MAT 260: BASIC LINEAR ALGEBRA (Spring 2016)

Credit: (3-0)3
Catalog description: Matrices, determinants and systems of linear equations. Vector spaces, the Euclidean space, inner product spaces, linear transformations. Eigenvalues, diagonalization.
Course Coordinator: Emel Bilgin (office: TZ 30, email: *bemel_at_metu.edu.tr*)
Instructors: Anar Dosi (Sections 1, 2); Emel Bilgin (Section 3)
Exams and Grading: Course grades are determined by two (non-cumulative) midterm exams, and a (cumulative) final exam, as well as a small number of bonus points awarded on the basis of attendance, class participation, and/or project completion.

- **Exam 1:** 25 %
- **Exam 2:** 25 %
- **Final:** 40 %
- **Quiz:** 10% (3 quizzes through the semester)
- **Bonus:** 5 % (solving problems on the board)

Textbook: "Linear Algebra", Larry Smith, 3rd ed., Springer, 1998 (available at the bookstore, and the Reserve section of the library)
Homework and Method of Studying: The course is of an abstract nature compared to most other courses; comprehension of the proofs and a careful reading of the lecture notes or the textbook are important. Students should attempt to solve **all** of the questions at the end of each chapter, and regularly visit office hours to talk to the instructors about questions that they cannot solve. Homework will not be graded or corrected. However, a large percentage of the questions on each exam will be very similar to the exercises in the book. (Beware: We will make just enough changes so that memorization of solutions or proofs does not help. A thorough understanding will be necessary and sufficient.)
Website: http://math.ncc.metu.edu.tr/math260/
Make-up Policy: In order to be eligible to enter a make-up examination for a missed examination, a student should have a documented or verifiable, and officially acceptable excuse. **It is not possible to make up multiple missed examinations.** The make-up examination for all exams will be after the final exam, **and will include all topics.**
Math Help Room: The mathematics help room in T-103 is a room staffed by mathematics faculty and teaching assistants where students may gather to ask questions, work on homework, and view exams. *Students are also invited to seek out instructors in their offices.*
There will be a total of 42 **one hour units** in the course. **Each week, three units will be taught.** The contents of each unit are listed below, where the section numbers refer to the course textbook by L. Smith. *Note: This schedule may be modified/reorganized as the class progresses.*

Week 1: Feb 16-20	0	**Introduction to the Course**
	1-2	**Ch 2**. Vector Spaces, **§2.1:** Axioms for Vector Spaces. **§2.2:** Cartesian (or Euclidean) Spaces. **§2.3:** Some Rules for Vector Algebra.
Week 2: Feb 23 - 27	3-4	**Ch 3.** Examples of Vector Spaces, **§3.1:** Three Basic Examples. **§3.2:** Further Examples of Vector Spaces. **Ch 4.** Subspaces, **§4.1:** Basic Properties of Vector Subspaces. **§4.2:** Examples of Subspaces.
Week 3: Mar 2-6	5-6	**Ch 5.** Linear Independence and Dependence, **§5.1:** Basic Definitions and Examples. **§5.2:** Properties of Independent and Dependent Sets. **Ch 6.** Finite-Dimensional Vector Spaces and Bases **§ 6.1:** Finite-Dimensional Vector Spaces.
Week 4: Mar 9-13	**6-7**	**§6.2:** Properties of Bases. **§6.3:** Using Bases. **Ch 7.** The Elements of Vector Spaces: A Summing Up **§7.1:** Numerical Examples.
Week 5: Mar 16-20	8	**Ch 8.** Linear Transformations **§8.1:** Definition of Linear Transformations. **§ 8.2:** Examples of Linear Transformations. **§8.3:** Properties of Linear Transformations.
Week 6: Mar 23-27	**8**	**§8.4:** Images and Kernels of Linear Transformations. **§8.5:** Some Fundamental Constructions. **§8.6:** Isomorphism of Vector Spaces.
Week 7: Mar 30 - Apr 3	9	**Ch 9.** Linear Transformations: Examples and Applications **§9.1:** Numerical Examples**. Ch 10.** Linear Transformations and Matrices

Week 8: Apr 6 – 10	**10**	**§10.1:** Linear Transformations and Matrices in R^2. **§10.2:** Some Numerical Examples. **§10.3:** Matrices and Their Algebra. **§10.4:** Special Types of Matrices.
Week 9: Apr 13 – 17	11	**Ch 11.** Representing Linear Transformations by Matrices **§11.1:** Representing a Linear Transformation by a Matrix. **§11.2:** Basic Theorems. **§11.3:** Change of Bases.
Week 10: Apr 20 – 24	12	**Ch 12.** More on Representing Linear Transformations by Matrices **§12.1:** Projections. **§12.2:** Nilpotent Transformations. **§12.3:** Cyclic Transformations. **Ch 13.** Systems of Linear Equations **§13.1:** Existence Theorems.
Week 11: Apr 27 – May 1	**13**	**§13.2:** Reduction to Echelon Form. **§13.2:** Reduction to Echelon Form *(cont)*. **Ch 14.** The Elements of Eigenvalue and Eigenvector Theory **§14.1:** The Rank of an Endomorphism.
Week 12: May 4-8	**14**	**§14.2:** Eigenvalues and Eigenvectors. **§14.3:** Determinants. **§14.4:** The Characteristic Polynomial.
Week 13: May 11 – 15	35	**§14.5:** Diagonalization Theorems. **§17.3:** Jordan Form *(parts of)*. **Ch 15.** Inner Product Spaces **§15.1:** Scalar Products.
Week 14: May 18 – 22	38	**§15.2:** Inner Product Spaces. **§15.3:** Isometries. Additional Topics and Applications **§15.4:** The Riesz Representation Theorem.
FINAL EXAM: May 25 - June 6		