



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

Course Title	Course Code
Fundamentals of Control Systems	151226363

Semester in Program	Number of Course Hours per Week		ECTS
	Theory	Practice	
6	3	0	6

Course ECTS Credit Distribution				
Basic Sciences	Engineering Sciences	Design	General Education	Social
2	2	1		

Language of Instruction	Course Level	Course Type
English	Undergraduate	Required

Prerequisite	Circuit Analysis II
Objectives of the Course	Teaching fundamental concepts of control systems, calculating time response of feedback control systems. Performing stability analysis of control systems
Brief Course Content	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. Analysis of discrete time systems

Learning Outcomes of the Course	Contributed POs	Teaching Methods *	Assessment Methods **
1 Understanding the basics of feedback systems	1,2	1	A
2 Relating systems poles to their output responses	1,2	1	A
3 Determining system stability	1,2	1	A
4 Designing controllers to shape the output responses	1,2	1	A
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	K.Ogata, Modern Control Engineering, Prentice Hall, 4th Ed., 2002.
Supplementary Resources	R.C. Dorf, R. H. Bishop, Modern Control Systems, 10th Ed., Prentice Hall, 2004.
Necessary Course Material	

Course Weekly Schedule	
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 time
7	Steady state-error and system type. P, PI, and PID controllers
8	Mid-Term Exams
9	Stability. Routh-Hurwitz Criterion
10	Root locus analysis
11	Root locus analysis
12	Nyquist diagrams. Stability using Nyquist criterion.
13	14 Frequency response. Phase and gain margins
14	Discrete time systems, z transforms
15	Discrete time stability analysis, difference equations
16,17	Final Exams

Calculation of Course Workload			
Activities	Count	Time (Hour)	Total Workload (Hour)
Weekly classroom time	14	3	42
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	10	10
Final Exam	1	1	1
Studying for Final Exam	1	14	14
		Total workload	180
		Total workload / 30	6
		Course ECTS Credit	6

Assessment	
Activity Type	%
Mid-term	40
Quiz	
Homework	
Final Exam	60
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	4
	b. Sufficient knowledge of basic sciences	4
	c. Sufficient basic engineering and Electrical-Electronics engineering knowledge	4
	d. Skill of applying all these knowledge and experience to complicated Electrical-Electronics engineering problems	4
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.	4
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 Karamancıoğlu			
--------------------	-------------------------------------------	--	--	--

Date:06.07.2024