uc3m | Universidad Carlos III de Madrid
Vicerrectorado de Estudios
Apoyo a la docencia y gestión del grado

COURSE: Solid state fundamental engineering		
DEGREE: Engineering Physics	YEAR: 2020-2021	TERM: 2

WEEKLY PLANNING

WEEK	SESSION	DESCRIPTION	TEACHING (mark X)		SPECIAL ROOM FOR SESSION (Computer class room, audio-visual class room)	WEEKLY PROGRAMMING FOR STUDENT		
			LECTURES	SEMINARS		DESCRIPTION	CLASS HOURS (1,66=50+50 min)	HOMEWORK HOURS (Max. Estim. 6,5h)
1	1	BONDING IN SOLIDS: General considerations, Ionic bonds, Covalent bonds, Van der Waals bonds, Metallic bonds, Hydrogen bonds	X			Reading in advance the corresponding books chapters. Study and personal work in the lecture	1,66	6,5
	2			x		Solve the proposed exercices. Participate in discussions and activities	1,66	
2	3	LATTICE VIBRATIONS, PHONONS,HEAT CAPACITY: Introduction, Interaction of atoms in the crystal, Vibrations of a one dimensional monoatomic chain, Vibration of a one dimensional diatomic chain, Three dimensional lattice, Phonons, Heat capacity.	x			Reading in advance the corresponding books chapters. Study and personal work in the lecture	1,66	6,5
	4			x		Solve the proposed exercices. Participate in discussions and activities	1,66	
3	5	LATTICE VIBRATIONS, PHONONS,HEAT CAPACITY: Introduction, Interaction of atoms in the crystal, Vibrations of a one dimensional monoatomic chain, Vibration of a one dimensional diatomic chain, Three dimensional lattice, Phonons, Heat capacity.	x			Reading in advance the corresponding books chapters. Study and personal work in the lecture	1,66	6,5
	6			x		Solve the proposed exercices. Participate in discussions and activities	1,66	

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4	7	THE THEORY OF FREE ELECTRONS Y SOLIDS: Classical theory of metals: The Drude model, Electrical and thermal conductivity in metals, Quantum theory of metals: The Sommerfeld model, Work function, Thermionic emission, Photoelectric effect	x			Reading in advance the corresponding books chapters. Study and personal work in the lecture	1,66	6,5
	8			x		Solve the proposed exercices. Participate in discussions and activities	1,66	
5	9	THE BAND THEORY OF SOLIDS: Introduction: Band theory, Bloch theorem, The Kronig-Penny model, Some remarks about the Bloch theorem, Electrons affective mass, Metals and insulators, Holes and electrons	x			Reading in advance the corresponding books chapters. Study and personal work in the lecture	1,66	6,5
	10			x		Solve the proposed exercices. Participate in discussions and activities	1,66	
6	11	SEMICONDUCTORS: 5.1Introduction, Band Gap, Pure or intrinsic semiconductors, Extrinsic semiconductors, P-n junctions, Diodes, Transistors: Bipolar junctions transistor	x			Reading in advance the corresponding books chapters. Study and personal work in the lecture	1,66	6,5
	12			x		Solve the proposed exercices. Participate in discussions and activities	1,66	
7	13	SEMICONDUCTORS: 5.1Introduction, Band Gap, Pure or intrinsic semiconductors, Extrinsic semiconductors, P-n junctions, Diodes, Transistors: Bipolar junctions transistor	x			Reading in advance the corresponding books chapters. Study and personal work in the lecture	1,66	6,5
	14			x		Solve the proposed exercices. Participate in discussions and activities	1,66	
8	15	DIELECTRIC MATERIALS: 6.1Introduction, Dielectric materials, Mechanisms of polarization, The complex dielectric constant. Frequency response, Piezoelectricity, Ferroelectricity	x			Reading in advance the corresponding books chapters. Study and personal work in the lecture	1,66	6,5
	16			x		Solve the proposed exercices. Participate in discussions and activities	1,66	

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9	17	DIELECTRIC MATERIALS: 6.1Introduction, Dielectric materials, Mechanisms of polarization, The complex dielectric constant. Frequency response, Piezoelectricity, Ferroelectricity	x			Reading in advance the corresponding books chapters. Study and personal work in the lecture	1,66	6,5
	18			x		Solve the proposed exercices. Participate in discussions and activities	1,66	
10	19	MAGNETIC MATERIALS: 7.1Introduction, Microscopic overview, Diamagnetism, Paramagnetism, Ferromagnetism and antiferromagnetism, Magnetic resonance	x			Reading in advance the corresponding books chapters. Study and personal work in the lecture	1,66	6,5
	20			x		Solve the proposed exercices. Participate in discussions and activities	1,66	
11	21	MAGNETIC MATERIALS: 7.1Introduction, Microscopic overview, Diamagnetism, Paramagnetism, Ferromagnetism and antiferromagnetism, Magnetic resonance	x			Reading in advance the corresponding books chapters. Study and personal work in the lecture	1,66	6,5
	22			x		Solve the proposed exercices. Participate in discussions and activities	1,66	
12	23	OPTCAL PROPERTIES OF MATERIALS: Basic concepts, Optical properties of metals. Optical properties of non-metals, Applications of optical phenomena: Photoconductivity. Luminiscence. Lasers	x			Reading in advance the corresponding books chapters. Study and personal work in the lecture	1,66	6,5
	24			x		Solve the proposed exercices. Participate in discussions and activities	1,66	
13	25	SUPERCONDUCTIVITY: Overview, Electrical resistivity, The effect of a magnetic field, Microscopic theory, High Tc superconductors, Applications	x			Reading in advance the corresponding books chapters. Study and personal work in the lecture	1,66	6,5
	26			x		Solve the proposed exercices. Participate in discussions and activities	1,66	
14	27	*LAB SESSION 1: X-Ray diffraction		x		Reading the guideline document, Data acquisition, Analysis of results, Preparation of the report	1,66	6,5

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14	28	*LAB SESSION 2: Hall Effect		x		Reading the guideline document, Data acquisition, Analysis of results, Preparation of the report	1,66	6,5
	29	*LAB SESSION 3: GAP in a semiconductor		x		Reading the guideline document, Data acquisition, Analysis of results, Preparation of the report	1,66	3,25
						Subtotal 1	**48**	**94**
						Total 1 *(Hours of class plus student homework)*	**142**	
15		Tutorials, handing in, etc					3,6	-
16		Assessment					4	10
17								
18								
						Subtotal 2	**8**	**10**
						Total 2 *(Hours of class plus student homework)*	**18**	
TOTAL (*Maximun 160 horas*)							**160**	