Math 260 Basic Linear Algebra
(Spring 2011)

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: Benjamin Walter
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Exams and Grading: Course grades are determined by (online) homework, 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: 35 %**
- **Homework: 15 %** *(WeBWork)*
- **Bonus: 5 %** *(policy varies between sections)*

Homework: Work will be assigned and graded **weekly** using the online WeBWork system.

Suggested Problems: Due to the limitations of WeBWork, complete mastery of subject material will require solving additional theoretical problems. For each lecture, we will announce additional suggested problems from the textbook. The list of problems is available on the course website.

Course Website: http://math.ncc.metu.edu.tr/math260/

Textbook: "Elementary Linear Algebra", Howard Anton, 9th Int. ed., Wiley, 2005

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. *This semester, we are experimenting with the help room as a replacement for formal office hours; however students are still invited to seek out instructors in their offices if they wish.*

Instructor	Section	Office	Phone	E-Mail
Özgür Kişisel	Section 1	SZ-31 / Admin	2941 / 2015	akisisel@metu.edu.tr
Benjamin Walter	Sections 2, 3	S-132	2960	benjamin@metu.edu.tr

Course Schedule: There will be a total of 42 **one hour units** in the course. **Each week, three units will be taught.** Lectures focus on chapters 1-2 and 4-8 of the textbook with occasional additional topics from chapter 9 as well as applications from chapter 11 inserted at appropriate areas. In the schedule below, units marked * may be omitted to save time if necessary.

Lectures	
Section 1	Mon: 9:40-10:30 Wed: 8:40-10:30
Section 2	Tue: 8:40-9:30 Thu: 8:40-10:30
Section 3	Tue: 10:40-12:30 Thu: 13:40-14:30

Week 1: Feb.17-23	1	**Introduction to the Course** **Chapter 1. Systems of Linear Equations and Matrices** **§1.1** Introduction to Systems of Linear Equations
	2	**§1.2** Gaussian Elimination
	3	**§1.2** Gaussian Elimination *(cont)* **§1.3** Matrices and Matrix Operations
Week 2: Feb.24-Mar.2	4	**§1.4** Inverses; Rules of Matrix Arithmetic **Application: §11.7** Graph Theory
	5	**§1.5** Elementary Matrices and a Method for Finding A^{-1}
	6	**Additional Topic: §9.9** LU Decomposition
Week 3: Mar.3-9	7	**§1.6** Further Results on Systems of Equations and Invertibility
	8	**Chapter 2. Determinants** **§2.1** Determinants by Cofactor Expansion
	9	**§2.2** Evaluating Determinants by Row Reduction
Week 4: Mar.10-16	10	**§2.3** Properties of the Determinant Function *(simplified proofs, stop at Thm 2.3.5)* **Application: §11.1** Curves Through Points
	11	**Chapter 4. Euclidean Vector Spaces** **§4.1** Euclidean n-Space **§4.2** Linear Transformations from R^n to R^m
	12	**§4.2** Linear Transformations from R^n to R^m *(cont)*
Week 5: Mar.17-23	13	**§4.3** Properties of Linear Transformations from R^n to R^m
	14*	**Review***
	15	**§4.4** Linear Transformations and Polynomials **Chapter 5. General Vector Spaces** **§5.1** Real Vector Spaces
Week 6: Mar.24-30	16	**§5.3** Linear Independence
	17	**§5.2** Subspaces **§5.4** Basis and Dimension
	18	**§5.4** Basis and Dimension *(cont)* **§5.5** Row Space, Column Space, and Nullspace

Week 7: Mar.31-Apr.6	19	**§5.5** Row Space, Column Space, and Nullspace *(cont)* **Application: §11.2** Electrical Networks
	20	**§5.6** Rank and Nullity
	21	**Chapter 6. Inner Product Spaces** **§6.1** Inner Products **§6.2** Angle and Orthogonality in Inner Product Spaces
Week 8: Apr.7-12	22	**§6.3** Orthonormal Bases; Gram-Schmidt Process
	23	**§6.3** QR-Decomposition
	24	**§6.4** Best Approximation; Least Squares **Additional Topic: §9.3** Least Squares Fitting to Data
Week 9: Apr.14-20	25*	**Application: §11.20*** A Least Squares Model for Human Hearing
	26*	**Review***
	27	**Chapter 7. Eigenvalues, Eigenvectors** **§7.1** Eigenvalues and Eigenvectors **Additional Topic: §9.2** Geometry of Linear Operators on R^2
Week 10: Apr.21-27	28	**§7.1** Eigenvalues and Eigenvectors *(cont)*
	29	**§7.2** Diagonalization
	30	**§7.2** Diagonalization *(cont)* **Application: §11.6** Markov Chains
Week 11: Apr.28-May 4	31	**Generalized Eigenvectors and Jordan Form** ***(reference to be added)***
	32	**§6.6** Orthogonal Matrices **§7.3** Orthogonal Diagonalization
	33	**Chapter 8. Linear Transformations** **§8.1** General Linear Transformations
Week 12: May 5-11	34	**§8.2** Kernel and Range
	35	**§8.3** Inverse Linear Transformations
	36	**§6.5** Change of Basis **§8.4** Matrices of General Linear Transformations
Week 13: May 12-18	37	**§8.5** Similarity
	38	**§8.6** Isomorphism
	39	**Additional Topics and Applications** **§9.5** Quadric Forms **§9.6** Diagonalizing Quadratic Forms; Conic Sections
Week 14: May 20-26	40	**§9.6** Diagonalizing Quadratic Forms; Conic Sections *(cont)* **§9.7** Quadric Surfaces
	41*	**§11.11*** Computer Graphics
	42*	**Review***