



## ESOGÜ Electrical-Electronics Engineering Department

**COURSE CODE:** 151226373 - 151246373 **COURSE TITLE:** Fundamentals of Control Systems

Semester	Weekly Hours		COURSE				
	Theoretical	Practical	Credits	ECTS	Type	Language	
6	3	0	3	5	Compulsory ( x ) Elective ( )	Turkish ( ) English ( x )	
Write the credit (for non-credit courses weekly hours) below (If necessary distribute the credits.).							
<b>Math and Basic Science</b>		<b>Electrical Engineering</b> [mark (√) if there is high design content]		<b>General Education</b>	<b>Humanities</b>		
		3 ( )					
<b>Assessment</b>		<b>THEORETICAL-PRACTICAL COURSES</b>			<b>LABORATORY COURSES</b>		
<b>Midterm</b>		<b>Type</b>	<b>Number</b>	<b>%</b>	<b>Activity Type</b>	<b>Number</b>	<b>%</b>
		Midterm	1	30	Quiz		
		Quiz	4	20	Lab performance		
		Homework	5	10	Report		
		Project			Oral exam		
		Other (.....)			Other (.....)		
<b>Final</b>			1	40			
<b>Makeup exam (Oral/Written)</b>		Written					
<b>Prerequisites</b>		Circuit Analysis II					
<b>Brief content of the course</b>		Introduction. Open-loop, closed-loop. Block diagrams. Modeling dynamic systems. Electromechanical systems. Properties of feedback systems. Time response. Steady-state error. Stability. Root locus analysis. Nyquist diagrams. Frequency response. Phase and gain margins.					
<b>Objectives of the course</b>		Teaching fundamental concepts of control systems, calculating time response of feedback control systems. Performing stability analysis of control systems.					
<b>Contribution of the course towards professional education</b>		In this course, modeling, stability and response of dynamic systems for different inputs are examined. Since these concepts are properties of not only the electrical but also mechanical, chemical or other systems, this course prepares students for the problems that they will face in the industry.					
<b>Outcomes of the course</b>		Students who successfully complete this course 1) be aware of contribution of feedback 2) Learn the relation between poles of the system and response 3) Decide the stability of systems					
<b>Textbook of the course</b>		Ogata, K., Modern Control Engineering, Prentice Hall, Inc., 4th Ed. 2001.					
<b>Other reference books</b>		Dorf, A., Modern Control Systems, Addison Wesley, 9th Ed., 2001. Nise, B., Control Systems Engineering, John Wiley, 3rd Ed., 2000.					
<b>Required material for the course</b>		MATLAB program					

WEEKLY PLAN OF THE COURSE	
Week	Topics
1	Introduction, components of control system. Open-loop vs closed-loop
2	Block diagrams, modeling dynamic systems, differential equations and transfer functions.
3	Modeling mechanical and electromechanical systems
4	Properties of feedback systems. Sensitivity analysis, disturbance.
5	Time response. Transient and steady-state response of first-order and second-order systems
6	Relation between pole locations and settling time, overshoot, rise
7	Steady state-error and system type. P, PI, and PID controllers.
8	Midterm
9	Midterm
10	Stability. Routh-Hurwitz Criterion
11	Root locus analysis.
12	Root locus analysis
13	Nyquist diagrams. Stability using Nyquist criterion.
14	Frequency response. Phase and gain margins.
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):**

Assoc. Prof. Dr. Osman Parlaktuna

**Signature(s):**

**Date:**