



**HASAN KALYONCU UNIVERSITY**  
**Faculty of Engineering**  
**Course Description Form**

<b>COURSE:</b> Differential Equations				
<b>CODE:</b> MATH212		<b>SEMESTER:</b> SPRING		
<b>LANGUAGE:</b> ENGLISH		<b>TYPE:</b> COMPULSORY		
<b>PRE-REQUISITES:-</b>	<b>THEORY</b>	<b>PRACTICAL</b>	<b>CREDIT</b>	<b>ECTS</b>
<b>CO-REQUISITES:-</b>				
<b>WEEKLY HOURS:</b>	3	0	3	5

**CONTENT OF THE COURSE:**

Classification of differential equations, solutions, initial value and boundary value problems, existence of solutions, First-Order Equations for which exact solutions are obtainable, Solution methods of high order linear differential equations, Electric circuit problems, Laplace Transform; definitions, theorems, examples, solution of linear, constant-coefficient initial-value problems, theorems, convolution integral and theorem, Impulse function and response, system function. Systems of Linear Differential Equations, Solutions of systems of linear differential equations.

**OBJECTIVE OF THE COURSE:**

To create the necessary infrastructure for the solution of differential equations in electrical and electronics engineering courses and applications.

**WEEKLY SCHEDULE**

<b>Week</b>	<b>Topics</b>
1	Classification of differential equations, solutions, initial value and boundary value problems, existence of solutions.
2	First-Order Equations for which exact solutions are obtainable.
3	First-Order Equations for which exact solutions are obtainable.
4	Solution methods of high order linear differential equations.
5	Solution methods of high order linear differential equations.
6	Solution methods of high order linear differential equations.
7	Electric Circuit Problems.
8	MIDTERM
9	Laplace Transform; definitions, theorems, examples.
10	Laplace Transform; solution of linear, constant-coefficient initial-value problems.
11	Laplace Transform; theorems, convolution integral and theorem.
12	Impulse function and response, system function. Systems of Linear Differential Equations.
13	Solutions of systems of linear differential equations.
14	Solutions of systems of linear differential equations.

**TEXTBOOK:**

Fundamentals of Differential Equations, Global Edition, 9/E, Nagle, Saff, Snider, Pearson.

**REFERENCE BOOKS:**

Differential Equations, Paul's Online Notes, Paul Dawkins.



<b>LO2</b>	3	1	0	0	0	0	0	0	0	0	0
<b>LO3</b>	3	2	0	0	0	0	0	0	0	0	0
<b>LO4</b>	3	0	0	0	0	0	0	0	0	0	0
<b>LO5</b>	3	0	0	0	0	0	0	0	0	0	0
<b>LO6</b>	3	0	0	0	0	0	0	0	0	0	0
<b>LO7</b>	3	0	0	0	0	0	0	0	0	0	0
PO: Program Outcomes   LO: Learning Outcomes Values: 0: None   1: Low   2: Medium   3: High											

<b>LEARNING OUTCOMES OF THE COURSE:</b>	<b>PROGRAM OUTCOMES:</b>
<p><b>LO1:</b>Recognizes basic DE types and grasps basic definitions, the meaning of solution functions, the initial-value problem concept.</p> <p><b>LO2:</b> Recognize 1st order equation types for which exact solutions are available, and should be able to solve them; separable, linear, exact and those reducible to them.</p> <p><b>LO3:</b> Understands solution character of homogeneous and nonhomogeneous linear DE's, the relation between them, and solves linear DE's with constant coefficients by two methods; (i) applying the method of undetermined coefficients, and (ii) using the method of variation of parameters.</p> <p><b>LO4:</b>Analyzes electrical circuits by solving linear DE's with constant coefficients.</p> <p><b>LO5:</b>Grasps definitions of Laplace and inverse Laplace transforms, their basic properties, performs simple transform calculations and solves linear DE's with constant coefficients by means of Laplace transform.</p> <p><b>LO6:</b>Understands the concepts of impulse function and response, system function, convolution integral and convolution theorem of Laplace transform.</p> <p><b>LO7:</b>Solves systems of linear DE's with constant coefficients in Laplace domain and by means of the matrix exponential and understands the equivalence of the two.</p>	<p><b>PO1:</b> 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><b>PO2:</b> Ability to identify, formulate, and solve complex engineering problems; ability to select and apply proper analysis and modeling methods for this purpose.</p> <p><b>PO3:</b> 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><b>PO4:</b> 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><b>PO5:</b> Ability to design and conduct experiments, gather data, analyze and interpret results for investigating complex engineering problems or discipline specific research questions.</p> <p><b>PO6:</b> Ability to work efficiently in intra-disciplinary and multi-disciplinary teams; ability to work individually.</p> <p><b>PO7:</b> 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><b>PO8:</b> 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><b>PO9:</b> Consciousness to behave according to ethical principles and professional and ethical responsibility; knowledge on standards used in</p>

	<p>engineering practice.</p> <p><b>PO10:</b> Knowledge about business life practices such as project management, risk management, and change management; awareness in entrepreneurship, innovation; knowledge about sustainable development.</p> <p><b>PO11:</b> 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>
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