	ELECTRONICS ENGINEERING FUNDAMENTALS		
	BACHELOR IN MECHANICAL ENGINEERING	**ACADEMIC YEAR: 2º (2020-2021)**	**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.

PLANIFICACIÓN SEMANAL DE LA ASIGNATURA

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	**0**	Preliminar session. **Review.** Electronic signals. Classification. Characteristics. Review of electric circuit analysis and basic circuit theory.		X			A review of the basic concepts of electrical engineering to be applied this course: Types of electronic signals. Parameters and characteristics. Course guidelines	1,66	

1	1	**Introduction to the course and lab sessions. Guidelines.** **Topic 1. Electronic systems: and introduction.** Basic concepts on amplifiers, transductors, power sources. Electronic Systems: some examples.	X		ONLINE		Examples of real systems and applications based on electronic systems. Top-down analysis of an electronic desing. Block diagram of a generic electronic system. SPOC lab enabling course.	1,66	2,86
2	2	**Topic 2. Electronic instrumentation. Sensors and transducers** Sensors and transducers. Principle of operation. Linearity and superposition		X			Overview of different electronic sensors and transducers for sensing input physical magnitudes: light, temperature, force y pressure, position, speed y sound Linearity and superposition in electronic systems. Examples of real systems and applications based on electronic systems. Top-down analysis of an electronic desing. Block diagram of a generic electronic system. Amplification in electronic systems. Amplifying the output signal provided by a sensor/transducer SPOC lab enabling course.	1,66	6
2	3	Exercises including sensors and transducers within an electronic circuit. **Topic 3. Amplifiers and analog electronic subsystems** Classification and modeling. Operation. Gain, linearity, frequency response	X		ONLINE			1,66	
3	4	**Electronic instrumentation.** Electronic instrumentation and measurement of electronic signals.		X	LAB	NO	Implementation of basic electronic circuits and electronic equipment handling.	1,66	7

3	5	**Topic 3. Amplifiers and analog electronic subsystems** Description, modeling and operation. Negative feedback topologies and applications. Basic exercises with electronic amplifiers.	X		ONLINE		Operational amplifiers and negative feedback topologies. Op-amp based amplifying stages in different real applications. Basic electronic amplifier exercises SPOC lab enabling course. **Preparation of Practice 1**	1,66	
4	6	Amplifier based exercises Practice 1 discussion		X		NO	Study through simulations of amplifier models that include load effects in real circuits.	1,66	7
4	7	**Software for analog circuit simulation** First steps with the simulation software. Simulation of amplifying stages.	X		ONLINE		Exercises involving operational amplifiers Practice 1 discussion **Preparation of Practice 1** **Obtain the lab-enabling certificate.**	1,66	
5	8	***PRACTICE 1: Electronic sensors and transducers***		X	LAB	YES	Implementation of basic electronic schemes involving some of the sensors studied.	1,66	6
5	9	**Topic 4. Electronic components.** MOSFET transistor. Operation. Applications in both digital and analog electronic systems.	X		ONLINE		Study of MOSFET transistors and their use in both analog (amplifiers) and digital (inverter logic gate) circuits	1,66	
6	10	Amplifier based exercises Practice 2 discussion		X			Exercises involving amplifiers	1,66	6

6	11	**Topic 4. Electronic components** Diode. Operation. Applications in electronic systems. Clipping circuits and Zener diode	X		ONLINE		Study of diode's principle of operation and their use cases. **Preparation of Practice 2**	1,66	
7	12	***PRACTICE 2: Amplifying stages with Operational Amplifiers***		X	SIMUL	YES	**Resolution of practice 2 (simulation)**	1,66	7
7	13	Diode-based real electronic applications. Rectifiers and application to energy conversion electronic systems. Energy and efficiency concepts	X		ONLINE		Exercises of diode-based electronic circuits and MOSFET-based electronic sources for powering sources.	1,66	
8	14	Exercises about diodes as rectifiers		X			Study of MOSFET transistors exercises and their use in real circuits. Study of the need for digital electronic circuits. 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.	1,66	6
8	15	**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		ONLINE			1,66	
9	16	Resolution of problems (MOSFET and diodes) and review the concepts		X			Complete and review main questions about analogue electronics. Study of basic combinational circuits and their main applications. Study of basic sequential circuits and their main applications. **Preparation of Practice 3**	1,66	6
9	17	Combinational circuits in digital electronics. Sequential circuits in digital electronics. Basic examples	X		ONLINE			1,66	

10	18	***PRACTICE 3: CIRCUITS WITH TRANSISTORS***		X	SIMUL		**Resolution of practice 3 (simulation)** Basic use cases of digital electronic units.	1,66	6
10	19	Applications of digital circuits (I) Implementation of logic function with multiplexers and decoders.	X		ONLINE		Preparation for MIDTERM Exam	1,66	
11	20	**MIDTERM EXAM**		X			Preparation for MIDTERM Exam Lab session involving operational amplifiers.	1,66	6
11	21	Applications of digital circuits (II) Memories	X		ONLINE			1,66	
12	22	Applications of digital circuits (III). Registers and digital counters.		X		YES	Lab session working with MOSFET transistors 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. **Preparation of Practice 4**	1,66	6
12	23	**Interface between analog and digital electronic subsystems:** data conversion**.** Data conversion examples. A/D and D/A converters. Characteristics.	X		ONLINE			1,66	
13	24	***PRACTICE 4: DIGITAL SUBSYSTEMS (Simulation)***		X	**SIMUL**	YES	**Resolution of practice 4 (simulation)** Implementations for real D/A and A/D converters	1,66	6
13	25	A/D and D/A converter implementations.	X		ONLINE			1,66	
14	26	Resolution of problems		X			Knowledge of the process of integrated electronics manufacturing,	1,66	6

14	27	**Integrated circuits.** Manufacturing. Moore's Law. Introduction to digital electronic subsystems. Problems and exercises upon demand. Questions.	X		ONLINE		state-of-the art technologies and future trends. Preparation for the ordinary exam.	1,66	
15	28	Problems and exercises. Questions.		X			Preparation for the ordinary exam.	1,66	3
							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	
							T TOTAL *(Total 1 + Total 2. 180 hours max.)*	**150**	