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
Email: semasalur@gmail.com
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

Final Exam