Course Description Form	
Course Code and Name	ME216 Applied Mathematics for Mechanical Engineers
Course Semester	4
Catalog Content	Vector spaces. Matrices and determinants. Algebraic eigenvalue problems. Coordinae transformations. Quadratic forms. Matrix functions. Analysis of vector functions. Gradient. Divergence. Curl. Differential vector identities. Vector integral theorems. Green. Gauss. Divergence and Stokes integral theorems. Analytical functions. Contour integrations.
Textbook	1) P.V. O'Neil, Advanced Engineering Mathematics, Cengage Learning.
Supplementary Textbooks	1) G. Nikos and D. Joyner, Linear Algebra with applications.Brooks/Cole Co. 2) O. Bretscher, Linear Algebra with Applications, Pearson.
Credit	5
Prerequisites of the Course (Attendance Requirements)	
Type of the Course	Compulsory
Instruction Language	English
Course Objectives	To improve mechanical engineering students' ability to solve vector, matrix and integral problems as well as problems related to their application
Course Learning Outcomes	1. The capability to solve the application problems with the aid of vector definitions in one and multidimensional space. 2. Knowledge of the methods for solving linear system of equations and apply these methods. 3. Knowledge about eigenvalues and eigenvectors of a matrix and find these values. 4. Knowledge of system of differential equations solutions methods and apply them. 5. Definitions of line, area and volume integrals, related integral theorems and learning how to apply them.
Instruction Methods	Face to face
Weekly Schedule	1. Week Linear algebra: Matrices, vectors, determinants. Inverse of a matrix. Matrix algebra. Linear algebraic systems. Echelon form. 2. Week Gauss and Gauss-Jordan elimination method for the solution of linear systems. Rank of a matrix. Linear independence-dependence, 3. Week Vector spaces. Inner product spaces. Linear transformations. Singular-value decomposition and polar decomposition of a matrix. 4. Week Matrix eigenvalue problems: Eigenvalues and eigenvectros of a square matrix. Symmetric antisymmetric, and orthogonal matrices. Similarity of matrices 5. Week Basis of eigenvectors. Diagonalization. Transformation of quadratic forms from arbitrary to principal directions. 6. Week Application to differential systems.Vector differential calculus: Gradient, divergence, curl. 7. Week Vector integral calculus: Line integral, double integral, triple integral,

	8. Week Midterm Exam I: Surface integrals, 9. Week Surface integrals, 10. Week Gauss divergence and Stokes' integral theorems. 11. Week Complex numbers and complex elementary functions. Derivative. Analytic function 12. Week Midterm Exam I: Cauchy-Riemann equations. Line integral in the complex plane. 13. Week Cauchy's integral theorem. 14. Week Cauchy's integral formula. 15. Week Final Exam.
Teaching and Learning Methods *(These are examples. Please fill which activities you use in the course)*	Weekly theoretical course hours: 3 Weekly applied course hours: 0 Reading Activities: 1 Internet browsing, library work: 3 Designing and implementing materials: 0 Report preparing: 0 Preparing a Presentation: 0 Presentations 0 Preparation of Midterm and Midterm Exam: 10 Final Exam and Preparation for Final Exam: 10
Assessment Criteria	

	Numbers	**Total Weighting (%)**
Midterm Exams	2	54
Assignment	0	0
Application	0	0
Projects	0	0
Practice	0	0
Quiz	3	6
Percent of In-term Studies (%)		60
Percentage of Final Exam to Total Score (%)		40
Attendance		0

Workload

Activity	**Total Number of Weeks**	**Duration (weekly hour)**	**Total Period Work Load**
Weekly Theoretical Course Hours	14	3	42
Weekly Tutorial Hours			0
Reading Tasks	11	1	11
Studies	11	3	33
Material Design and Implementation			0
Report Preparing			0
Preparing a Presentation			0
Presentations			0
Midterm Exam and Preperation for Midterm Exam	2	10	20
Final Exam and Preperation for Final Exam	1	10	10
Other (should be emphasized)	3	3	9
Total Workload			125
Total Workload / 25			5
Course Credit (ECTS)			5

Contribution Level Between Course Learning Outcomes and Program Outcomes

No	Program Outcomes	1	2	3	4	5
1	Adequate knowledge of subjects specific to mathematics, natural sciences and related engineering disciplines; ability to use theoretical and applied knowledge related to these areas in complex engineering problems.				X	
2	Ability to identify, define, formulate, and solve complex engineering problems; ability to select and apply appropriate analysis and modeling methods to this end.				X	
3	Ability to design a complex system, process, device or product under realistic constraints and conditions to meet specific requirements; ability to apply modern design methods for this purpose			X		
4	Ability to develop, select and use modern techniques and tools required for the analysis and solution of complex problems encountered in engineering practice; ability to use information technologies effectively.			X		
5	Ability to design and conduct experiments, collect data, analyze and interpret results to investigate complex engineering problems or discipline-specific research topics					
6	Ability to work effectively in disciplinary and multi-disciplinary teams; ability to work individually.					
7	Ability to communicate effectively in Turkish, both orally and in writing; knowledge of at least one foreign language; the ability to write effective reports and understand written reports, to prepare design and production reports, to deliver effective presentations, to give and receive clear and understandable instructions.					
8	Awareness of the necessity of lifelong learning; the ability to access information, to follow developments in science and technology, and to renew oneself constantly.					
9	Acting in accordance with ethical principles, professional and ethical responsibility; information about standards used in engineering applications.					
10	Information about business life practices such as project management, risk management and change management; awareness of entrepreneurship, innovation; information about sustainable development.					
11	Knowledge about the universal and social effects of engineering applications on health, environment and safety and the problems of the age reflected in the engineering field; awareness of the legal consequences of engineering solutions.					

The Course's Lecturer(s) and Contact Informations

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