Course Title	Course Code
PLC AUTOMATION SYSTEMS	

Semester in Program	Number of Course Hours per Week		ECTS
	Theory	Practice	
7	3	2	7

Course ECTS Credit Distribution				
Basic Sciences	Engineering Sciences	Design	General Education	Social
1	4	2	0	0

Language of Instruction	Course Level	Course Type
English	Undergraduate	Elective

Prerequisite	
Objectives of the Course	Introducing the architecture of PLCs, Teaching the fundamental components of a PLC, Illustrating how to develop a control program using a PLC.
Brief Course Content	Introduction to PLC and PLC components. S7-1200 PLC and its features. Input-Output devices. Step-7 TIA Portal software development tool. Software development with LAD. PLC instruction set and applications. Open- and closed-loop control.

	Learning Outcomes of the Course	Contributed POs	Teaching Methods *	Assessment Methods **
1	Learn the architecture of PLCs	1c, 3, 5	1, 3, 4	A, I
2	Learn the fundamental components of a PLC	1c, 3, 5	1, 3, 4	A, I
3	Develop a control program using a PLC	1c, 3, 5	1, 3, 4	A, I
4	Learn open- and closed-loop control	1c, 3, 5	1, 3, 4	A, I
5				
6				
7				
8				

*Teaching Methods 1:Lecture, 2:Discussion, 3:Experiment, 4:Simulation, 5:Question-Answer, 6:Tutorial, 7:Observation, 8:Case Study, 9:Technical Visit, 10:Problem Solving, 11:Induvidual Work, 12:Team/Group Work, 13:Brain Storm, 14:Project Design / Management, 15:Report Preparation and/or Presentation

Assessment Methods A: Exam, **B:**Quiz, **C:**Oral Exam, **D:**Homework, **E:**Report, **F:**Article Examination, **G:**Presentation, **I:**Experimental Skill, **J:**Project Observation, **K:**Class Attendance; **L:**Jury Exam

Main Textbook	Jack, H., Automating Manufacturing Systems with PLCs, 2010.
Supplementary Resources	1) Altın, E., S7 1200 ile PLC Programlama, 2018. 2) S7-1200 Programmable Controller System Manual, Siemens Inc., 2012.
Necessary Course Material	

Course Weekly Schedule	
1	Introduction to Course
2	Programmable Logic Controllers (PLC): General PLC Issues – 1
3	Programmable Logic Controllers (PLC): General PLC Issues – 2
4	Boolean Logic Design
5	Ladder Logic Functions: Bit Logic, Latch (Set-Reset), and Timer Instructions
6	Ladder Logic Functions: Counters – Math Instructions
7	Structured Logic Design
8	Mid-Term Exams
9	Flowchart Based Design
10	Advanced Ladder Logic Functions: Move – Shift / Rotate Instructions
11	Advanced Ladder Logic Functions: High Speed Counter (HSC) Instructions
12	Advanced Ladder Logic Functions: Interrupt-Driven Programs
13	Open and Closed Loop PLC programs using both HSC and Interrupt-Driven Subroutines
14	Logical Sensors in Several Industrial Applications
15	Logical Actuators in Several Industrial Applications
16,17	Final Exams

Calculation of Course Workload			
Activities	**Count**	**Time (Hour)**	**Total Workload (Hour)**
Weekly classroom time	14	5	70
Weekly study time (review, reinforcing, preparation)	14	3	42
Homework			
Taking a quiz			
Studying for a quiz			
Oral exam			
Studying for an oral exam			
Report writing (Preparation and presentation time included)	8	3	24
Project (Preparation and presentation time included)			
Presentation (Preparation time included)			
Mid-Term Exam	1	2	2
Studying for Mid-Term Exam	1	25	25
Final Exam	1	2	2
Studying for Final Exam	1	25	25
		Total workload	**190**
		Total workload / 30	**6,33**
		Course ECTS Credit	**7**

Assessment	
Activity Type	**%**
Mid-term	35
Experimental Skill	25
Final Exam	40
Total	100

NO	PROGRAM OUTCOMES		Contribution
	COURSE CONTRIBUTION TO THE PROGRAM OUTCOMES (5: Very high, 4: High, 3: Middle, 2: Low, 1: Very low)		
1	a.	Sufficient knowledge of mathematics	
	b.	Sufficient knowledge of basic sciences	
	c.	Sufficient basic engineering and Electrical-Electronics engineering knowledge	5
	d.	Skill of applying all these knowledge and experience to complicated Electrical-Electronics engineering problems	
2	Skill of defining, identifying, formulating and solving the complicated problems in Electrical-Electronics engineering and related areas by applying appropriate analysis and modelling methods.		
3	Skill of designing a complicated process, system, equipment or product by applying modern design methods under realistic constraints and conditions.		4
4	To analyze and solve the complicated engineering problems: a. skill of developing, selecting and applying the required techniques and devices		
	b.	skill of using information technologies effectively	
5	To study the complicated on the complicated Electrical-Electronics engineering problems and research subjects: a. skill of experimental design		5
	b.	skill of performing the experiments, collecting the data and analyzing and interpreting the results	5
6	a.	Skill of performing individual studies	
	b.	Skill of performing intra and interdisciplinary and multidisciplinary teamwork and studies	
7	a.	Skill of effective oral and writing communication in Turkish	
	b.	Skill of improving and using foreign language knowledge	
	c.	Skill of effective reporting, understanding the reports and preparing the design and production reports	
	d.	Skill of effective presentation and giving and getting clear and understandable instructions.	
8	Awareness of the necessity of life-long learning and skill of accessing to information and following the improvements in contemporary science and technology		
9	a.	Awareness of necessity of behaving in accordance with the ethical principles and awareness of the importance of having professional ethical responsibilities	
	b.	Knowledge about legal regulations and standards of engineering	
10	a.	Knowledge about project management, risk management and change management	
	b.	Awareness of the significance of entrepreneurship and innovation	
	c.	Knowledge about sustainable development	
11	Knowledge about the effects of engineering applications and practices on the global and social health, ecology and safety, knowledge about the current problems in relation to the working areas of Electrical-Electronics engineering; and awareness of the legal issues resulting from engineering solutions		
12	Knowledge about modern problems in local and universal scale		

LECTURER(S)				
Prepared by	Prof. Dr. Semih Ergin			
Signature(s)				

Date: 06.07.2024