linear Transformations

Supplementary Problems: 1, 3, 7, 8, 9ab, 12, 13, 14, 16, 19, 21, 22

Section 4.2: Matrix Representations of Linear Transformations

Supplementary Problems: 3, 5, 6, 7, 9, 14, 16, 17, 18b, 20

Section 4.3: Similarity

Supplementary Problems: 2, 3, 6, 8, 9, 11, 12, 14, 15a*, 15b

Section 5.1: Scalar Product

Supplementary Problems: 3ab, 15

Section 5.2: Orthogonal Subspaces

Supplementary Problems: 1bc, 6, 7, 8, 14, 15, 17

Section 15.3: Method of Least Squares

Supplementary Problems: 1c, 2, 9, 11, 14

Week of July 29

Topics

Section 5.4: Inner Product Spaces

Supplementary Problems: 3, 4ab, 7ab, 10, 11

Section 5.4: Inner Product Spaces, Part II

Supplementary Problems: *9, 12, 13, 15, 16, 21, 22, *33

Section 5.5: Orthonormal Sets

Supplementary Problems: 2, 5, 6, 8, 12, 15, *20, *36

Section 6.1: Eigenvalues and Eigenvectors

Supplementary Problems: 1acf, 2, 3, 6, 9, 12, 21, *32

Section 6.3: Diagonalization

Supplementary Problems: 1ace, 3, 6

6.4 Hermitian Matrices

Final Exam