OSTIM TECHNICAL UNIVERSITY
FACULTY OF ENGINEERING

COURSE SYLLABUS FORM
2022-2023

Instructor: Dr. Hikmet BAL, hikmet.bal@ostimteknik.edu.tr

MEC 301 System Dynamics and Control Theory							
Course Name	**Course Code**	**Period**	**Hours**	**Application**	**Laboratory**	**Credit**	**ECTS**
SYSTEM DYNAMICS and CONTROL THEORY	MEC 301	1	3	0	0	3	5

Precondition	
Language of Instruction	English
Course Status	Compulsory
Course Level	Bachelor
Learning and Teaching Techniques of the Course	Lecture, Discussion, Question Answer, Practice

Course Objective

To provide basic knowledge on system dynamics and automatic control to students and to build the understanding of classical control theory and basic controller design methods.

Learning Outcomes

A successful student of this course,

1. Has knowledge about the modelling of physical systems and control systems structure.
2. Can analyze of system in time domain and frequency domain by using transfer function.
3. Can design controller and compensator for systems.
4. Can analyze the stability of a system.

Course Outline
Modeling of physical systems and dynamic equations. Transfer functions and block diagrams. Basics of automatic control. Control operations. Frequency and time response. Stability and Routh-Hurwitz criteria. Root locus. Frequency response methods and Bode diagrams.

Weekly Topics and Related Preparation Studies		
Weeks	Topics	Preparation Studies
1	Introduction to System Dynamics and Control Systems	
2	Mathematical modelling of physical systems and dynamic equations	
3	Mathematical modelling of physical systems and dynamic equations	
4	Laplace Transform Transfer functions of multiple input and multiple output systems.	
5	Block diagrams. Obtaining transfer functions from block diagrams Structure of feedback control systems. Desired characteristics of control systems	
6	Block diagrams. Obtaining transfer functions from block diagrams Structure of feedback control systems. Desired characteristics of control systems	
7	Controller and control actions. Proportional (P), integral (I), derivative (D) control actions. P, I, P+D, P+I and P+I+D control	
8	Transient response specifications and their use in analysis and design of 2nd order systems.	
9	Transient response specifications and their use in analysis and design of 2nd order systems.	
10	Stability of control systems. Stability and system poles. Relative stability and stability margin.	
11	Steady state response. Steady state error and error constants. Root locus method. Examples of root locus diagrams method.	
12	Frequency response method. Graphical representations of frequency response. Bode diagrams. Polar plots. Log magnitude versus phase plots	

13	Frequency response method. Graphical representations of frequency response. Bode Nyquist diagrams. Polar plots. Log magnitude versus phase plots	
14	Control system design by root locus method and frequency response method	

Textbook(s)/References/Materials:

Ogata, K., “Modern Control Engineering”, 5th Edition, Prentice-Hall, 2010.
Nise, N. S., “Control Systems Engineering”, 6th Edition, Addison-Wesley, Menlo Park, CA, 2010.
Kuo, B. C., Golnaraghi, F., “Automatic Control Systems”, 8th Edition, Prentice-Hall, Englewood Cliffs, 2002
Ercan, Y., Mühendislik Sistemlerinin Modellenmesi ve Dinamiği, 2.Baskı, Literatür Yayınevi, İstanbul, 2003. ISBN: 9789750401077

Assessment

Studies	Number	Contribution margin (%)
Attendance	14	10
Lab		
Application		
Field Study		
Course-Specific Internship (if any)		
Quizzes / Studio / Critical	2	20
Homework		
Presentation		
Projects		
Report		
Seminar		
Midterm Exams / Midterm Jury	1	30
General Exam / Final Jury	1	40
	Total	**100**
Success Grade Contribution of Semester Studies		60
Success Grade Contribution of End of Term		40
	Total	**100**

Relationship Between Course Learning Outcomes and Program Competencies

#	Learning Outcomes	Contribution Level				
		1	2	3	4	5

1	An ability to apply knowledge of science, mathematics, and engineering.					x
2	An ability to design dynamic systems, components, or processes to meet industrial needs.					x
3	An ability to identify, formulate, and solve engineering problems.					x
4	Take responsibility to solve unpredictable and complex problems encountered in applications as an individual and as a member of a team			x		
5	Plan and manage activities in teamwork			x		
6	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.				x	
7	Can do research on interdisciplinary fields.			x		

ECTS / Workload Table

Activities	**Number**	**Duration (Hours)**	**Total Workload**
Course hours (Including the exam week: 16 x total course hours)	16	3	48
Laboratory			
Application			
Course-Specific Internship			
Field Study			
Study Time Out of Class	14	2	28
Presentation / Seminar Preparation			
Projects			
Reports			
Homeworks			
Quizzes / Studio Review	5	2	10
Preparation Time for Midterm Exams / Midterm Jury	1	15	15
Preparation Period for the Final Exam / General Jury	1	15	15
Total Workload	(116/30=)		**116**