



MARMARA UNIVERSITY - FACULTY OF ENGINEERING

2017-2018 Fall

CSE 4026 Introduction to Robotics and Control Theory

COURSE DESCRIPTION FORM

Offering Department		Department of Computer Engineering	Technical Elective						
Course Code		CSE 4026							
Course Name		Introduction to Robotics and Control Theory							
Language of Instruction		English							
ECTS		5							
Contact Hours		Theoretical (T): 3	Practice (P): 0	Laboratory(L): 0					
Pre-requisites									
Instructor		Name	Mehmet Baran						
		E-mail	Crom.baran@gmail.com						
Course Materials		Mandatory	R.C. Dorf, Modern Control Systems						
		Recommended	D. Frederick, J. Chow; Feedback Control Problems Using Matlab						
Course Objectives		Designing feedback systems and simulating them using MATLAB.							
Course Content		Lineer systems, Laplace transforms, Feedback and its basic properties, Basic tools of control theory.							
Learning Outcomes		LO1	To be able to write the differential equation and the transfer function corresponding to a linear system. Understanding their poles and zeros. Response parameters of the second order system : Rise time, overshoot, settling time, damping, Natural frequency						
		LO2	Learning the concept of Feedback.						
		LO3	To understand how feedback changes sensitivity, transient response, disturbance rejection, steady state error and linearity.						
		LO4	Have knowledge about the relationship between stability and pole position and Routh-Hurwitz criteria						
		LO5	To be able to use the tools like Root Locus, Bode Plot, Nyquist, Lag, Lead, Lead-lag and to know basic principles of PID compensators.						
		LO6	Simulate control systems via Matlab						
Program Outcomes			LO1	LO2	LO3	LO4	LO5	LO6	
PO1	Adequate knowledge in mathematics, science (a) and computer engineering subjects (b) pertaining to the relevant discipline (1); ability to use theoretical and applied information in these areas to model and solve engineering problems (2).		1a,2						
PO2	Ability to identify, formulate, and solve complex engineering problems (a); ability to select and apply proper analysis and modelling methods for this purpose (b).		a, b	a, b	a, b	a, b	a, b		
PO12	Knowledge of advanced mathematics subjects including differential equations, integral calculus (a), linear algebra (b), statistics and probability (c), and discrete mathematics (d).		1ab	1ab	1ab	1ab	1ab		
PO13	Knowledge of mathematics, basic sciences (a), computer science (b) and engineering sciences (c) required for the design and analysis of complex electrical and electronic devices, software and systems including hardware and software.							a,b,c	
Subjects (Knowledge, Skills and Behaviours), Contributions of Subjects to Learning Outcomes, Assessment Methods	No	Week	Subjects	LO1	LO2	LO3	LO4	LO5	LO6
	S1	1-2	Linear systems and the Laplace Transforms.	MF, H					
	S2	3	Pole-zero analysis of the linear systems. Response of the second order systems.	MF, H					
	S3	4	Feedback. Stabilization of unstable systems via feedback.		MF, H		MF, H		H
S4	5-6	The relation of feedback to sensitivity, Linearity, Transient response, Steady state error and			MF, H			H	

			Disturbance rejection.																	
	S5	7	The concept of stability. Routh-Hurwitz criterion..				MF, H													
	S6	8	Root Locus				MF, H	H												
	S7	9	Bode plots				MF, H	H												
	S8	10-11	Nyquist Plots				MF, H	H												
	S9	12-13	Lag, lead and PID compensator design				MF, H	H												
	S10	14	Z-transforms and introduction of digital control.				MF, H													
Assessment Methods and Weights	No	Type	Weight	Implementation Rule	Make-up Rule															
	M1,M2,F	M1,M2, Final	80%	All exams are closed book. No calculator or cellphone is allowed.	Marmara University regulations will be followed for make-up exams.															
	H	Homeworks	20%	MATLAB simulations of the topics that are covered in class.	-															
	TOTAL			100%																
Determining Letter Grades	<ul style="list-style-type: none"> The letter grades will be determined based on the 2 midterm and final exams and homeworks. In order to determine the letter grade, a curve or catalog based method will be followed based on the total average scores of the students. The final exam score and the total average score of the student must be at least 35 to pass the course. According to Marmara University Undergraduate regulations, the weight of the final exam must be at least 40 out of 100. 																			
	<table border="1"> <thead> <tr> <th>Assessment</th> <th>1.Midterm</th> <th>2.midterm</th> <th>Homeworks</th> <th>Final</th> <th>TOTAL</th> </tr> </thead> <tbody> <tr> <td>Weight</td> <td>20</td> <td>20</td> <td>20</td> <td>40</td> <td>100</td> </tr> </tbody> </table>									Assessment	1.Midterm	2.midterm	Homeworks	Final	TOTAL	Weight	20	20	20	40
Assessment	1.Midterm	2.midterm	Homeworks	Final	TOTAL															
Weight	20	20	20	40	100															
Teaching Method, Student Work Load	Time Applied by the Instructor																			
	No	Method	Explanation					Hours												
	1	Lectures	Lectures are given in class using the board or via presentations. Example questions are solved to enhance the concepts.					14x3=42												
	2	Problem Session/ Practice	Problems related to the course topics are solved on the board.					-												
	3	Laboratory	Experiments are done in the laboratory or theoretical concepts covered during the lectures are practiced using computer exercises.					6												
	4	Interactive Courses	Questions are asked to students during lectures and they are encouraged to guess the answers (peer learning is also in this category)					-												
	5	Field Work	Students attend activities outside the campus.					-												
	6	Midterm	Midterm exam is given during the midterm week.					2x2=4												
	7	Final	Final exam is given during the final exam week.					2												
	Estimated Time to be Allocated by a Student																			
	8	Project	The students carry out research about the problem given in the project, design and implement their solution and prepare a report.					-												
	9	Homeworks	The students solve the problems given as homework.					20												
	10	Pre-class learning of Course Material	The students study and learn the new subjects from course materials.					14												
11	Review of Course Material	Students review the course subjects from course materials to prepare for the exams and homeworks.					36													
12	Office Hour	Students ask questions to the instructor or the assistant during office hours.					2													
TOTAL							126													
Academic Honesty	Violations of scholastic honesty include, but are not limited to cheating, plagiarizing, fabricating information or citations, facilitating acts of dishonesty by others, having unauthorized possession of examinations, submitting work of another person or work previously used without informing the instructor, or tampering with the academic work of other students.																			
	In case academic dishonesty is observed, the first authority is the instructor of the course. The instructor may decide to give the student zero for the homework(s)/lab(s)/exam(s), give the letter grade FF, or may take disciplinary action.																			