ESOGÜ Electrical-Electronics Engineering Department

COURSE CODE: 151223559 - 151243559   **COURSE TITLE:** Advanced Calculus

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 (√) if there is high design content]		**General Education**	**Humanities**
0	4	( )	0	0

Assessment	THEORETICAL-PRACTICAL COURSES			LABORATORY COURSES		
	Type	**Number**	**%**	**Activity Type**	**Number**	**%**
Midterm	Midterm	1	50	Quiz		
	Quiz			Lab performance		
	Homework			Report		
	Project			Oral exam		
	Other (………)			Other (………)		
Final		1	50			
Makeup exam (Oral/Written)	Written					
Prerequisites	Calculus I					

Brief content of the course	Complex numbers, algebraic properties, geometric properties. Regions in the complex plane, functions of a complex variable, mappings, limits, continuity Derivatives, Cauchy-Riemann equations, analytic functions. Elementary functions, complex exponents. Cauchy Goursat theorem, Cauchy integral formula. Series, Taylor series, Laurent series, residues. Residues at poles, improper integrals. First order differential equations, higher order linear differential equations, order reduction. Constant coefficient differential equations, Variation of parameters, Cauchy diff. eqns. Power series solutions of the differential equations, Laplace transformations in solving differential equations. Eigenstructures in solving differential equations. Sturm-Liouville Boundary Value Problems
Objectives of the course	Generalizing the freshman calculus concepts to multivariable functions. Understanding and solving elementary classes of differential equations using variety of tools.
Contribution of the course towards professional education	Electromechanic system models often require a reasonable level knowledge of complex calculus tools and differential equation solving abilities. This course introduces a fairly large spectrum of these topics.
Outcomes of the course	Students who successfully complete this course 1) Use complex calculus tools. 2) Solve certain classes of differential equations analytically and large class of them numerically.
Textbook of the course	1) R.V. Churchill and J.W. Brown, Complex Variables and Applications, Mc GrawHill, 6-th Edition 1984 2) S. L. Ross, Differential Equations, 3rd Edition, Wiley, 1984
Other reference books	
Required material for the course	

WEEKLY PLAN OF THE COURSE

Week	Topics
1	Complex numbers, algebraic properties, geometric properties
2	Regions in the complex plane, functions of a complex variable, mappings, limits, continuity
3	Derivatives, Cauchy-Riemann equations, analytic functions
4	Elementary functions, complex exponents
5	Cauchy Goursat theorem, Cauchy integral formula
6	Series, Taylor series, Laurent series, residues
7	Residues at poles, improper integrals
8	Midterm
9	Midterm
10	First order differential equations, higher order linear differential equations, order reduction
11	Constant coefficient differential equations, Variation of parameters, Cauchy diff. eqns.
12	Power series solutions of the differential equations, Laplace transformations in solving differential equations,
13	Eigenstructures in solving differential equations
14	Sturm-Liouville Boundary Value Problems
15,16	Final

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

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

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

Name of Instructor(s):

Signature(s):

                                                                                          Date: