

**2020/2021 - M1 IMDEA Course Plan
Semester 2**

Teaching Unit	Course	Contents	Working hours	ECTS
Acoustics & Mechanics	Acoustics II Green	Be able to use Green's functions and Integral formalism to solve simple realistic problems (using Python)	28	2
	Acoustics II Project		10	2
	Vibrations I	Be able to model simple vibrating structures (string, membrane) using analytical approaches	12	1
	Vibrations Experiments	Free and forced oscillations of a system having a single or two degrees of freedom. Determination of mode parameters of a beam / Chladni's vibrating plates Forced vibrations of a beam, Free oscillations of a string. Revving of an engine / order analysis, Dynamic balancing	20	2
Methodology	CAD Modelling	Basic principles and SolidWorks user interface, introduction to sketching, modeling simple parts (prismatic and revolution), use of advanced solid features (rehearsal, shells and ribs, scans, ...), use of drawings, upward assembly.	20	2
Signal Processing & Electronics	Digital Filtering	General concepts of digital filters, Z transform, poles and zeros, stability, frequency response, design of IIR and FIR filters. Virtual instrumentation, Digital filtering, Use of a development starter kit, Real time applications, Implementation on chip (DSP)	26	3
	LP analog electronics	Courses and practical activities (to build and test a circuit, as a low-power audio amplifier, using simulation tool and laboratory instruments).	31	3
	Signal analysis I	Non-stationary data analysis, basics of digital filtering, acoustic imaging	36	3
Electroacoustics	Loudspeaker technology	General concepts about materials : classification of materials, general mechanical properties of materials, elastic and viscoelastic materials, equations of behaviour, experimental characterization techniques (elongation, flexion, Dynamical Mechanical Analysis). Technologies of materials : materials for membranes, materials for motors, materials for suspension, application of materials in loudspeaker design. Examples of design process and measurement techniques. Link between materials and perceptive aspects.	12	1
	Transmission lines	General concepts on transmission lines. Equations of acoustic transmission lines without and with viscothermal effects. Transfer Matrix and impedance calculation. Effect of higher order modes. Measurement techniques of acoustic wave guides	20	2
Professional	Project	During the 1st year of the programme, students must conduct a project dealing with electroacoustics. The aim is to carry out a feasibility study involving modelling using lumped elements. CAD modelling measurement aspects.	36	6
	Project development	Audio product development	6	
	Seminars	Seminars given by engineers, researchers working in the field of electroacoustics	10	0
Communication	English	Oral and reading comprehension. Oral and written expression. Grammatical and lexical activities	18	1
	Scientific expression	Scientific writing, presentation, posters, effective visuals. Introduction to LaTeX and Beamer	10	1
	Tools for job searching	The aim of this course is to know the different usual tools for job searching and to be able to use them for the Master's thesis company research.	11	1
			322	30