Universidad Carlos III de Madrid
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COURSE: Industrial Automation		
• **DEGREE:** Energy Engineering	**YEAR: 2017/2018**	**TERM: 1**

WEEKLY PROGRAMMING

WEEK	SESSION	DESCRIPTION	GROUPS (marK X)		SPECIAL ROOM FOR SESSION (Computer class room, audio-visual class room)	Indicate YES/NO If the session needs 2 teachers	WEEKLY PROGRAMMING FOR STUDENT		
			LECTURES	SEMINARS			DESCRIPTION	CLASS HOURS	HOMEWORK HOURS (Max. 7h week)
1	1	**Presentation**: The detailed content of the subject, the detailed chronogram, and the evaluation system will be explained.		X		NO		1,66	
1	2	**Introduction**: Logic systems. Basic concepts of the Boole algebra. Combinational and sequential logic systems.	X			NO	Previous reading of the lesson. To study of the concepts related to logic systems. To solve the proposed exercises of Boole algebra.	1,66	3
2									
2	3	**Logic System modelling:** Logic system representation. State diagrams. System representation using functional diagrams.	X			NO	Previous reading of the lesson. To study the solved exercises about State Diagram. To study the concepts related to	1,66	3

							the system representation using functional diagrams. To study the solved exercises of functional diagrams.		
3	4	State Diagram exercises.		X		NO	To prepare the proposed exercises of State Diagrams before their resolution at the classroom.	1,66	6
3	5	**Technologies:** Wiring and programmable systems. PLC hardware.	X			NO	Previous reading of the lesson. To study of the concepts related to the automation technologies. To study the concepts related to the PLC hardware.	1,66	
4	6	SFC exercises.		X		NO	To prepare the proposed exercises of Functional Diagrams before their resolution at the classroom.	1,66	6
4	7	**Programming I:** Execution modes. Programming languages according to the norm IEC 61131-3. Common elements.	X			NO	Previous reading of the lesson. To study of the concepts related to the Programming languages according to the norm IEC 61131-3.	1,66	
5	8	System modelling exercices		X		NO	To prepare the proposed exercises of State Diagrams before their resolution at the classroom.	1,66	6
5	9	**Ladder (contact language) programming:** Examples of ladder (LD) programming. Unity Pro elements.	X			NO	Previous reading of the lesson. To study of the concepts related to ladder (LD) programming.	1,66	
6	10	State diagrams and LD exercises		X		NO	To prepare the proposed exercises of Ladder programming before their resolution at the classroom.	1,66	8
6	11	**Exam 1:** Contents: State and functional diagrams.	X			NO	To prepare the evaluation test.	1,66	
7	12	Laboratory session 1: PLC programming introduction: hardware configuration, variables, execution modes, programming) PLC programming introduction: LD programming.		X	1.1L01/02	YES	Previous reading of the proposed guiding notes. The student will configure the PLC, will program a simple script and he will test the different execution modes. The student will program a simple script using LD.	1,66	6
7	13	**SFC Programming:** SFC program execution.	X			NO	Previous reading of the lesson. To study of the concepts related to SFC program execution.	1,66	
8	14	SFC – LD exercises		X		NO	To prepare the proposed exercises of SFC	1,66	

							and LD programming before their resolution at the classroom.		6
8	15	**Programming III:** PLC programming concepts extension. Examples: doubts about modelling and programming will be solved.	X			NO	Previous reading of the lesson. To study of the concepts related to programming examples.	1,66	
9	16	Laboratory session 2: SFC Programming.		X	1.1L01/02	YES	Previous reading of the proposed guiding notes. The student will program a simple script using SFC and LD.	1,66	6
9	17	**Sensors:** Classification. Features, presence/proximity sensors. Other sensors: Position, strength, acceleration, pressure, flow, and temperature	X			NO	Previous reading of the lesson. To study of the concepts related to sensors.	1,66	
10	18	Programming exercises		X		NO	Students will solve a proposed laboratory exercise. The solutions will be presented and discussed in class.	1,66	6
10	19	**Actuators:** Electric engines. Hydraulic actuators. Pneumatic (actuators, valves, symbology)	X			NO	Previous reading of the lesson. To study of the concepts related to actuators.	1,66	
11	20	Laboratory session 3: PLC programming		X	1.1L01/02	NO	PLC programming to solve proposed exercises.	1,66	6
11	21	**Industrial Communications:** Introduction to Fieldbuses	X			NO	Previous reading of the lesson. To study of the concepts related to actuators.	1,66	
12	22	Laboratory session 4: PLC programming		X	1.1L01/02	NO	PLC programming to solve proposed exercises.	1,66	6
12	23	**Introduction to continous time systems**: Modelling. Linealization. Diagram blocks. Transfer function. Analysis of feedback systems.	X			NO	Previous reading of the lesson. To study of the concepts related to continuous systems.	1,66	
13	24	**Exam 2:**		X	1.1L01/02	YES	In this test each student will solve a problem	1,66	8

		A practical programming exercise will be done individually. This exercise is the second valuable test of the continuous evaluation.					using the PLC. The teacher in charge of the small group will evaluate the solution.		
13	25	Frequential analysis of systems, Diagram of Bode. PID **Controllers**. Introduction to frequential design of regulators PID.	X			NO	Previous reading of the lesson. To study of the concepts related to continuous systems.	1,66	
14	26	**Exam 2:** A practical programming exercise will be done individually. This exercise is the second valuable test of the continuous evaluation.		X	1.1L01/02	YES	In this test each student will solve a problem using the PLC. The teacher in charge of the small group will evaluate the solution.	1,66	7
14	27	**Complete example of continous system control using Matlab/Simulink**: modelling, temporal analysis of system, PID control design and frequential response of feedback system.	X			NO	Previous reading of the lesson. To study of the concepts related to continuous systems.	1,66	
							Subtotal 1	**43,16**	**83**
							Total 1 *(Hours of class plus student homework hours between weeks 1-14)*	126,16	
15		Tutorials, handing in, etc							
16		Assessment						3	15
17									
18									
							Subtotal 2	**3**	**15**
							Total 2 *(Hours of class plus student homework hours between weeks 15-18)*	18	
TOTAL *(Total 1 + Total 2. Maximum 180 hours)*								**144,16**	