Universidad Carlos III de Madrid

COURSE: Signal and Systems		
DEGREE: Bachelor in Biomedical Engineering	**YEAR: 3rd**	**TERM: 1st**

WEEKLY PROGRAMMING									
WEEK	**SESSION**	**DESCRIPTION**	**GROUPS**		SPECIAL ROOM FOR SESSION (Computer class room, audio-visual class room)	Inidicate YES/NO If the session needs 2 teachers: Maximum 4 sessions	**WEEKLY PROGRAMMING FOR STUDENT**		
			LECTURE	**SEMINAR**			**DESCRIPTION**	**CLASS HOURS**	**HOMEWORK HOURS Maximum 7 H**
1	1	Unit 1 - Signals • Presentation of the course contents • Properties of the signals: regularity, symmetry	**X**		No		• Learn about signals as vectors and their properties.	1,66	4
1	2	Unit 1 - Signals • Characterization of signals: energy and average power. RMS value. • Basic operations with signals: time reversal, scaling, shifting		**X**	No		• Learn about the characteristics of signals.	1,66	
2	3	Unit 1 - Signals • Basic signals • Vectorial interpretation of signals	**X**		No		• Typical signals and what they are used for.	1,66	6
2	4	Unit 1 - Signals • Exercises		**X**	No		• Solution of the proposed exercises.	1,66	
3	5	Unit 2- Systems • Introduction • Interconnection of systems: series, parallel and feedback systems • Properties of the systems: causality, stability, time invariance, linearity	**X**		No		• Learn about the different systems and their relation to signals.	1,66	4
3	6	Unit 2- Systems • Linear Time-Invariant Systems (LTI) • Convolution		**X**	No		• Basic properties of systems and convolution.	1,66	
4	7	Unit 2- Systems • Unit Step response • Interconnection of the SLIT	**X**		No		• Basic analysis of the response to systems.	1,66	6

4	8	Unit 2- Systems • Exercises.		**X**	No		• Solution of the proposed exercises.	1,66	
5	9	Unit 3- Fourier series • Introduction: Response of LTI Systems to Complex Exponentials • Fourier Series Representation of Continuous-Time Periodic Signals: Analysis and Synthesis Equations	**X**		No		• Learn about Fourier series.	1,66	6
5	10	Quiz Unit 3- Fourier series • Convergence. • Properties of Continuous-Time Fourier Series. Examples.		**X**	No		• Conditions for Fourier series.	1,66	
6	11	Unit 3- Fourier series • Fourier Series Representation of Discrete-Time Periodic Signals: Analysis and Synthesis Equations • Properties of Discrete-Time Fourier Series and comparisons with the Continuous Case. Examples	**X**		No		• Properties for Fourier series and examples.	1,66	4
6	12	Laboratory Session 1 – Signals and Systems in the time domain.		**X**	Yes			1,66	
7	13	Unit 4- Fourier Transform • Introduction • The Continuous-Time Fourier Transform for Aperiodic Signals	**X**		No		• Learn about the Fourier transform.	1,66	6
7	14	Unit 3- Fourier series • Exercises		**X**	No		• Solution of the proposed exercises.	1,66	
8	15	Unit 4- Fourier Transform • The Continuous-Time Fourier Transform for Periodic Signals • Properties of the Continuous-Time Fourier Transform. Examples. Parseval's Theorem	**X**		No		• Fourier transform for continuous periodic signals.	1,66	
8	16	Unit 4- Fourier Transform • The Discrete-Time Fourier Transform for Aperiodic Signals • The Discrete-Time Fourier Transform for Periodic Signals		**X**	No		• Discrete-time Fourier transform.	1,66	4
9	17	Unit 4- Fourier Transform • Properties of the Continuous-Time Fourier Transform	**X**		No		• Properties of the Fourier transform.	1,66	6
9	18	Unit 4- Fourier Transform • Exercises		**X**	No		• Solution of the proposed exercises	1,66	
10	19	Unit 5- Sampling • Introduction • The Sampling Theorem • Reconstruction of Continuous-Time Signals from Its Samples Using Interpolation	**X**		No		• Introduction to Sampling and reconstruction of continuous time signals.	1,66	4
10	20	Laboratory Session 2 – Fourier Transform.		**X**	Yes		• Solution of the proposed exercises.	1,66	
11	21	Unit 5- Sampling • Discrete-Time Processing of Continuous-Time Signals • Decimation and Interpolation	**X**		No		• Examples of sampling and their application.	1,66	6
11	22	Quiz		**X**	No		• Solution of the proposed exercises.	1,66	

		Unit 5- Sampling • Exercises							
12	23	Unit 6- Discrete Fourier Transform • Introduction • Sampling of the Fourier Transform	**X**		No		• Sampled Fourier Transform.	1,66	4
12	24	Laboratory Session 4 – Sampling.		**X**	Yes			1,66	
13	25	Unit 6- Discrete Fourier Transform • Discrete Fourier Transform • Properties • Circular Convolution and Linear Convolution. Examples	**X**		No		• Discrete Fourier transform and its properties. • Linear and circular convolution, differences and applications.	1,66	6
13	26	Quiz Unit 6- Discrete Fourier Transform • Exercises		**X**	No		• Solution of the proposed exercises.	1,66	
14	27	Unit 7: Z-transform • Introduction • The z-Transform • The Region of Convergence. Properties • The Inverse z-Transform	**X**		No		• Introduction to the Z-transform.	1,66	6
14	28	Unit 7: Z-transform • Properties of the z-Transform. • Evaluation of the Frequency Response from the Pole-Zero Plot • Analysis and Characterization of LTI Systems Using the z-Transform • Block Diagram Representation		**X**	No		• Properties and excercises.	1,66	
14	29	Laboratory: Exam		**X**	Yes			1,66	
SUBTOTAL								**48,33 + 72 = 120,33**	
15		Tutorials, Handing in, etc							
16-18		Assessment			No			3	16,66
TOTAL								**140**	