Universidad Carlos III de Madrid
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COURSE: ELECTRONIC, PHOTONIC AND ELECTRO-OPTIC COMPONENTS		
MASTER: ELECTRONIC SYSTEMS ENGINEERING AND APPLICATIONS	**YEAR: 1st**	**TERM: 1st**

WEEKLY PLANNING

WEEK	SESSION	DESCRIPTION	GROUPS (mark X)		Special room for session (computer classroom, audio-visual classroom…)	WEEKLY PROGRAMMING FOR STUDENT		
			LECTURES	SEMINARS		DESCRIPTION	CLASS HOURS	HOMEWORK HOURS (Max. 7h week)
1	1	Introduction to the electronic, photonic and electro-optic components. Subject syllabus. Classification of components. Main tools to manage with components: datasheets, application notes and case studies. Characterization of components. Integration in electronic systems.	X			Getting course material. Answering questions about background.	1,5	
1	2	Power Semiconductors: Basic Operating Principles. Application fields. Line rectifiers: Rectifier diodes and Thyristors. Freewheeling and snubber diodes: Structure and functional principle. Static and Dynamic behaviors. Application Notes for Thyristors and Rectifier Diodes.	X			Revision of Class Materials. Study of developed themes.	1,5	4

2	3	Power MOSFET and IGBT: Packaging. Integration of sensors, protective equipment and driver electronics. Datasheet Ratings for MOSFET, IGBT, Diodes and Thyristors. Application Notes for IGBT and MOSFET Modules.	X			Revision of Class Materials. Study of developed themes.	1,5	
2	4	SiC Power Devices and Modules: Present and Future of SiC Power Devices. Static Characteristics. Si vs SiC. SiC Schottky Barrier Diode (SBD). SiC MOSFET. Characteristics of SiC power modules. Examples of applications and benefits of using SiC.	X			Revision of Class Materials. Study of developed themes.	1,5	4
3	5	GaN Power Devices: Switching and High Frequency characteristics. GaN vs SiC. MOSFET. HEMT. Examples of applications: Three-phase inverter used in hybrid electric vehicles. Manufacturers Data Sheets.	X			Revision of Class Materials. Study of developed themes.	1,5	
3	6	High-frequency and high-speed techniques in electronics. High frequency amplifiers. Radio frequency circuit elements.		X		Previous Reading. Discussion in class.	1,5	4
4	7	Technology behind high-frequency active components. Classification of high-frequency active components. MESFET. HEMT. HBT. Application circuits.	X			Revision of Class Materials. Study of developed themes.	1,5	
4	8	Passive photonic components and devices: optical fiber (single-mode, polarization maintaining, polymer fibers), circulators, directional couplers, polarization sensitive components, in-fiber Bragg gratings and wavelength sensitive components, Fabry-Perot filters and wavelength selective devices, multiplexers.		X		Previous Reading. Discussion in class.	1,5	4

5	9	Active photonic components and devices: semiconductor lasers, VCSELs, quantum-cascade lasers, photo-detectors, amplitude and phase optical modulators (Mach-Zehnder, electro-absorption), optical amplifiers (SOA, EDFA). Application circuits.	X			Revision of Class Materials. Study of developed themes.	1,5	
5	10	Lesson 4: Liquid Crystal Devices. 4.1. Introduction • Light propagation and polarization • Polarizers and retarders • Electrooptical materials 4.2. Liquid crystal materials • Properties and basic configurations • Novel materials and structures	X			Revision of Class Materials. Study of developed themes.	1,5	4
6	11	Lesson 4: Liquid Crystal Devices. 4.3. Liquid crystal components and applications • Commercial devices: Spatial switch, variable retarder, variable optical attenuator (VOA), tunable filter, spatial light modulator (SLM) • Novel applications: tunable lenses, security devices, microwave devices…		X		Revision of Class Materials. Exercises.	1,5	
6	12	Lesson 5: Microelectromechanical Systems (MEMS) 5.1. Introduction • MEMS properties and history development • Sensors and actuators • Basic electrical and mechanical concepts	X			Revision of Class Materials. Study of developed themes.	1,5	4
7	13	Lesson 5: Microelectromechanical Systems (MEMS) 5.2. MEMS applications • Biological and medical • Automotive • Communications • Other applications		X		Revision of Class Materials. Exercises.	1,5	
7	14	Characterization of components in Lab.			LAB	Manual reading. Report.	1,5	5
						Subtotal 1	**21**	**29**
		Total 1 *(Hours of class plus student homework hours between weeks 1-7)*					**50**	

1-7		Tutorials, handing in, etc.					11	
8		Assessment					3	11
						Subtotal 2	**3**	**22**
						Total 2 *(Hours of tutorials, handing in, assessment,etc., plus student homework at week 8)*	**25**	

TOTAL *(Total 1 + Total 2)*	**75**