



## COURSE INFORMATION FORM

<b>Faculty</b>	<b>Faculty of Engineering</b>	
<b>Program</b>	<b>B.Sc. in Civil Engineering</b>	<b>Required</b>
	<b>B.Sc. in Computer Engineering</b>	<b>Required</b>
	<b>B.Sc. in Electrical-Electronics Engineering</b>	<b>Required</b>
	<b>B.Sc. in Industrial Engineering</b>	<b>Required</b>
	<b>B.Sc. in Mechanical Engineering</b>	<b>Required</b>
<b>Semester</b>	<b>Fall 2017-2018</b>	

<b>Course Code</b>	MATH 211			
<b>Course Title in English</b>	Linear Algebra			
<b>Course Title in Turkish</b>	Lineer Cebir			
<b>Language of Instruction</b>	English			
<b>Type of Course</b>	Flipped Classroom			
<b>Level of Course</b>	Undergraduate			
<b>Course Category (by % of Content)</b>	Basic Science 100	Basic Engineering -	Engineering Design -	General Education -
<b>Semester Offered</b>	Fall			
<b>Contact Hours per Week</b>	Lecture: 3 hours	Recitation: -	Lab: -	Other: -
<b>Estimated Student Workload</b>	145 hours per semester.			
<b>Number of Credits</b>	6 ECTS			
<b>Grading Mode</b>	Standard Letter Grade			
<b>Pre-requisites</b>	None			
<b>Expected Prior Knowledge</b>	None			
<b>Co-requisites</b>	None			
<b>Registration Restrictions</b>	Only Undergraduate Students			
<b>Overall Educational Objective</b>	To learn the fundamentals of matrix theory and linear algebra relevant to engineering problems.			
<b>Course Description</b>	This course provides general concepts on linear algebra by covering the following topics: Systems of linear equations and matrices, Gaussian elimination, matrix algebra, inverse of a matrix, elementary matrices, LU-factorization, the determinant of a square matrix, the properties of determinants, Cramer's rule, vector spaces, subspaces, linear independence, basis and dimension, change of basis, inner product spaces, orthonormal basis, linear transformations, matrix representations of linear transformations, eigenvalues and eigenvectors, diagonalization.			
<b>Course Description in Turkish</b>	Bu derste lineer cebir genel kavramları şu konu başlıkları altında incelenmektedir: Lineer denklem sistemleri ve matrisler, Gauss eliminasyon yöntemi, matris cebri, bir matrisin tersi, elemanter matrisler, LU ayrıştırma, bir kare matrisin determinanı, determinanın özellikleri, Cramer kuralı, vektör uzayları, alt uzaylar, lineer bağımsızlık, baz ve boyut, baz değişimi, iç çarpım uzayları, ortonormal baz, lineer dönüşümler, lineer dönüşümün matris temsili, özdeğerler ve özvektörler, köşegenleştirme.			
<b>Course Learning Outcomes and Competencies</b>	Upon successful completion of the course, the learner is expected to be able to: 1. Solve the systems of linear equations by using Gauss elimination (a),			

2. Find the inverse of a square matrix and solve the systems of linear equations by using matrix inversion (a),
3. Compute the determinant of a matrix and solve the systems of linear equations by using Cramer's rule (a),
4. Demonstrate the concepts of the terms span, linear independence, basis, and dimension, and apply these concepts to various vector spaces and subspaces (a),
5. Identify linear transformations and compute their matrix representations (a),
6. Evaluate the eigenvalues and the corresponding eigenvectors of a matrix (a).

**Relation to Student Outcomes and Competencies: N=None S=Supportive H=Highly Related**

Relationship of the Course with the Student Outcomes and Competencies	Level	Learning Outcome #	Assessed by
<b>Program Outcomes</b>	N/S/H		Exam, Project, HW, Experiment, Presentation, etc.
(a) an ability to apply knowledge of mathematics, science, and engineering	H	1-6	Exams, Quizzes*
(b) an ability to design and conduct experiments, as well as to analyze and interpret data			
(b)-1. an ability to design/develop an experiment by identifying required assumptions, constraints, data collection methods and models			
(b)-2. Implement experimental procedures to conduct an experiment and use engineering judgment to draw conclusions			
(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			
(d)-1. Function effectively on a disciplinary team			
(d)-2. Function effectively on a multidisciplinary team			
(e) an ability to identify, formulate, and solve engineering problems			
(f) an understanding of professional and ethical responsibility			
(g) an ability to communicate effectively			
(g)-1. Communicate effectively with well-organized written documents			
(g)-2. Communicate effectively verbally with a range of audiences			
(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				
*can also be through FC practice only if quantified				
Prepared by and Date	Assoc. Prof. Dr. Hasan KÖRÜK / September 2017			
Name of Instructors	Assoc. Prof. Dr. Hasan KÖRÜK Prof. Dr. Metin GER			
Course Contents	Week	Topic		
	1.	Matrices and systems of equations.		
	2.	Matrices and systems of equations.		
	3.	Matrices and systems of equations.		
	4.	Matrices and systems of equations.		
	5.	Determinants.		
	6.	Determinants.		
	7.	Vector Spaces.		
	8.	Vector Spaces.		
	9.	Vector Spaces.		
	10.	Inner Product Spaces.		
	11.	Linear Transformations.		
	12.	Linear Transformations.		
	13.	Eigenvalues and Eigenvectors.		
	14.	Eigenvalues and Eigenvectors.		
	15.	Final Examination Period.		
	16.	Final Examination Period.		
Required / Recommended Readings	Elementary Linear Algebra, Ron Larson, Cengage Learning, 7th or 8th edition (ebook or hardcopy).  Steven J. Leon, Linear Algebra with Applications, Pearson, 8th edition, 2009. David C. Lay, Linear Algebra and Its Applications, Pearson, 4th edition, 2011.			
Teaching Methods	Lectures using "flipped classroom" as an active learning technique.			
Homework and Projects	-			
Laboratory Work	-			
Computer Use	-			
Other Activities	-			
Assessment Methods	<u>Types of Assessment</u>	<u>Number</u>	<u>Ratio (%)</u>	
	Midterm Exams	2	40	
	Quizzes	3-6	15	
	Flipped Learning Practice	8-14	10	
	Final Exam	1	35	
	Total	-	100	
Course Administration	<b>Section 1</b> <b>Instructor's office and phone number:</b> <b>Office hours:</b> <b>Email address:</b>		<b>Assoc. Prof. Dr. Hasan Körük</b> 5 <sup>th</sup> Floor, 0212 3953654 Tuesday 14:00-16:00 <a href="mailto:korukh@mef.edu.tr">korukh@mef.edu.tr</a>	
	<b>Section 2</b> <b>Instructor's office and phone number:</b>		<b>Prof. Dr. Metin Ger</b> 5 <sup>th</sup> Floor, 0212 3953600	

**Office hours:**  
**Email address:**

Tuesday 14:00-16:00

[germ@mef.edu.tr](mailto:germ@mef.edu.tr)

**Rules for attendance:** Classroom participation contributes to 10% of the final grade.

**Missing a quiz:** Provided that proper documents of excuse are presented, each missed quiz by the student will be given a grade which is equal to the average of all of the other quizzes. No make-up will be given.

**Missing a midterm:** Provided that proper documents of excuse are presented, each missed midterm by the student will be given the grade of the final exam. No make-up will be given.

**Missing a final:** Faculty regulations.

**Late policy for Flipped Classroom Participation:** There will be a penalty of 50% reduction in the mark of Flipped Classroom Participation when being late to the lecture.

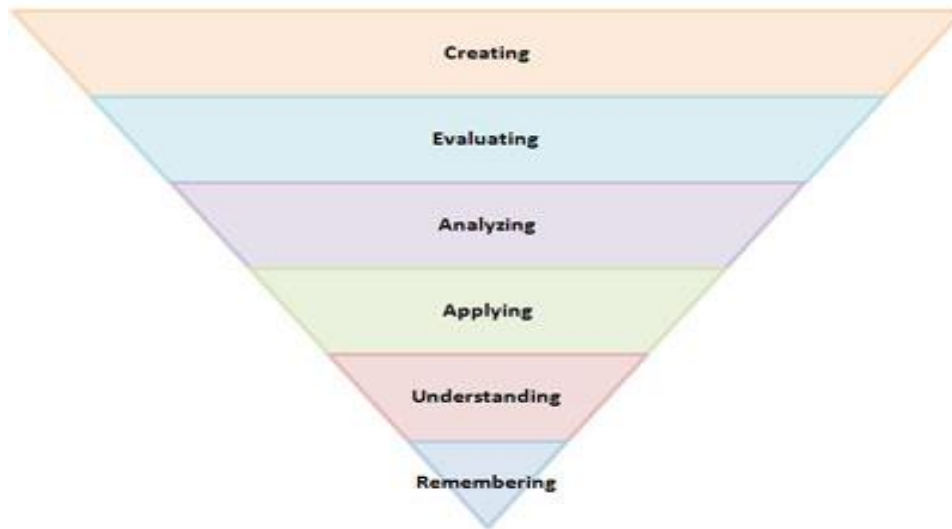
**A reminder of proper classroom behavior, code of student conduct:** YÖK Regulations.

**Statement on plagiarism:** YÖK Regulations (<http://www.mef.edu.tr/tr/yonetmelikler>).

ECTS Student Workload Estimation	Activity	No/Weeks	Hours			Calculation	Explanation
		No/Weeks per Semester (A)	Preparing for the Activity (B)	Spent in the Activity Itself (C)	Completing the Activity Requirements (D)		
	Lecture/Flipped Classroom	14	2	3	1	84	A*(B+C+D)
	Quizzes	5	2	1		15	A*(B+C+D)
	Midterm(s)	2	12	2		28	A*(B+C+D)
	Homework, Project					0	A*(B+C+D)
	Final Examination	1	16	2		18	A*(B+C+D)
	Total Workload					145	
	Total Workload/25					5,8	
	ECTS					6	

**Key verbs for cognitive domain in writing learning outcomes and competences:**

# Bloom's Taxonomy



Revised edition by Lorin Anderson (a student of Bloom)

## Key Verbs:

Remembering: defines, describes, identifies, knows, labels, lists, matches, names, outlines, recalls, recognizes, reproduces, selects, states.

Understanding: comprehends, converts, defends, distinguishes, estimates, explains, extends, generalizes, gives an example, infers, interprets, paraphrases, predicts, rewrites, summarizes, translates.

Applying: applies, changes, computes, constructs, demonstrates, discovers, manipulates, modifies, operates, predicts, prepares, produces, relates, shows, solves, uses.

Analyzing: analyzes, breaks down, compares, contrasts, diagrams, deconstructs, differentiates, discriminates, distinguishes, identifies, illustrates, infers, outlines, relates, selects, separates.

Evaluating: appraises, compares, concludes, contrasts, criticizes, critiques, defends, describes, discriminates, evaluates, explains, interprets, justifies, relates, summarizes, supports.

Creating: categorizes, combines, compiles, composes, creates, devises, designs, explains, generates, modifies, organizes, plans, rearranges, reconstructs, relates, reorganizes, revises, rewrites, summarizes, tells, writes.

## Key verbs for affective domain in writing learning outcomes and competences:

Receiving Phenomena: asks, chooses, describes, follows, gives, holds, identifies, locates, names, points to, selects, sits, erects, replies, uses.

Responding to Phenomena: answers, assists, aids, complies, conforms, discusses, greets, helps, labels, performs, practices, presents, reads, recites, reports, selects, tells, writes.

Valuing: completes, demonstrates, differentiates, explains, follows, forms, initiates, invites, joins, justifies, proposes, reads, reports, selects, shares, studies, works.

Organizing: adheres, alters, arranges, combines, compares, completes, defends, explains, formulates, generalizes, identifies, integrates, modifies, orders, organizes, prepares, relates, synthesizes.

Internalizing values: acts, discriminates, displays, influences, listens, modifies, performs, practices, proposes, qualifies, questions, revises, serves, solves, verifies.