Universidad Carlos III de Madrid
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COURSE: Telecommunication Systems		
DEGREE: Bachelor in Sound and Image Engineering	YEAR: 4th	SEMESTER: 1st.

WEEK	SESSION	DSESSION CONTENT	Class Method (marcar X)		Indicate if teaching takes place outside the classroom (Computer Lab)	STUDENT WORK		
			Lecture	Exercise		DESCRIPTION	Class Hours	Student Workload
1	1	Course Introduction Unit 1: • Communication Systems and Networks • Telecommunication Services • Normative and Standards	X			Revise: * Medium Access Control * Multiplexing * Networks Assimilate Course Content during class	1,66	
1	2	Unit 2: Linear Modulations • Baseband Pulse Amplitude Modulations (PAM) • Signal Constellations and Pulse Shping Filters • Spectrum • Transmission over Gaussian Channels • InterSymbol Interference (ISI)		X		- Assimilate Course Content during class - Exercises and case studies	1,66	3
2	3	Unit 2: Linear Modulations • Pulse Shaping: raised cosine filter • Transmission over linear channels • Noise at the receiver • Error Probability	X			- Assimilate Course Content during class - Exercises and case studies	1,66	5
2	4	Unit 2: Linear Modulations • Passband PAM: AM, QAM • Signal Constellations • Spectrum • Transmission over Gaussian Channels		X		- Assimilate Course Content during class - Exercises and case studies	1,66	

		• InterSymbol Interference (ISI)						
3	5	Unit 2: Linear Modulations • Exercises	x			- Exercises and case studies	1,66	5
3	6	Unit 2: Linear Modulations • Exercises		x		- Exercises and case studies	1,66	
4	7	Unit 3: Phase and Frequency Modulations • Phase Modulations: PSK, QPSK and OQPSK • Differential Phase Modulations • Continuous Phase Frequency Shift Keying CPFSK • Minimum Shift Keying MSK	x			- Assimilate Course Content during class - Exercises and case studies	1,66	5
4	8	Lab Session 1		x	LAB	- Lab session preparation	1,66	
5	9	Unit 4: Multipulse Modulations • Multicarrier and Frequency Division Modulations FDM • Continuous-time Orthogonal FDM • Discrete.Time OFDM • Transmitters and Receivers for OFDM • Discrte Equivalent Channels. Effects of ISI. Cyclic Prefix. • Spread Spectrum Modulations.	x			- Assimilate Course Content during class - Exercises and case studies	1,66	5
5	10	Exercises		x		- Exercises and case studies	1,66	
6	11	Exercises	x			- Exercises and case studies	1,66	5
6	12	Lab. Session 2		x	LAB	- - Lab session preparation	1,66	
7	13	**First Mid-term Exam**	x				1,66	7
7	14	**Unit 5: Channel Coding** • Introduction to Channel Coding • Linear Block Codes. • Optimum soft and hard decision estimators • Linear Block Codes. Generator Matrix • Cut-off Rate. Design of Block Codes.		x		- Assimilate Course Content during class - Exercises and case studies	1,66	
8	15	Unit 5: Channel Coding • Convolutional Codes. Punctured Codes • Trellis Coded Modulation • Examples: Reed Solomon, TCM	x				1,66	5
8	16	Unit 6: **Telecommunication Systems over guided Media Cable Networks** • Architecture and Network Elements • Physical Layer o Attenuation	x			- Assimilate Course Content during class - Exercises and case studies	1,66	

		○ Noise and Interferences: RF Ingress, Common Path Distortion						
9	17	Unit 6: **Telecommunication Systems over guided Media Cable Networks** • Physical Layer. Noise in Amplifiers in Series • Equivalent Thermal Noise • Eb/N0. Bit Error Rate • Standards in Multimedia Comms. DOCSIS, DVB-C/C2	X			- Assimilate Course Content during class - Exercises and case studies	1,66	5
9	18	Exercises		x		- Exercises and case studies	1,66	
10	19	**Digital Suscriber Loop xDSL** • Standards: ADSL, ADSL2+, HDSL, VDSL • Architecture and Elements: ATU, DSLAM, BRAS • Physical Layer ○ Crosstalk, attenuation, ISI ○ Multicarrier Moduclations ○ Optimizing the Physical Layer: waterfilling, bit swapping	x			- Assimilate Course Content during class - Exercises and case studies	1,66	5
10	20	Exercises	x			- Exercises and case studies	1,66	
11	21	**Fiber Optics** • Passive (PON) and active Optical Networks • PON Architecture and Elements: OLT, ONU, ODN • Physical Layer ○ Attenuation, dispersion, termal and quantum noise. ○ Emitters (FP, DFP, EAM), Detectors (PiN, APD) ○ Link Budget • Standards for Multimedia Comms.	x			- Assimilate Course Content during class - Exercises and case studies	1,66	5
11	22	Exercises		x		- Exercises and case studies	1,66	
12	23	Unit 7: **Radio Telecommunication Systems** **Satcom: LEO/GEO Satellites for Multimedia Communications** • **DVB-S/S2** • **Large Scale Propagation Models** ○ Free Space		x		- Assimilate Course Content during class - Exercises and case studies	1,66	5
12	24	**Exercises**	x			- Exercises and case studies	1,66	5
13	25	Unit 7: **Radio Telecommunication Systems** • **Point-to-point Microwave Radiolinks** • **Mobile Networks** • **Large Scale Propagation Models** ○ Log-distance: Okumura Hata ○ Log-normal • **Small Scale Propagation Models**	x		LAB	- Lab session preparation	1,66	5

		○ Fading, Doppler ○ Discrete Models for Channels Channel Coding Design for fading Channels						
13	26	Units 8 and 9: **Telecommunication Systems Standards** DVB-S/S2, DVB-T, DVB-C Exercises		x		- Exercises and case studies	1,66	
14	27	Lab Session 3: Link Budget Lab Session 4: Slow Flat Fading simulation. Discrete Models for Communication Channels		x		- Exercises and case studies	1,66	5
14	28	**Second Mid-term Exam**		x	LAB	- Lab session preparation - Project preparation	1,66	7
	29		x			- Revise the second part of the course for exam preparation.	1,66	5
						Subtotal 1	**48,18**	**64**

112,18

15		Supervision, Project Report submission, etc						
16		Exam Preparation				Course study and review	3	50
17								
18								
						Subtotal 2	**3**	

165,18