ESOGÜ Electrical-Electronics Engineering Department

COURSE CODE: **COURSE TITLE:** Differential Equations

Semester	Weekly Hours		COURSE			
	Theoretical	**Practical**	**Credits**	**ECTS**	**Type**	**Language**
3	4	0	4	7	Compulsory (X) Elective ( )	Turkish ( ) English (X)

Write the credit (for non-credit courses weekly hours) below (If necessary distribute the credits.).				
Math and Basic Science	**Electrical Engineering** [mark (Ö) if there is high design content]		**General Education**	**Humanities**
4	0	( )	0	0

Assessment	THEORETICAL-PRACTICAL COURSES			LABORATORY COURSES		
	Type	**Number**	**%**	**Activity Type**	**Number**	**%**
Midterm	Midterm	1	40	Quiz		
	Quiz			Lab performance		
	Homework			Report		
	Project			Oral exam		
	Other (Laboratory)			Other (………)		
Final			60			
Makeup exam (Oral/Written)						

Prerequisites	-
Brief content of the course	Definitions and classifications, Existence of a unique solution, Exact equations, Separable equations, Homogeneous equations, Linear equations, Bernouilli equations, Riccati equations, Orthogonal trajectories, Oblique trajectories, Solving higher order linear differential equations, An order reduction technique Homogeneous linear differential equations with constant coefficients, Undetermined coefficients method, Variation of parameters method, The Cauchy-Euler equation, Power series solutions, Differential operators, The Laplace transform, Solving Bessel's equation, Sturm-Liouville Boundary Value Problems, Picard's iterations, Euler Equation, Partial Differential Equations, PDE model of traffic flow, Phase plane analysis
Objectives of the course	Teaching fundamental methods to solve of differential equations and systems of differential equations.
Contribution of the course towards professional education	The purpose of the course is to provide an understanding on differential equations, ability to classify and solve differential equations and systems of differential equations.
Outcomes of the course	1. Differential equations basics. 2. Differential equations tools. 3. Solving a wide class of differential equations and systems of differential equations.
Textbook of the course	- Shepley L. Ross, Differential Equations, 3rd edition, John Wiley and Sons, 1984.
Other reference books	
Required material for the course	

WEEKLY PLAN OF THE COURSE	
Week	**Topics**
1	Definitions and classifications, Solution of a differential equation, Existence of a unique solution, Exact differential equations
2	Integrating factors, Separable differential equations, Homogeneous differential equations, Linear differential equations, Bernouilli differential equations
3	Riccati differential equations, Orthogonal trajectories, Oblique trajectories, More on the Existence and Uniqueness
4	Solving higher order linear differential equations, An order reduction technique, Homogeneous linear differential equations with constant coefficients
5	Undetermined coefficients method, Variation of parameters method, The Cauchy-Euler equation
6	Power series solutions about an ordinary point, Power series solutions about a singular point, The Method of Frobenius.
7	Solving diff. equation systems using differential operators, The Laplace transform, Existence of the Laplace Transform, Solving differential equations using Laplace transforms
8	Midterm
9	Partial Fractions Decomposition, Solving Bessel's differential Equation using laplace Transforms
10	Solving differential equation systems using eigenstructures
11	Sturm-Liouville Boundary Value Problems, Solving first order differential equations using Picard's iterations, Euler Equation, Solving Bessel's Diff. Equation of Order Zero using power series, An application: Dynamics of Disease Spreading, An application: Population growth model,
12	Partial differential Equations basics, Solving Partial differential Equations using the Separation of Variables, PDE model of traffic flow
13	Approximate methods of solving first order differential equations. The method of isoclines.
14	Phase plane analysis
15,16	Final

NO	OUTCOMES OF THE PROGRAMME	4	3	2	1
1	Adequate knowledge of mathematics, science and Electrical and Electronics Engineering; ability to practice theoretical and practical knowledge of these areas into modeling and solving complex problems of Electrical and Electronics Engineering.	X			
2	Ability to identify complex engineering problems in Electrical and Electronics Engineering and related fields, for this purpose having skills to formulate, select and apply appropriate methods.				X
3	Having skills to apply modern design methods to design a complex system, process, equipment or product that should work under realistic conditions and constraints and satisfy specific requirements concerning the Electrical and Electronics Engineering.				X
4	Having skills to develop, select and apply modern techniques and tools needed to analyze and solve complex applications in Electrical and Electronics Engineering, skills to use information technology effectively.				X
5	Skills to design and conduct tests, collect data, analyze results, and interpret data for the experimental investigation of complex problems in Electrical and Electronics Engineering.				X
6	Ability to function effectively as an individual and as a member of teams within the discipline and in multidiscipline areas.				X
7	Communicating effectively in oral and written form both in Turkish and English. Effective eport writing and understanding written reports, preparing design and manufacturing reports, making effective presentations, skills to give and receive clear and concise instructions.				X
8	Awareness of the necessity of lifelong learning, access to information, monitoring developments in science and technology and the ability to self-renewing.				X
9	Understanding of professional and ethical responsibility.				X
10	Information on project management, change management and risk management practices, awareness on entrepreneurship and innovation, knowledge on sustainable development.				X
11	Information about universal and societal effects of engineering applications on health, safety and environment; awareness of the legal consequences of engineering solutions.				X

Scale for assessing the contribution of the course to the program outcomes:

4: High   3: Medium   2: Low   1:None

Name of Instructor(s):   Prof. Dr. Gökhan ÇINAR

Signature(s):   **Date:**