



HASAN KALYONCU UNIVERSITY
Faculty of Engineering
Course Description Form

COURSE: Numerical Analysis					
CODE: MATH214		SEMESTER: SPRING			
LANGUAGE: ENGLISH		TYPE: COMPULSORY			
PRE-REQUISITES:- CO-REQUISITES:-		THEORY	PRACTICAL	CREDIT	ECTS
WEEKLY HOURS:3		3	0	3	5

CONTENT OF THE COURSE:

Methods for finding Roots of Equations: The Intermediate Value Theorem, The Mean Value Theorem, The Rolle's Theorem, Taylor Series, Approximations and Errors, Bisection, Newton-Raphson Method, Lagrange polynomial interpolation, System of Non-linear Equations, System of Linear Algebraic Equations: Gauss Elimination, Matrix Inversion, Gauss-Seidel Iteration, Least Squares Regression, Polynomial Interpolation, Numerical Differentiation, Numerical Integration, Newton-Cotes Formulae, Romberg's and Gauss-Quadrature Integration, Solution of Ordinary Differential Equations, Euler, Runge-Kutta, Multi-Step Methods, Initial-Value Problems, Boundary-Value Problems

OBJECTIVE OF THE COURSE:

Enhancing problem solving skills: Numerical methods are extremely powerful problem-solving tools. Construction and use of numerical systems for solving a problem.

WEEKLY SCHEDULE

Week	Topics
1	Methods for finding Roots of Equations: The Intermediate Value Theorem, The Mean Value Theorem, The Rolle's Theorem
2	Taylor Series, Approximations and Errors
3	Bisection Method
4	Newton-Raphson Method,
5	Lagrange Polynomial Interpolation
6	System of Non-linear Equations System of Linear Algebraic Equations: Gauss Elimination, Matrix Inversion, Gauss-Seidel Iteration
7	Least Squares Regression
8	Midterm
9	Numerical Differentiation
10	Numerical Integration, Newton-Cotes Formula
11	Romberg's and Gauss-Quadrature Integration
12	Solution of Ordinary Differential Equations
13	Euler, Runge-Kutta, Multi-Step Methods
14	Initial-Value Problems, Boundary-Value Problems

TEXTBOOK: Numerical Analysis , 9th ed., by Burden & Faires, edited by Brooks & Cole 2001.

PO: Program Outcomes LO: Learning Outcomes Values: 0: None 1: Low 2: Medium 3: High
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LEARNING OUTCOMES OF THE COURSE:	PROGRAM OUTCOMES:
<p>LO1: A comprehension of mathematics (algebra, differential, integration ...) and fundamentals of science</p> <p>LO2: Ability to apply knowledge of mathematics, science and engineering to problems in electronics engineering.</p> <p>LO3: Ability to recognize the needs and challenges of our age and to assess the global and social impact of engineering solutions</p> <p>LO4: Ability to identify, formulate and solve engineering problems.</p> <p>LO5: Ability to effectively communicate knowledge and opinions via written, oral visual means.</p>	<p>PO1: 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.</p> <p>PO2: Ability to identify, formulate, and solve complex engineering problems; ability to select and apply proper analysis and modeling methods for this purpose.</p> <p>PO3: 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.</p> <p>PO4: Ability to devise, select, and use modern techniques and tools needed for analyzing and solving complex problems encountered in engineering practice; ability to employ information technologies effectively.</p> <p>PO5: Ability to design and conduct experiments, gather data, analyze and interpret results for investigating complex engineering problems or discipline specific research questions.</p> <p>PO6: Ability to work efficiently in intra-disciplinary and multi-disciplinary teams; ability to work individually.</p> <p>PO7: Ability to communicate effectively in Turkish, both orally and in writing; knowledge of a minimum of one foreign language; ability to write effective reports and comprehend written reports, prepare design and production reports, make effective presentations, and give and receive clear and intelligible instructions.</p> <p>PO8: 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.</p> <p>PO9: Consciousness to behave according to ethical principles and professional and ethical responsibility; knowledge on standards used in engineering practice.</p> <p>PO10: Knowledge about business life practices such as project management, risk management, and change management; awareness in entrepreneurship, innovation; knowledge about sustainable development.</p> <p>PO11: 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; awareness of the legal consequences of engineering solutions.</p>