



**ESOGU ELECTRICAL - ELECTRONICS ENGINEERING DEPARTMENT
COURSE INFORMATION FORM**

Course Title	Course Code
Differential Equations	151223562

Semester in Program	Number of Course Hours per Week		ECTS
	Theory	Practice	
3	4	0	7

Course ECTS Credit Distribution				
Basic Sciences	Engineering Sciences	Design	General Education	Social
7				

Language of Instruction	Course Level	Course Type
English	Undergraduate	Required

Prerequisite	
Objectives of the Course	Teaching fundamental methods to analyze and solve differential equations and systems of differential equations.
Brief Course Content	Definitions and classifications, Existence of a unique solution, Exact equations, Separable equations, Homogeneous equations, Linear equations, Bernoulli 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

Learning Outcomes of the Course	Contributed POs	Teaching Methods *	Assessment Methods **
1 Mathematical tools for the differential equations	1	1	A
2 Solving the well-known differential equation types	1	1	A
3			
4			
5			
6			
7			
8			

*Teaching Methods 1:Lecture, 2:Discussion, 3:Experiment, 4:Simulation, 5:Question-Answer, 6:Tutorial, 7:Observation, 8:Case Study, 9:Technical Visit, 10:Problem Solving, 11:Individual Work, 12:Team/Group Work, 13:Brain Storm, 14:Project Design / Management, 15:Report Preparation and/or Presentation

**Assessment Methods A:Exam, B:Quiz, C:Oral Exam, D:Homework, E:Report, F:Article Examination, G:Presentation, I:Experimental Skill, J:Project Observation, K:Class Attendance; L:Jury Exam

Main Textbook	Shepley L. Ross, Differential Equations, 3rd edition, John Wiley and Sons, 1984.
Supplementary Resources	P. Blanchard, R. L. Devaney, G. R. Hall, Differential Equations, Brooks/Cole, 2012.

Necessary Course Material	
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Course Weekly Schedule	
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, Bernoulli 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	Mid-Term Exams
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	Phase plane analysis
16,17	Final Exams

Calculation of Course Workload			
Activities	Count	Time (Hour)	Total Workload (Hour)
Weekly classroom time	14	4	56
Weekly study time (review, reinforcing, preparation)	14	8	112
Homework			
Taking a quiz			
Studying for a quiz			
Oral exam			
Studying for an oral exam			
Report writing (Preparation and presentation time included)			
Project (Preparation and presentation time included)			
Presentation (Preparation time included)			
Mid-Term Exam	1	1	1
Studying for Mid-Term Exam	1	15	15
Final Exam	1	1	1
Studying for Final Exam	1	20	20
Total workload			203
Total workload / 30			6.77
Course ECTS Credit			7

Assessment	
Activity Type	%
Mid-term	40
Quiz	60
Homework	
Bir öğe seçin.	
Bir öğe seçin.	
Final Exam	
Total	100

COURSE CONTRIBUTION TO THE PROGRAM OUTCOMES (5: Very high, 4: High, 3: Middle, 2: Low, 1: Very low)		
NO	PROGRAM OUTCOMES	Contribution
1	a. Sufficient knowledge of mathematics	5
	b. Sufficient knowledge of basic sciences	2
	c. Sufficient basic engineering and Electrical-Electronics engineering knowledge	2
	d. Skill of applying all these knowledge and experience to complicated Electrical-Electronics engineering problems	2
2	Skill of defining, identifying, formulating and solving the complicated problems in Electrical-Electronics engineering and related areas by applying appropriate analysis and modelling methods.	1
3	Skill of designing a complicated process, system, equipment or product by applying modern design methods under realistic constraints and conditions.	1
4	To analyze and solve the complicated engineering problems: a. skill of developing, selecting and applying the required techniques and devices	1
	b. skill of using information technologies effectively	1
5	To study the complicated on the complicated Electrical-Electronics engineering problems and research subjects: a. skill of experimental design	1
	b. skill of performing the experiments, collecting the data and analyzing and interpreting the results	1
6	a. Skill of performing individual studies	1
	b. Skill of performing intra and interdisciplinary and multidisciplinary teamwork and studies	1
7	a. Skill of effective oral and writing communication in Turkish	1
	b. Skill of improving and using foreign language knowledge	1
	c. Skill of effective reporting, understanding the reports and preparing the design and production reports	1
	d. Skill of effective presentation and giving and getting clear and understandable instructions.	1
8	Awareness of the necessity of life-long learning and skill of accessing to information and following the improvements in contemporary science and technology	1
9	a. Awareness of necessity of behaving in accordance with the ethical principles and awareness of the importance of having professional ethical responsibilities	1
	b. Knowledge about legal regulations and standards of engineering	1
10	a. Knowledge about project management, risk management and change management	1
	b. Awareness of the significance of entrepreneurship and innovation	1

	c. Knowledge about sustainable development	1
11	Knowledge about the effects of engineering applications and practices on the global and social health, ecology and safety, knowledge about the current problems in relation to the working areas of Electrical-Electronics engineering; and awareness of the legal issues resulting from engineering solutions	1
12	Knowledge about modern problems in local and universal scale	1

LECTURER(S)				
Prepared by	Prof. Dr. Abdurrahman Karamancioğlu			

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