COURSE DESCRIPTION FORM	
Course Code and Title	CE343 NUMERICAL ANALYSIS
Semester	5
Catalog description	Mathematical Modelling, Error Analysis, Roots of Equations: Bracketing and Open Methods, Solution Methods for Linear Algebraic Equations and Systems of Nonlinear Equations. Curve Fitting: Linear and Nonlinear Regression, Interpolation, Numerical Differentiation and Integration Methods, Numerical methods for solving Ordinary Differential Equations, Introduction to Finite Difference Methods for solving Partial Differential Equations
Required reading	Steven C. ChapraandCanale R.P. "Numerical Methods for Engineers", McGraw-Hill.
Recommended reading	-
ECTS	3
Prerequisites and co-requisites	There is no prerequisite or co-requisite for this course.
Compulsory/Elective	Compulsory
Language of instruction	English
Aim of course	To improve the ability of students to use numerical methods, to teach the modeling of engineering problems to the students and to develop appropriate solution strategies.
Learning outcomes of the course unit	An ability to use numerical methods Modelling of engineering problems and development of solution strategies using numerical methods accordance with this model Finding solution using numerical methods for differential equations that do not have any analytical solution Computer programming application on engineering problems
Mode of delivery	The mode of delivery of this course is face to face.
Course content	1. Introduction, Mathematical Modelling, Error Analysis 2. Roots of Equations 1: Bracketing Methods;Graphical Methods, The Bisection Method, The False Position Method 3. Roots of Equations 2: Open Methods; Simple Fixed-Point Iteration, The Newton Raphson Method, The Secant Method Systems of Nonlinear Equations 4. Linear Algebraic Equations 1: Gauss Elimination, Gauss-Seidel, Gauss-Jordan Methods 5. Linear Algebraic Equations 2: L-U Decomposition and Matrix Inverse 6. Curve Fitting 1: Least-Squares Regression; Linear Regression, Polynomial Regression, Multiple Linear Regression, Nonlinear Regression 7. Curve Fitting 2: Interpolation; Newton's Divided-Difference Interpolating Polynomials, Lagrange Interpolating Polynomial 8. Curve Fitting 2: Interpolation; Newton's Divided-Difference Interpolating Polynomials, Lagrange Interpolating Polynomial and Mid-Term Examination I 9. Numerical Integration 1: Newton Cotes Integration Formulas: The Trapezoidal Rule, Simpson's Rule 10. Numerical Integration 2: Multiple Integrals, Improper Integrals, Numerical Differentiation:High-Accuracy Differentiation Formulae,Partial Derivatives 11. Ordinary Differential Equations 1: Euler's Method, Improvements of Euler's Method, Runge-Kutta Methods 12. Ordinary Differential Equations 2: Systems of Equations,

Boundary-Value and Eigenvalue Problems
13. Partial Differential Equations 1: Finite Difference and Elliptic Equations
14. Partial Differential Equations 2: Finite Difference and Parabolic Equations
15. Mid-Term Examination II

Planned learning activities and teaching methods

3 lecture hours per week (3+0)
Midterm exam and required works
Final exam and required works

Assessment methods and criteria

	Quantity	Percentage (%)
Mid-terms	2	50
Assignment	6	10
Exercises	-	-
Projects	-	-
Practice	-	-
Quiz	-	-
Contribution of In-term Studies to Overall Grade %	-	60
Contribution of Final Examination to Overall Grade (%)	-	40
Attendance	-	-

Workload

Efficiency	**Total Week Count**	**Weekly Duration (in hour)**	**Total Workload in Semester**
Theoretical Study Hours of Course Per Week	14	3	42
Practicing Hours of Course Per Week	14	0	0
Reading	14	0	0
Searching in Internet and Library	14	0	0
Designing and Applying Materials	14	0	0
Preparing Reports	14	1	14
Preparing Presentation	14	0	0
Presentation	14	0	0
Mid-Term and Studying for Mid-Term	2	5	10
Final and Studying for Final	1	7	7
Other	0	0	0
Total Workload:			73
Total Workload / 25:			2,92
ECTS:			3

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.					

	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 one computer programming language effectively.		X			
	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.					
	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.					
	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.					
	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.					
	12	Consciousness to behave according to ethical principles and professional and ethical responsibility.					
	13	Knowledge on standards used in civil engineering practice.					
	14	Knowledge about business life practices such as project management, risk management, and change management.					
	15	Awareness in entrepreneurship, innovation; knowledge about sustainable development.					
	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.					
	17	Awareness of the legal consequences of engineering solutions.					

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