MIDDLE EAST TECHNICAL UNIVERSITY
DEPARTMENT OF MATHEMATICS

1. Course number and name:**Math 260 (2360260) Basic Linear Algebra**

2. Credits and contact hours: **METU Credit & ECTS Credit:(3-0)3 & 5**

3. Instructor's or course coordinator's name: **Semra PAMUK**

4. Textbook, title, author, and year:

   Linear Algebra and Its Applications, Gilbert Strang, 4th Edition, 2006
   Basic Linear Algebra, Cemal Koç

   a. other supplemental materials:

5. Specific course information
   a. brief description of the content of the course (catalog description)

Matrices, determinants and systems of linear equations. Vector spaces, the Euclidian space, inner product spaces, linear transformations. Eigenvalues, diagonalization.

   b. prerequisites or co-requisites:**None**
   c. indicate whether a required, elective, or selected elective course in the program:**required**

6. Specific goals for the course
   a. specific outcomes of instruction, ex. The student will be able to explain the significance of current research about a particular topic.

This course aims to provide the students majoring in science and engineering with a brief introduction to linear algebra and some of its applications.. By the end of the course, students will
1) solve systems of linear equations algorithmically, using Gaussian Elimination
2) Use matrix algebra efficiently and carry out basic proofs
3) Compute determinants by cofactor expansions and by row reduction
4) Decide whether an abstract set with given operations is a vector space (over real or complex numbers), determine subspaces of a given vector space
5) Find and operate with essential ingredients of a vector space (finding bases, computing dimension, checking linear independence, computing coordinates)
6) Make computation in inner product spaces, and apply Gram-Schmidt orthogonalization algorithm.
7) Compute eigenvalues, eigenvectors of a matrix and use them for diagonalization
8) Find matrix representation of a linear transformation with respect to arbitrary basis

b. explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.

(a) an ability to apply knowledge of mathematics, in science and engineering
(e) an ability to identify, formulate and solve engineering problems

EXAM DATES

First Midterm March 9, 2020, 17.40

Second Midterm April 13, 2020, 17.40

Final May 10, 2020, 17.00

Make-up TBA

7. Brief list of topics to be covered:

Week	Syllabus(Math 260)
1	Systems of linear equations and Gaussian elimination Matrices, operations on matrices
2	Row operations, elementary matrices. Solving homogeneous and non-homogeneous systems.
3	Invertibility, inverse and transpose of a matrix
4	Vector spaces and subspaces .
5	Linear independence, basis, and dimension. The four fundamental subspaces.
6	Linear transformations
7	Matrix representation of linear transformations
8	Inner products, norm and orthogonality
9	Orthogonal and orthonormal bases, the Gram-Schmidt orthogonalization process, orthogonal projections
10	Determinants: definition, properties

11	Formulas for determinant (Cofactor expansion), and applications of determinant
12	Eigenvalues and eigenvectors.
13	Diagonalization, and diagonalization of real symmetric matrices. Matrix exponentials.
14	Change of bases and similarity of matrices.

Criterion 3. Student Outcomes

The program must have documented student outcomes that prepare graduates to attain the program educational objectives.

Student outcomes are outcomes (a) through (k) plus any additional outcomes that may be articulated by the program.

(a) an ability to apply knowledge of mathematics, science, and engineering
(b) an ability to design and conduct experiments, as well as to analyze and interpret data
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(d) an ability to function on multidisciplinary teams
(e) an ability to identify, formulate, and solve engineering problems
(f) an understanding of professional and ethical responsibility
(g) an ability to communicate effectively
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
(i) a recognition of the need for, and an ability to engage in life-long learning
(j) a knowledge of contemporary issues
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.