Course Description Form	
Course Code and Name	ME 313 INTRODUCTION TO NUMERICAL ANALYSIS
Course Semester	5
Catalog Content	Finite difference, interpolation and extrapolation, solution of nonlinear equations, numerical integration and derivative, systems of linear equations and matrices, least squares method, solutions of ordinary differential equations, introduction to boundary value problems.
Textbook	Numerical Methods for Engineers, S. C. Chapra and R. P. Canale, McGraw-Hill
Supplementary Textbooks	1. Numerical Methods for Engineers, B. M. Ayyub and R. H. McCuen, Prentice Hall 2. Applied Numerical Methods with Software, S. Nakamura, Prentice Hall
Credit	4
Prerequisites of the Course (Attendance Requirements)	-
Type of the Course	Compulsory
Instruction Language	English
Course Objectives	To introduce the fundamental numerical methods used for the solution of engineering problems.
Course Learning Outcomes	1. Understanding and application of the methods to find the roots of an equations. 2. Students are expected to be able to apply basic numerical methods about the system of linear algebraic equations. 3. Students are expected to understand and apply the curve fitting methods. 4. Students are expected to understand and apply the basic knowledge of numerical differentiation and integration. 5. Students are expected to understand and apply the basic knowledge of numerical solution of differential equations.
Instruction Methods	Lecture, Question & Answer, Drill - Practise
Weekly Schedule	1. Week: INTRODUCTION: Numerical methods used for problem solving. Steps in solving a problem with a computer. Mathematical modelling. 2. Week: ROOTS OF EQUATIONS: Graphical methods. Bracketing methods: Bisection and false-position methods. 3. Week: ROOTS OF EQUATIONS: Open methods: Simple one-point iteration, Newton–Raphson, secant and modified Newton–Raphson methods. 4. Week: SYSTEMS OF LINEAR ALGEBRAIC EQUATIONS: Introduction. Methods for solving systems of linear algebraic equations. Gauss elimination method. 5. Week: SYSTEMS OF LINEAR ALGEBRAIC EQUATIONS: Matrix inversion method. Gauss-Seidel method. LU decomposition methods 6. Week: CURVE FITTING: Introduction. Least square regression: Linear regression, polynomial regression and multiple linear regression. 7. Week: CURVE FITTING: Interpolation methods: Newton Interpolation, Lagrange interpolation 8. Week: Midterm 1: CURVE FITTING: Interpolation methods: quadratic spline interpolation.Cubic spline interpolation.

	9. Week: NUMERICAL INTEGRATION: Introduction. Numerical integration methods: Newton–Cotes formulas, trapezoidal rule. 10. Week: NUMERICAL INTEGRATION: Simpson's rules: Simpson's 1/3 rule, Simpson's 3/8 rule. 11. Week: NUMERICAL DIFFERENTIATION: Introduction. Finite difference approximations of the first and the second derivatives: Forward, backward and central diff 12. Week: NUMERICAL DIFFERENTIATION: Derivatives of unequally spaced data. 13. Week: Midterm 2: NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS: Euler's method, Runge–Kutta methods. 14. Week: NUMERICAL SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS 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:2 Preparation of Midterm and Midterm Exam:10 Final Exam and Preparation for Final Exam:10

Assessment Criteria

	Numbers	Total Weighting (%)
Midterm Exams	2	50
Assignment	5	5
Application	0	0
Projects	0	0
Practice	2	0
Quiz	3	5
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	8	1	8
Studies	10	2	20
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)			0
Total Workload			100
Total Workload / 25			4.0
Course Credit (ECTS)			4

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	1. ndinler@gazi.edu.tr, Dr. Nureddin Dinler 2. pirasaci@gazi.edu.tr, Dr. Tolga Pırasacı						