Universidad Carlos III de Madrid
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	DENOMINACIÓN ASIGNATURA: ELECTRONICS ENGINEERING FUNDAMENTALS		
	GRADO: BACHELOR'S DEGREE IN INDUSTRIAL TECHNOLOGIES ENGINEERING	**ACADEMIC YEAR: 2º (2019-2020)**	**TERM: 2º**

The course has 29 sessions distributed during 15 weeks. The duration of each session is 100 minutes (50 + 50) with (10+10) minutes break between each session. The laboratory sessions are set in six of these sessions, specifically those addressed as SEMINARS.

COURSE WEEKLY PLAN

WEEK	SESSION	DESCRIPTION OF THE SESSION CONTENTS	GROUP)		Indicate if it is a different location from the classroom	Indicate YES/NO if it is a session with >1 teaching staff	STUDENT WEEKLY HOMEWORK LOAD		
			LECTURE	SEMINAR			DESCRIPTION	CLASS HOURS	HOMEWORK HOURS (Max. 7h per week)
1	1	**Introduction to the course and lab sessions. Guidelines.** **Topic 1. Electronic signals and systems.** Electronic systems.	X				Examples of real systems and applications based on electronic systems. Top-down analysis of an electronic design. Block diagram of a generic electronic system. SPOC lab enabling certificate.	1,66	2,86

2	2	Electronic signals. Classification. Characteristics. Review of electric circuit analysis and basic circuit theory.		X			Types of electronic signals. Parameters and characteristics. Linearity and superposition in electronic systems. Amplification in electronic systems. Amplifying the output signal provided by a sensor/transducer. SPOC lab enabling certificate.	1,66	6
2	3	Linearity and superposition. Introduction to electronic sensors, transducers and amplification.	X					1,66	
3	4	**Topic 2. Electronic instrumentation. Sensors and transducers** Electronic instrumentation and measurement of electronic signals.		X	**LAB**	NO	Implementation of basic electronic circuits and electronic equipment handling. Overview of different electronic sensors and transducers for sensing input physical magnitudes: light, temperature, force y pressure, position, speed and sound. **Preparation of Practice 1** **Obtain the lab enabling certificate.**	1,66	7
3	5	Sensors and transducers. Principle of operation.	X					1,66	
4	6	***PRACTICE 1: Electronic sensors and transducers***		X	**LAB**	SI	Implementation of basic electronic schemes involving some of the sensors studied. Models of analog amplifiers and their main characteristics. Small- and large-gain signal regime.	1,66	7
4	7	**Topic 3. Amplifiers and analog electronic subsystems** Classification and modeling. Operation. Gain, linearity, frequency response.	X					1,66	

5	8	**Software for analog circuit simulation** First steps with the simulation software. Simulation of amplifying stages.		X	**COMPUTER ROOM**		Study through simulations of amplifier models that include load effects in real circuits.	1,66	6
5	9	**Operational amplifiers (opamps).** Description, modeling and operation. Negative feedback topologies and applications.	X				Operational amplifiers and negative feedback topologies. Op-amp based amplifying stages in different real applications. **Preparation of Practice 2**	1,66	
6	10	***PRACTICE 2: AMPLIFYING STAGES WITH OPERATIONAL AMPLIFIERS***		X	**LAB**	SI	Lab session involving operational amplifiers. Study of MOSFET transistors and their use in both analog (amplifiers) and digital (inverter logic gate) circuits. **Preparation of Practice 3**	1,66	6
6	11	**Topic 4. Electronic components and integrated circuits** **Electronic components.** MOSFET transistor. Operation. Applications in both digital and analog electronic systems.	X					1,66	
7	12	***PRACTICE 3:TRANSISTOR-BASED ELECTRONIC CIRCUIT***		X	**LAB**	SI	Study of a real application of MOSFET transistors on a lab electronic circuit implementation. Study of diode's principle of operation and their use cases.	1,66	7
7	13	**Electronic components.** Diode. Operation. Applications in electronic systems. Clipping circuits and Zener diode	X					1,66	

8	14	Diode-based real electronic applications.		X	**COMPUTER ROOM**		Simulation of real diode-based electronic circuits Knowledge of the process of integrated electronics manufacturing, state-of-the art technologies and future trends. Study of the need for digital electronic circuits.	1,66	6
8	15	**Integrated circuits.** Manufacturing. Moore's Law. Introduction to digital electronic subsystems.	X					1,66	
9	16	**Topic 5. Digitals electronic subsystems** Fundamentals of digital electronics. Numbering and coding in digital systems. Boolean algebra. Basic logic gates. Boolean logic functions and representation		X			Fundamentals of digital electronics and coding systems in the digital domain. Boolean algebra and logical functions and the way to represent them. Study of the basic logic gates. Study of basic combinational circuits and their main applications. Study of basic sequential circuits and their main applications. **Preparation for Partial Exam**	1,66	6
9	17	Combinational circuits in digital electronics. Implementation of logic functions. Sequential circuits in digital electronics: memory units.	X					1,66	
10	18	Registers, memories, digital counters; relationship with modern computers and microprocessors.		X			Basic use of memory units.	1,66	6
10	19	**PARTIAL EXAM**	X					1,66	

11	20	**Software for digital circuit simulation** First steps with the simulation software. Schematics, chronograms, timing.		X	**COMPUTER ROOM.**		First steps on digital simulation software and basic digital circuits analysis. First approach to combinational and sequential systems Study of the need for A/D and D/A circuits to convert signals from the analog to the digital domain and vice versa. D/A and A/D converters and their main characteristics.	1,66	6
11	21	**Interface between analog and digital electronic subsystems:** data conversion**.** Data conversion examples. A/D and D/A converters. Characteristics.	X					1,66	
12	22	Electronic components vendor specs. Management. Datasheet search and interpretation.		X	**COMPUTER ROOM**		Study of different implementations of converters and case uses. Web search of real off-the-shelf converter's datasheets and exploring its parameters. . Study of different implementations of converters and memory units and case uses. **Preparation of Practice 4**	1,66	6
12	23	A/D and D/A converter implementations.	X					1,66	
13	24	***PRACTICE 4: DIGITAL ELECTRONIC SUBSYSTEMS (I)***		X	**LAB**		Implementation of a digital electronic circuit. Measurement of digital signals and their parameters. Study of different power supply approaches and their applications. **Preparation of Practice 5**	1,66	6
13	25	**Topic 6. Power systems and energy conversion.** Power sources. Converters: CC/CC, inverters and rectifiers.	X					1,66	
14	26	***PRACTICE 5: DIGITAL ELECTRONIC SUBSYSTEMS (II)***		X	**LAB**		Implementation of an electronic circuit with both analog and digital parts. Use cases of power sources. **Preparation for lab individual exam**	1,66	6
14	27	Applications of energy conversion electronic systems.	X					1,66	

15	28	***PRACTICE 6: LAB INDIVIDUAL EXAM***		X	**LAB**		Preparation for the ordinary exam.	1,66	3
15	29	Problems and exercises upon demand. Questions.	X			SI		1,66	
							Subtotal 1	**48,14**	**86,86**
							Total 1 *(Class and working hours between1-14 weeks)*	135	
	15		Recovery lectures, mentorship, deliverables, etc.						
	16		Exam preparation UPON REQUEST and Evaluation					3	12
	17								
	18								
							Subtotal 2	**3**	**12**
							Total 2 *(Class and working hours between15-18 weeks)*	15	
							TOTAL *(Total 1 + Total 2. 180 hours max.)*	**150**	