

MM 216E Applied Mathematics for Mechanical Engineers				DEPARTMENT of MECHANICAL ENGINEERING					
Semester	Methods of Education							Credits	
	Lecture	Recit.	Lab.	Project / Field Study	Homework	Other	Total	Credit	ECTS Credit
4	42	-	-	23	60	-	125	3	5.0
Language	English								
Compulsory / Elective	Compulsory								
Prerequisites	None								
Course Contents	Vector spaces. Matrices and determinants. Algebraic eigenvalue problems. Coordinate transformations. Quadratic forms. Matrix functions. Vector differential calculus; gradient, divergence, curl and related vector identities. Green, Gauss divergence, and Stokes' theorems. Theory of analytic functions. Contour integration.								
Course Objectives	Improving capacity of mechanical engineering students to learn and solve the application problems about the main concepts of vector, matrice and integrals.								
Learning Outcomes and Competences	The capability to solve the application problems with the aid of vector definitions in one and two dimensional space, the learning of methods to solve linear system of equations, line, area and volume integrals together with the integral theorems.								
Textbook and / or Reference	1) G. Nakos and D.Joyner , Linear Algebra with Applications.Brooks/Cole Pub.Co. 1998., ISBN 0-534-95526-6. 2) O.Bretscher, Linear algebra with applications, Prentice-Hall, 1997. 3) P.V. O'Neil, Advanced Engineering Mathematics. 4) E. Kreyszig, Advanced Engineering Math.								
Assessment Criteria						If any, mark as (x)		Percentage (%)	
	Midterm Exams					X		40	
	Quizzes								
	Homeworks					X		20	
	Projects								
	Term Paper								
	Laboratory Work								
	Other								
Final Exam					X		40		
Instructors	Assoc.Prof. Atilla BIYIKOGLU, Assoc.Prof. Ezgi GUNAY, Assist.Prof. Tuncay KARACAY								
Week	Subject								
1-2-3	Linear algebra: Matrices, vectors, determinants. Inverse of a matrix. Matrix algebra. Linear algebraic systems. Echelon form.Gauss and Gauss-Jordan elimination method for the solution of linear systems. Rank of a matrix. Linear independence-dependence, vector space. Inner product spaces. Linear transformations. Singular-value decomposition and polar decomposition of a matrix.								
4-5-6	Matrix eigenvalue problems: Eigenvalues and eigenvectos of a square matrix. Symmetric antisymmetric, and orthogonal matrices. Similarity of matrices. Basis of eigenvectors. Diagonalization. Transformation of quadratic forms from arbitrary to principal directions. Application to differential systems.								
7-8-9-10	Vector differential calculus: Gradient, divergence, curl. Vector integral calculus: Line integral, double integral, triple integral, surface integrals, Gauss divergence and Stokes' integral theorems.								
11-12-13-14	Complex numbers and complex elementary functions. Derivative. Analytic functions. Cauchy-Riemann equations. Line integral in the complex plane. Cauchy's integral theorem. Cauchy's integral formula.Taylor series and Laurent series. Singularities and zeros. Calculus of residues: Evaluation of real integrals.								