Universidad Carlos III de Madrid
www.uc3m.es

	COURSE: ELECTRONICS ENGINEERING FUNDAMENTALS		
	DEGREE: BACHELOR IN SECURITY ENGINEERING	**YEAR: 3º**	**TERM: 1ST**

The course has 28 sessions distributed in 14 weeks. The duration of each session is 100 minutes (50 + 50) with (10+10) minutes break between each one. The laboratory sessions are set in four of these sessions. In addition there are two sessions given by experts did not indicate in the schedule.

WEEKLY PROGRAMMING

WEEK	SESSION	CONTENT DESCRIPTION	GROUP (mark X)		SPECIAL ROOM FOR SESSION (computer class room, audio-visual class room,…)	Indicate YES/NO it is a 2 teachers session	WEEKLY SCHEDULE FOR STUDENTS		
			LECTURE	SEMINAR			DESCRIPCTION	CLASS HOURS	HOMEWORK (Max. 7h per week)

1	1	**Introduction to the course** - List of topics - Session organization - Practices: Calendar. Evaluation - Professors and groups - Tutorial schedule - Bibliography - **Introduction to the Electronic Systems** - The Outer world and the electronic world - Sensors (transducers) and actuators - Analog and digital systems - Block diagram. Full electronic system example					- Study of the basic concepts of Digital electronics, numerical systems and combontional circuits. - Proposed exercises solving	1,66	3,18
1	2	**Digital Electronics Fundamental (I)**- - Introduction. Basic concepts - Basic logic functions - Digital systems codification - Boole algebra. Logic gates - Combinational circuit representation						1,66	
2	3	**Problemas de Electrónica Digial (I)** - Numerical systems - Boole algebra minimization - Combinational Adder					- Decoders, multiplexers, synchronous systems and memories study - Proposed exercises solving	1,66	6
2	4	**Circuitos Lógicos** - Combinational circuit analysis - Other combinational functions - Synchronous sequential systems						1,66	
3	5	**Problemas de Electrónica Digial (II)** - Problems of combinational logic - Problems of Decoders - Problems of sequential systems					- Study of Memories and synchronous systems. - Proposed exercises solving	1,66	6

3	6	**Memories, programmable logic and logic functions synthesis.** **- Memories** - Basic parameters and terminology - Memory types - Addressing - Memory extension. Memory maps **- Programmable Logic** - Programmable logic devices - Improvements and evolution - Logic funtions synthesis with PLDs						1,66	
4	7	**Problems of digital systems.** - Problems of Memories **Integrated circuits technology** - Computer Architectures. DSPs - Manufacturing. Videos					- Study of Memories and synchronous systems. - Practice 1 preparation - Circuits theory review - Proposed exercises solving	1,66	7
4	8	**Analog Circuits (I)** - Analog signals parameters - Resistor and potentiometer characteristics						1,66	
5	9	***PRACTICE 1: DIGITAL SYSTEM: COUNTER***			LAB	YES	- Practice 1 preparation - Superposition theorem study - Thevenin and Norton theorems study - Partial evaluation 1 preparation	1,66	7
5	10	**Problems of Analog Circuits (I)** - Problems of circuit theory review - Problem of Wheatstone Bridge						1,66	
6	11	**PARTIAL EVALUATION**					- Partial evaluation 1 preparation - Superposition theorem study - Thevenin and Norton theorems study	1,66	7

6	12	**Analog Circuit (II)** - Superposition Theorem - Thevenin and Norton Theorem						1,66	
7	13	- Problems of Thévenin, Norton. - Problems of Superposition					- Superposition theorem study - Thevenin and Norton theorems study - Instrumentation study - Proposed exercises solving	1,66	7
7	14	**Basic Electronics Instrumentation** - Real powers of current and voltage. - Real Voltmeter/amperimeters. DC/AC modes. Load effects. - Oscilloscope. - Protoboard.			LAB	YES		1,66	
8	15	**Passive Components. Capacitors** - Capacitors characteristics. - AC/DC capacitors behaviour. - Capacitors: charge/discharge **RC Filters. Temporal and frequential response.** - Low pass RC filter. Bode Diagram. - High pass RC filter.					- RC-Filters circuits study - Diodes study - Proposed exercises solving	1,66	7
8	16	**Components: Diode** - Semiconductors Introduction. - The PN junction diode. - Diode biasing. - Characteristic diode plot. - Diode types. Zener diode. - Datasheets. - Equivalent circuits. **Diode applications (I):** Rectifiers - Power source. - Half wave rectifiers. - Half wave rectifier with capacitor.						1,66	

9	17	**Problems of diodes** - Full wave rectifiers - Zener regulator. - Limiter circuit with diode and source. - Limiter with two diodes.					- Proposed exercises solving - Practice 2 preparation	1,66	7
9	18	***PRACTICE 2: RC FILTER y CIRCUIT WITH DIODES***			LAB	YES		1,66	
10	19	**Components: MOSFET transistor.** - Transistor types - Accumulation N cannel MOSFET - Structure and functionality - Static characteristic plot - Equation and working zones - Symbol and terminals - Biasing circuits - Other type of MOSFETs					- Transitors study - Proposed exercises solving	1,66	7
10	20	**Problemes of MOSFET** - NMOS biasing circuit. - Autobiasing NMOS circuit. - MOSFET with RD variation to modify working region. ID-RD plots. - PMOS biasing circuit. - NMOS biasing circuit.						1,66	7

11	21	**Analog subsystems: Amplification (I)**
		- Amplification concept
		- Amplifier types
		- Coupling capacitors
		- Bode amplifier diagram
		- The ideal operational amplifier
		- Ideal A. O. applications:
		  - Open circuit: Comparator
		  - Negative feedback:
		  - Inverting - non inverting.
		  - Adder – amplifier
							- Amplifier study
							- Proposed exercises solving
							- Practice 3 preparation
								1,66	7

11	22	**Analog subsystems: Amplification (II)** - Ideal A. O. Applications with negative feedback: - Buffer - Differential amplifier - Instrumentation amplifier - A.O. integrator - A.O. derivator - Precision rectifier						1,66	
12	23	***PRACTICE 3: AMPLIFIERS AND MOSFET***			LAB	YES	- Amplifier study - Proposed exercises solving - Practice 3 preparation	1,66	7
12	24	**Exercises resolution for the Final Exam**						1,66	
13	25	**Exercises resolution for the Final Exam**					- Partial exam study	1,66	5
							Subtotal 1	**44,82**	**90,18**
							Total 1 *(Class and working hours between1-14 weeks)*	135	
	14		Recovery, tutorial clases, etc						
	15		Exam preparation and exam					3	12
	16								
	17								
							Subtotal 2	**3**	**12**
							Total 2 *(Class and working hours between15-18 weeks)*	15	
							TOTAL *(Total 1 + Total 2. 180 horas Max)*	**150**	