



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

MAT 210 Linear Algebra

Term: May 29 – June 29, 2017

Instructor: Winston Ou

Home Institution: Scripps College

Office Hours: TBD

Email: wewou@scrippscollege.edu

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

Office Hours:

Teaching Assistant: TBD

Email: 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 a 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:

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



Required Text

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

Attendance

Summer school is very intense and to be successful, students need to attend every class. Occasionally, due to illness or other unavoidable circumstance, a student may need to miss a class. UIBE policy requires a medical certificate to be excused. Any unexcused absence may affect the student's grade. Moreover, UIBE policy is that a student who has more than 1/3 of the class in unexcused absences will fail the course.

Grading Policy

In this course, grading will be based on the following:

Participation 5%; Homework: 15%; Exams: 10%, 20%, and 20%; Final Exam: 30%. No make-up exams will be given. Any cheating on exams will result in an automatic zero for that exam.

Course Hours

The course has 20 class sessions in total. Each class session is 120 minutes in length for a total of 2,400 minutes of class time. The course meets from Monday to Thursday.

Grading Policy

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

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

Homework

Will be assigned daily and handed in at the beginning of class the following day. No late work will be accepted. Unstapled homework will result in a 10% penalty. Total plagiarism of assignments will result in fractional or zero credit.

General expectations

Students are expected to:

- ✧ Attend all classes and be responsible for all material covered in class and otherwise assigned. Any unexcused absence may impact a student's grade. Moreover, UIBE policy is that a student who has missed more than 1/3 classes of a course will fail the course

- ✧ Complete the day's required reading and assignments before class
- ✧ Refrain from texting, phoning or engaging in computer activities unrelated to class during class

Tentative Course Schedule: (Starred problems are bonus)

Week 1	Assignment
Systems of Linear Equations, Row Echelon Form	1.1: 6gh, 8, 9, 10, 11 1.2: 5dkl, 6, 7, 8, 17
Matrix Arithmetic, Matrix Algebra	1.3: 6, 7, 13a, 15, 17 1.4: 3, 7, 12, 20, 21, 26, 29
Elementary Matrices	1.5: 8a, 10c, g, 15, 17, 18, 24, 27
Matrix Determinant	2.1: 1, 3dg, 6, 8 (use proof by induction), 10
Week 2	Assignment
Exam I; Properties of Determinants; Matrix Adjoints	2.2: 3df, 5, 6, 12, 14, *15, 16 2.3: 1bd, 6, 10, *12
Vector Spaces; Subspaces	3.1: 6, 8, 10, 15; 3.2: 5, 8, 13, 17, 19, 20
Linear Independence	3.3: 2b, 5b, 6, 15, 16, 20
Basis and Dimension	3.4: 10, 13, 17, 19, 5, 8, 9, 11, 13, *18
Week 3	Assignment
Change of Basis	3.5: 2, 3, 4, 6, 7, 9, 10
Exam II; Row Space and Column Space	3.6: 1, 3, 4ef, 8, 10, 14, 17, 19, 24, 26
Linear Transformations	4.1: 1, 3, 7, 8, 9ab, 12, 13, 14, 16, 19, 21, 22
Matrix Representations of Linear Transformations	4.2: 3, 5, 6, 7, 9, 14, 16, 17, 18b, 20
Week 4	Assignment
Similarity; Scalar Product	4.3: 2, 3, 6, 8, 9, 11, 12, 14, 15a*, 15b 5.1: 3ab, 15
Orthogonal Subspaces	5.2: 1bc, 6, 7, 8, 14, 15, 17
Exam III; Method of Least Squares	5.3: 1c, 2, 9, 11, 14
Inner Product Spaces	5.4: 3, 4ab, 7ab, 10, 11
Week 5	
Inner Product Spaces, Part II	5.4: *9, 12, 13, 15, 16, 21, 22, *33
Orthonormal Sets	5.5: 2, 5, 6, 8, 12, 15, *20, *36
Eigenvalues and Eigenvectors; Diagonalization	6.1: 1acf, 2, 3, 6, 9, 12, 21, *32 6.3: 1ace, 3, 6
Final Exam	

General Comments

In order to train your minds in mathematical thinking, much of lecture will consist of the “Socratic Method” of questioning. Even if silently, do try to puzzle out the answers. An analogy: the lecture should be a “mental exercise” class. Knowledge cannot be given: it must be stolen. Engage your mind. Many problems will not be solvable at first (or second) viewing. Be patient: clarify any unknown concepts, try to reduce the problem, brainstorm to unearth possibly relevant concepts, and follow your intuition. It may help to, after a period of hard work, put the problem away. Do not worry if you cannot do every problem: what is important is that you try.

If you find yourself getting lost in the material, come to office hours immediately! It is much easier to lead a student’s mind individually rather than in a group.

Note that we may not dot every i or cross every t in class: you are responsible for reading the text. In particular, it is to your advantage to read the material before coming to class; in this way the student becomes an active participant rather than a passive recipient.

Basic etiquette should be maintained. For example: to give your classmates time to think, please do not blurt out answers unless called upon (or overcome with excitement); please do not walk out of class without prior explanation, etc.

Using a cell phone in class is not permitted; students using phones will be asked to leave the class and not receive credit for attendance that day.

Tests will check your understanding of the lectures as well as cover homework-type problems; it will benefit you to check after each lecture to see if you’ve understood the line of the arguments. Precise knowledge of the theory is vital!