ESOGÜ Electrical-Electronics Engineering Department

COURSE CODE: 151227637-151247637 **COURSE TITLE:** Linear Control Systems

Semester	**Weekly Hours**		**COURSE**			
	Theoretical	**Practical**	**Credits**	**ECTS**	**Type**	**Language**
7	3	2	4	7	Compulsory ( ) Elective (x)	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**
	( )		

Assessment	**THEORETICAL-PRACTICAL COURSES**			**LABORATORY COURSES**		
Midterm	**Type**	**Number**	**%**	**Activity Type**	**Number**	**%**
	Midterm	1	35	Quiz		
	Quiz	3	15	Lab performance	7	50
	Homework	7	10	Report	7	50
	Project			Oral exam		
	Other (……)			Other (……)		
Final		1	40			
Makeup exam (Oral/Written)	Written					

Prerequisites	Fundamentals of Control Systems
Brief content of the course	Controller design using root locus and frequency response approaches. Lag, lead, lag-lead compensators, PI, PD ve PID controllers. State space analysis of control systems. Controllability and observability. Controller design by state space approach. State feedback controller. Observer.
Objectives of the course	Designing appropriate controller and/or observer such that the feedback control system satisfies desired response.
Contribution of the course towards professional education	In this course students design and implement several controllers and observers to satisfy given conditions. With this respect, students become ready to solve engineering problems that they will face during their career.
Outcomes of the course	Students completing this course successfuly 1) gain knowledge on design concept 2) have experience on desgin with different approaches 1) learn how and in what capacity a system's requirements can be satisfied.
Textbook of the course	Ogata, K., Modern Control Engineering, Prentice Hall, Inc., 4th Ed. 2001
Other reference books	Dorf, A., Modern Control Systems, Addison Wesley, 9th Ed., 2001. Nise, B., Control Systems Engineering, John Wiley, 3rd Ed., 2000
Required material for the course	MATLAB program

WEEKLY PLAN OF THE COURSE	
Week	**Topics**
1	Design criteria of control systems in time and frequency domains. Overshoot, settling time, steady-state error, phase and gain margins.
2	Root locus design of lag and lead compensators.
3	Root locus design of lag-lead compensator,. PI, PD, and PID controllers.
4	Compensator and controller design using Bode diagrams.
5	Minor-loop controller design
6	Steady-state representation of dynamic systems
7	Canonic representations
8	Midterm
9	Midterm
10	Analysis od dynamic systems in state space
11	Controllability and observability
12	Controller and observer design.
13	Observer-based controller design
14	Linear quadratic controler
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				x
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.		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 Electronic Engineering.	x			
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.	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 Electronic 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 report 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): Doç. Dr. Metin Özkan

Signature(s):

Date: