T.C. ESKİŞEHİR OSMANGAZİ UNIVERSITY
ENGINEERING AND ARCHITECTURE FACULTY
MECHANICAL ENGINEERING DEPARTMENT

COURSE INFORMATION FORM

SEMESTER	Spring

COURSE CODE	151816340	COURSE NAME	Control Systems

SEMESTER	WEEKLY COURSE PERIOD			COURSE OF			
	Theory	Practice	Laboratory	Credit	ECTS	TYPE	LANGUAGE
6	3	0	0	3	5	COMPULSORY (X) ELECTIVE ( )	Turkish

COURSE CATAGORY

Basic Science	Basic Engineering	Mechanical Engineering [if it contains considerable design, mark with (√)]	Social Science
	√	√	

ASSESSMENT CRITERIA

	Evaluation Type	Quantity	%
MID-TERM	Mid-Term	1	50
	Quiz		
	Homework		
	Project		
	Report		
FINAL EXAM		1	50

PREREQUIEITE(S)	
COURSE DESCRIPTION	The course aims to provide the student the knowledge of designing systems which can be automatically controlled and of making design changes to a system to increase its performance. The specific topics addressed are: Classical control theory in the frequency and time domains, stability-performance methods based on Bode/Nyquist and root-locus diagrams, representation in state space, reduction of multiple subsystems, application of feedback analysis and design to physical systems with feedback.
COURSE OBJECTIVES	1) Introduction to design, analysis, and synthesis of control systems. To teach the fundamental concepts of mathematical modeling and Control of engineering systems
ADDITIVE OF COURSE TO APPLY PROFESSIONAL EDUATION	Demonstration of how to apply what is learned theoretically in the field of control engineering. The course aims to provide the ability to analyze the performance of engineering systems and design controllers to improve the performance.
COURSE OUTCOMES	By the end of this module students will be able to learn: 1) to obtain mathematical modeling of engineering systems, 2) system representation by block diagrams, 3) time response analysis of dynamic systems, 4) stability analysis of systems, 5) performance specifications and analysis, 6) frequency response of a system and frequency response analysis of existing systems (Bode & Nyquist methods), 7) Root Locus method for the control system design and analysis, 8) proportional, integral, and derivative (PID) control, 9) knowledge of MATLAB “Control Toolbox” commands.
TEXTBOOK	Control Systems Engineering, Norman S. Nise

OTHER REFERENCES	1) Otomatik Kontrol Sistemleri, Benjamin C. Kuo & Farid Golnaraghi 2) Modern Control Engineering, Ogata, K. 3) Otomatik Kontrol / Sistem Dinamiği ve Denetim Sistemleri, İbrahim Yüksel
TOOLS AND EQUIPMENTS REQUIRED	

COURSE SYLLABUS

WEEK	TOPICS
1	Introduction to Control Systems
2	Math. Modeling: Modeling in the Time Domain (Modeling, Approximations & Linearization)
3	Mathematical Modeling: Modeling in the Time Domain (Mechanical, Electrical, Electromechanical, Thermal & Hydraulic Elements & Systems)
4	Math. Modeling: Modeling in the Frequency Domain (Laplace Transform Review)
5	Math. Modeling: Modeling in the Frequency Domain (Transfer Functions, Impedance Approach)
6	Block Diagrams
7	State-Space Model
8	Midterm exam
9	State-Space Model Conversion to/From Transfer Functions
10	Time Response (Stability, Routh Hurwitz Criteria)
11	Time Response (Feedback Control & Steady-State Errors)
12	Time Response (First, Second and Higher Order System Responses, Effects of Nonlinearities)
13	Frequency Response Analysis (Bode Plots)
14	Frequency Response Analysis (Nyquist Diagram)
15	Root Locus Analysis, Pole/Zero Effects; Controllers and Gain Adjustment (if time permits)
16,17	Final Exam

NO	PROGRAM OUTCOMES	3	2	1
1	Sufficient knowledge of engineering subjects related with mathematics, science and Mechanical Engineering; an ability to apply theoretical and practical knowledge on solving and modeling of Mechanical Engineering problems.	**X**		
2	Ability to determine, define, formulate and solve complex Mechanical Engineering problems; for that purpose an ability to select and use convenient analytical and experimental methods.		**X**	
3	Ability to design a complex system, a component and/or an engineering process under real life constrains or conditions, defined by environmental, economic and political problems; for that purpose an ability to apply modern design methods.		**X**	
4	Ability to develop, select and use modern methods and tools required for Mechanical Engineering applications; ability to effective use of information technologies.			**X**
5	In order to investigate Mechanical Engineering problems; ability to set up and conduct experiments and ability to analyze and interpretation of experimental results.	**X**		
6	Ability to work effectively in inner or multi-disciplinary teams; proficiency of interdependence.			**X**
7	Ability to communicate in written and oral forms in Turkish/English; proficiency at least one foreign language.		**X**	
8	Awareness of life-long learning; ability to reach information; follow developments in science and technology and continuous self-improvement.		**X**	
9	Understanding of professional and ethical issues and taking responsibility			**X**
10	Awareness of project, risk and change management; awareness of entrepreneurship, innovativeness and sustainable development.			**X**
11	Knowledge of actual problems and effects of engineering applications on health, environment and security in global and social scale; an awareness of juridical results of engineering solutions.			**X**

1: None. **2**: Partial contribution. **3**: Complete contribution.

Prepared by: Prof. Dr. Naci Zafer, Dr.Öğr. Üyesi Sezcan YILMAZ **Date:** 21.12.2021

Signature(s):