COURSE DESCRIPTION FORM	
Course Code and Title	MATH202 ENGINEERING MATHEMATICS
Semester	4
Catalog description	Vector analysis, matrices, systems of linear equations, linear transformations, change of basis, eigenvalue problems, quadratic forms and diagonalization. Gradient, divergence, curl. Line, surface and volume integrals. Green, Gauss and Stokes' theorems.
Required reading	Kreyszig, E., Advanced Engineering Mathematics, John Wiley and Sons
Recommended reading	O'Neil, P.V., Advanced Engineering Mathematics, Cengage Learning
ECTS	5
Prerequisites and co-requisites	Prerequisite of this course is: **MATH102 MATHEMATICS II** Required attendance to lectures is at least 70% of total term hours.
Compulsory/Elective	Compulsory course
Language of instruction	English
Aim of course	The aim of this course to teach fundamental concepts of linear algebra, vector spaces, and vector calculus relevant to engineering.
Learning outcomes of the course unit	Upon completion of the course student should be able to; 1. apply knowledge of mathematics, science, and engineering 2. identify, formulate, and solve engineering problems
Mode of delivery	The mode of delivery of this course is face to face.
Course content	1. Introduction to vectors, basic definitions, vector operations, vector spaces and linear algebra. 2. Linear independence, span, basis, inner product, orthogonality, vector norms. Directional derivative and gradient of a scalar function. Divergence and curl of a vector function. Conservative, solenoidal and irrotational fields. 3. Derivative of a vector function, partial derivative. Parametric representation of curves. Tangent vector, arc length. 4. Gradient, divergence and curl. 5. Line integrals of vector functions. 6. Surface and volume integrals. 7. Integral theorems: Green, Gauss and Stokes' theorems. 8. Midterm Examination 8. Matrices, matrix operations, transpose of a matrix, special matrices, row echelon form of a matrix, rank and norm of matrices, elementary row and column operations, echelon forms. 9. Determinant of a matrix, properties of determinants. Submatrices, minors, cofactors, inverse of a matrix by adjoint (cofactor) method. 10. System of linear algebraic equations. Homogeneous and non-homogeneous systems. 11. Solution of a system of equations by matrix inversion method, Cramer's rule and Gauss elimination method. 12. Gauss-Jordan method, consistent and inconsistent systems, general solution. Determinant and inverse of a matrix by Gauss elimination method. 13. Eigenvalue problems, basic definitions, eigenvalues and eigenvectors, modal matrix, equivalence and similarity transformations. 14. Diagonalization of a matrix, powers of a square matrix.

	15. Cayley-Hamilton theorem, quadratic forms, positive definiteness, diagonal form of quadratic forms.
Planned learning activities and teaching methods	4 lecture hours per week (4+0) Reading Midterm exam and required works Final exam and required works

Assessment methods and criteria

	Quantity	Percentage (%)
Mid-terms	1	60
Assignment	-	-
Exercises	-	-
Projects	-	-
Practice	-	-
Quiz	-	-
Contribution of In-term Studies to Overall Grade %		60
Contribution of Final Examination to Overall Grade (%)		40
Attendance		

Workload

Work activity	Total Week Count	Weekly Duration (in hour)	Total Workload in Semester
Theoretical Study Hours of Course Per Week	14	4	56
Practicing Hours of Course Per Week	0	0	0
Reading	13	3	39
Searching in Internet and Library	0	0	0
Designing and Applying Materials	0	0	0
Preparing Reports	0	0	0
Preparing Presentation	0	0	0
Presentation	0	0	0
Mid-Term and Studying for Mid-Term	1	10	10
Final and Studying for Final	1	15	15
Other	0	0	0
Total Workload:			120
Total Workload / 25:			4,8
ECTS:			5

Course's contribution to program

No	Program Learning Outcomes	1	2	3	4	5
1	Adequate knowledge in mathematics, science and engineering subjects pertaining to the relevant discipline; ability to use theoretical and applied knowledge in these areas in complex engineering problems.					X
2	Ability to identify, formulate, and solve complex civil engineering problems; ability to select and apply proper analysis and modeling methods for this purpose.				X	
3	Ability to design a complex system, process, device or product under realistic constraints and conditions, in such a way as to meet the desired result; ability to apply modern design methods for this purpose.	X				
4	Ability to devise, select, and use modern techniques and tools needed for analyzing and solving complex problems encountered in civil engineering practice; ability to employ information technologies and to use at least	X				

	one computer programming language effectively.						
5	Ability to design and conduct experiments, gather data, analyze and interpret results for investigating complex civil engineering problems or discipline specific research questions.		X				
6	Ability to work efficiently in intra-disciplinary and multi-disciplinary teams.		X				
7	Ability to work individually.			X			
8	Ability to communicate effectively in Turkish, both orally and in writing; ability to write effective reports and comprehend written reports.			X			
9	Knowledge of English of B1 level according to Common European Framework of Reference.	X					
10	Prepare design and production reports, make effective presentations, and give and receive clear and intelligible instructions.	X					
11	Recognition of the need for lifelong learning; ability to access information, to follow developments in science and technology, and to continue to educate him/herself.		X				
12	Consciousness to behave according to ethical principles and professional and ethical responsibility.		X				
13	Knowledge on standards used in civil engineering practice.		X				
14	Knowledge about business life practices such as project management, risk management, and change management.	X					
15	Awareness in entrepreneurship, innovation; knowledge about sustainable development.	X					
16	Knowledge about the global and social effects of engineering practices on health, environment, and safety, and contemporary issues of the century reflected into the field of engineering.	X					
17	Awareness of the legal consequences of engineering solutions.	X					

Name of lecturer(s) and contact information	1. Assoc. Prof. Dr. Dr. Bayram Çekim bayramcekim@gazi.edu.tr 2. Assoc. Prof. Dr. Aytekin Bayram ÇIBIK abayram@gazi.edu.tr