ÇANKAYA UNIVERSITY
Faculty of Arts and Sciences
Course Definition Form

Part I. Basic Course Information

Department Name	MATHEMATICS					**Dept. Numeric Code**	27
Course Code	MATH232	**Number of Weekly Lecture Hours**	2	**Number of Weekly Lab/Tutorial Hours**	2	**Number of Credit Hours**	**3**
Course Web Site	http://math232.cankaya.edu.tr					**ECTS Credit**	07

Course Name *This information will appear in the printed catalogs and on the web online catalog.*	
English Name	Linear Algebra II
Turkish Name	Lineer Cebir II

Course Description
Provide a brief overview of what is covered during the semester. This information will appear in the printed catalogs and on the web online catalog. Maximum 60 words.

Inner Product Spaces, Orthogonality, Orthonormal Sets, The Gram-Schmidt Orthogonalization Process, Eigenvalues and Eigenvectors, Diagonalization, Complex Vector Spaces, Hermitian Matrices, Positive Matrices, Normal Matrices, Real Symmetric Matrices, Unitary and Orthogonal Matrices, Bilinear and Quadratic Forms, Canonical Forms, Decompositions.

Prerequisites (if any) *Give course codes and check all that are applicable.*	1st: MATH231	2nd:	3rd:	4th:
	☐ Consent of the Instructor	☐ Senior Standing	☐ Give others, if any.	
Co-requisites (if any)	1st:	2nd:	3rd:	4th:
Course Type *Check all that are applicable*	☒ Must course for dept. ☐ Must course for other dept.(s) ☐ Elective course for dept. ☐ Elective course for other dept.(s)			

Course Classification *Give the appropriate percentage for each category.*					
Category	Mathematics & Natural Sciences	Engineering & Architectural Sciences			
Percentage	80	20			

Part II. Detailed Course Information

Course Objectives
Maximum 100 words.

The purposes of the course are:

1. To teach inner product spaces, orthogonal bases, orthogonalization
2. Eigenvalues, eigenvectors, diagonalization, orthogonal matrices
3. Linear algebra on complex vector spaces: Hermitian and unitary matrices
4. Spectral theorem

Learning Outcomes
Explain the learning outcomes of the course. Maximum 10 items.

Students will be able to

1. Apply the Gram Schmidt orthogonalization process to get an orthonormal basis
2. Find eigenvalues and eigenvectors of a matrix with real or complex entries
3. Diagonalize a matrix it if it is diagonalizable.
4. Find quadratic forms of a given matrix.
5. Decompose matrices.
6. Understand the relation between a linear operator and its matrix representations

Textbook(s)
List the textbook(s), if any, and other related main course material.

Author(s)	Title	Publisher	Publication Year	ISBN
Ron Larson	Elementary Linear Algebra, 8th edition	Cengage Learning	2016	978-1305658004
Jimmie Gilbert - Linda Gilbert	Linear Algebra and Matrix Theory	Academic Press	2014	978-0122829703

Reference Books
List, ifany,otherreference books to be used as supplementary material.

Author(s)	Title	Publisher	Publication Year	ISBN
D.C.Lay, S.R. Lay, J.J. McDonald	Linear Algebra and Its Applications	Pearson	2015	978-0321982384
S.H. Friedberg, A.J. Insel, L.E.Spence	Linear Algebra	Prentice Hall of India	2011	978-8120326064

Teaching Policy
Explain how you will organize the course (lectures, laboratories, tutorials, studio work, seminars, etc.)

4 hours of lecturing including problem solving and applications per week.Attendance to the lectures is compulsory.

Laboratory/Studio Work
Give the number of laboratory/studio hours required per week, if any, to do supervised laboratory/studio work and list the names of the laboratories/studios in which these sessions will be conducted.

Computer Usage
Briefly describe the computer usage and the hardware/software requirements for the course.

Course Outline
List the weekly topics to be covered.

Week	Topic(s)
1	Inner Product Spaces, Norm and Orthogonality
2	The Gram-Schmidt Orthogonalization Process, Orthogonal Subspaces
3	Eigenvalues and Eigenvectors
4	Diagonalizability,
5	Symmetric and Orthogonal Matrices
6	Complex Numbers, Complex Vector Spaces, Complex Inner Products
7	Complex Eigenvalues, Complex Eigenvectors
8	Unitary Matrices, Hermitian and Normal Matrices
9	Schur's Theorem, Spectral Theorem for Matrices
10	Change of Basis, Similarity
11	Linear Operators on Inner Product Spaces, Matrix Representations
12	Unitary, Hermitian and Normal operators
13	Quadratic Forms
14	Bilinear forms

Grading Policy
List the assessment tools and their percentages that may give an idea about their relative importance to the end-of-semester grade.

Assessment Tool	Quantity	Percentage	Assessment Tool	Quantity	Percentage	Assessment Tool	Quantity	Percentage
Homework			Case Study			Attendance		
Quiz(es)	5	10	Lab Work			Field Study		
Midterm Exam	2	**50**	Classroom Participation			Project		
Term Paper			Oral Presentation			Final Exam	1	40

ECTS Workload
List all the activities considered under the ECTS.

Activity	Quantity	Duration (hours)	Total Workload (hours)
Attending Lectures (*weekly basis*)	14	2	28
Attending Labs/Recitations (*weekly basis*)	14	2	28
Compilation and finalization of course/lecture notes (*weekly basis*)	14	1	14
Collection and selection of relevant material (*once*)	1	7	7
Self study of relevant material (*weekly basis*)	14	3	42
Take-home assignments	-	-	-
Preparation for quizzes	5	3	15
Preparation for mid-term exams (*including the duration of the exams*)	2	12	24
Preparation of term paper/case-study report (*including oral presentation*)	-	-	-
Preparation of term project/field study report (*including oral presentation*)	-	-	-
Preparation for final exam (*including the duration of the exam*)	1	17	17
		TOTAL WORKLOAD / 25	175/25
		ECTS Credit	**7**

Total Workloads are calculated automatically by formulas. To update all the formulas in the document firstpressCTRL+Aandthenpress F9.

Program Qualifications vs. Learning Outcomes *Consider the program qualifications given below as determined in terms of learning outcomes and acquisition of capabilities for all the courses in the curriculum. Look at the learning outcomes of this course given above. Relate these two using the Likert Scale by marking with X in one of the five choices at the right.*

No	Program Qualifications	Contribution				
		0	1	2	3	4
1	Adequate knowledge in mathematics; ability to use applied and theoretical information in these areas to solve pure and applied mathematics problems.					X
2	Ability to use modern computational tools to analyze an abstract or real life problem				X	
3	Adequate knowledge in theoretical and historical background in mathematics				X	
4	Ability to work individually and in teams efficiently, ability to collaborate effectively in teams to analyze complex systems from intra-disciplinary and multi-disciplinary areas				X	
5	Ability to communicate effectively in English about technical subjects, both orally and in writing				X	
6	Ability to use, develop and implement new experiments and algorithms to solve scientific, engineering and financial problems				X	
7	Ability to analyze a mathematical problem using both analytical and numerical methods; use and compare theoretical and simulational methods to gain deeper insight				X	
8	Ability to report the findings, conclusions and interpretations related to a project in the area of pure and applied mathematics, ability to write technical reports, to prepare and conduct effective presentations				X	
9	Recognition of the need for lifelong learning; ability to access information, to follow developments in science and technology, and to keep continuous self improvement				X	
10	Awareness of professional and ethical responsibility issues and their legal consequences					X

Scale for contribution to a qualification: **0**-none, **1**-little, **2**-moderate, **3**-considerable, **4**-highest