

SYLLABUS				
General information	Title and code of subject, number of credits	ETR 390 - Control System - 6 ECTS credits		
	Department	Physics and Electronics		
	Program	Bachelor		
	Academic semester	Spring 2021		
	Lecturer	Alim Huseynov		
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	Lecture room/Schedule	11 Mehseti Street, AZ1096 Baku, Azerbaijan (Neftchilar campus), room		
	Consultations			
Course language	English			
Prerequisites	ETR 234 – Analog and Digital Electronics			
Type of the subject	Major			
Textbooks and additional materials	<p>Textbooks:</p> <ol style="list-style-type: none"> 1. Practical process control, Cecil L.Smith, 2009 2. Modern Control Technology: Components & Systems, Kilian 3. Introduction to Mechatronics and Measurement Systems, David G. Alciatore & Michael B. Histan, 2011 4. Control Systems Engineering, 7th edition, Nise, 2014 5. Mechatronics-Electronic control systems in mechanical and electrical engineering, Sixth Edition , William Bolton, 2014 			
Teaching methods	Lecture		x	
	Group discussions at seminars		x	
Assessment		Components	Date/ Deadline	Percent (%)
		Tests		
		Active participation Discussion	At each lesson	10
		Assignment and quizzes	During the semester, 3 quiz	20
		Midterm exam		30
		Final exam		40
		Final		100
Course description	<p>This course of control system describes fundamental components of industrial control systems, difference between manual and automatic control systems, basics of modeling and transfer function representation, basic properties of feedback, classical controller design in time and frequency domain: lead, lag, lead-lag compensation, rate feedback, PID controller, input elements like different sensors and output elements like actuators and motors.</p> <p>The role of control systems in green engineering will continue to expand as the global issues facing us require ever increasing levels of automation and precision. This course allows drawing and analyzing the block diagram of open loop and closed loop control system, to recognize elements control system such as instrumentation devices, Programmable Logic Controllers and end devices such as actuator.</p>			
Course objectives	<p>In the course of control system students will be able to examine the basic concepts of control system. At the end of course the students understand what the controller, types of controller and how work the controller and where they are used. They will study that lies on the base of</p>			

	control system, will be able, to analyze the input and output signals of control system by using feedback.
Learning outcomes	What students should know by the end of the course: Control system, controller, PID controller, temperature controller, open loop and closed loop systems, on off controller, proportional controller, cascade blocks and parallel blocks of control system, signal operation, transfer function, states of control system, instrumentation devices, signal conditioning techniques, modern control strategies.

Week	Dates	Subject topics	Textbook/ Assignments
1.	14-02-21	Introduction to control system: types of control system. Closed loop and open loop control system Solve exercises	[2] p.1-24 [4] p. 1-32 Materials provided by Lecturer
2.	21-02-21	Feedback control, External disturbance inputs, Plant variations, Dynamic response, Steady-state accuracy, Non-linearity. Solve exercises	[2] p. 453-510 [4] p. 1-32 Materials provided by Lecturer
3.	28-02-21	Control loop stability. Quiz 1	[1] p. 69-110 [2] p. 453-510 Materials provided by Lecturer
4.	07-03-21	Proportional Mode control Solve exercises	[1] p. 138-172 [2] p. 453-510 Materials provided by Lecturer
5.	14-03-21	Integral Mode Control Solve exercises	[1] p. 174-210 [2] p. 453-510 Materials provided by Lecturer
6.	28-03-21	PID Control Quiz 2	[1] p. 212-241 [2] p. 453-510 Materials provided by Lecturer
7.	04-04-21	PID Controller Tuning Solve exercises	[1] p. 243-283 Materials provided by Lecturer
8.	11-04-21	Transfer function of control system components, Mathematical modeling of control system Solve exercises	[4] p.33-380 Materials provided by Lecturer
9.	18-04-21	Mid term exam	
10.	25-04-21	Types of signals analog and digital, Signal conditioning techniques. Solve exercises	[2] p.59-114 [5] p.69 - 111
11.	02-05-21	ADC and DAC techniques. Types and implementation. Solve exercises	[3] p. 346 – 363 [5] p. 95-112
12.	09-05-21	PLC, DCS and SCADA. Programming concepts, industrial standards and applications. Quiz 3	[2] p. 511-563 [5] p. 349 - 376
13.	16-05-21	Position, Pressure and Level sensing techniques and sensors. Solve exercises	[2] p.221-265 [3] p.375 - 406 [5] p.29-56
14.	23-05-21	Flow and Temperature sensing techniques and sensors. Solve exercises	[2] p. 265-278 [3] p. 408-414 [5] p. 54-61

15.	30-05-21	End elements: valves and motors. Solve exercises	[3] p. 431-477 [5] p. 165-239
		Final Exam	

