[MSD102] DESIGN OF ELECTRONIC SYSTEMS

GENERAL INFORMATION

Studies	MASTER DEGREE IN SMART ENERGY SYSTEMS			**Subject**	?
Semester	2	**Course**	1	**Mention / Field of specialisation**	
Character	COMPULSORY				
Plan	2025	**Modality**	Face-to-face	**Language**	EUSKARA/CASTELLANO
Credits	4,5	**Hours/week**	0	**Total hours**	63 class hours + 49.5 non-class hours = **112.5 total hours**

2030 AGENDA GOALS

PROFESSORS

OYARZUN GOYALDE, JAVIER
GARAYALDE PEREZ, ERIK

REQUIRED PREVIOUS KNOWLEDGE

Subjects	Knowledge
(No specific previous subjects required)	*(No previous knowledge required)*

LEARNING RESULTS

LEARNING RESULTS	KC	SK	AB	ECTS
MS111 - Design and manufacture affordable, non-polluting and electromagnetically compatible electronic circuits for the efficient integration of the different equipment making up a power system.		x		4,16
MS171 - Ability to work in multidisciplinary teams and in a multilingual environment	x		x	0,08
MS222 - Exhibits, argues and defends the results obtained in the work carried out before a panel of judges			x	0,1
MS251 - Develops a project in the field of energy systems in a practical application context		x		0,16
			Total:	4,5

KC: Knowledge or Content / SK: Skills / AB: Abilities

SECONDARY LEARNING RESULTS

RMS222 **[!]** ***Expone, argumenta y defiende ante un tribunal los resultados obtenidos en el trabajo desarrollado***

LEARNING ACTIVITIES	CH	NCH	TH
Development and writing of records, reports, presentations, audiovisual material, etc. on projects/work experience/challenges/case studies/experimental investigations carried out individually and/or in teams		2,5 h.	2,5 h.

EVALUATION SYSTEM	W
Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	100%

MAKE-UP MECHANISMS

(No mechanisms)

CH - Class hours: 0 h.
NCH - Non-class hours: 2,5 h.
TH - Total hours: 2,5 h.

RMS118 **[!]** ***Diseñar y fabricar circuitos electrónicos asequibles, no contaminantes y electromagnéticamente compatibles para la integración eficiente de los diferentes equipos que componen un sistema de energía***

LEARNING ACTIVITIES	CH	NCH	TH
Personal study and flexible development of concepts and subjects using active dynamics, to foster more meaningful learning		15 h.	15 h.
Conducting tests, giving presentations, presenting defences, taking examinations and/or doing checkpoints	2 h.		2 h.
Computer simulation exercises, individually and/or in teams	21 h.	26 h.	47 h.

Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	40 h.	40 h.

EVALUATION SYSTEM	W	MAKE-UP MECHANISMS
Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	34%	Individual written and/or oral tests or individual coding/programming tests
Presentation and defence of exercises, case studies, computer practical work, simulation practical work, laboratory practical work, term projects, end of degree project, master's thesis, challenges and problems	33%	
Individual written and/or oral tests or individual coding/programming tests	33%	

CH - Class hours: 63 h.
NCH - Non-class hours: 41 h.
TH - Total hours: 104 h.

RMS251 **[!]** ***Desarrolla un proyecto del ámbito de los sistemas energéticos en un contexto de aplicación práctica***

LEARNING ACTIVITIES	CH	NCH	TH
Development and writing of records, reports, presentations, audiovisual material, etc. on projects/work experience/challenges/case studies/experimental investigations carried out individually and/or in teams		4 h.	4 h.

EVALUATION SYSTEM	W	MAKE-UP MECHANISMS
Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	100%	*(No mechanisms)*

CH - Class hours: 0 h.
NCH - Non-class hours: 4 h.
TH - Total hours: 4 h.

RMS171 **[!]** ***Es capaz de trabajar en equipos multidisciplinares y en un entorno multilingüe***

LEARNING ACTIVITIES	CH	NCH	TH
Development and writing of records, reports, presentations, audiovisual material, etc. on projects/work experience/challenges/case studies/experimental investigations carried out individually and/or in teams		2 h.	2 h.

EVALUATION SYSTEM	W	MAKE-UP MECHANISMS
Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	100%	*(No mechanisms)*

CH - Class hours: 0 h.
NCH - Non-class hours: 2 h.
TH - Total hours: 2 h.

CONTENTS

I. PCB DESIGN AND MANUFACTURING

1. Overview of the PCB manufacturing process.
2. Review of the materials used in PCB manufacturing depending on the end application.
3. Assembly of both SMD and through-hole components.

4. PCB design using Altium.
    1. Creation of components, both the schematic symbol and the footprint for the PCB.
    2. Schematic design.
    3. PCB design.
    4. Final PCB check and automatic error search.
    5. Obtaining manufacturing files.

II. EMI and EMC

1. Generation and propagation of electromagnetic interference

1.1 Introduction

1.2. Sources of interference: components.

1.3. Sources of interference: transients and switching.

1.4. Interference coupling.

2. Transmission lines, electromagnetic theory and antennas

2.1 Transmission line theory

2.2. Electromagnetic fields

2.3. Antennas

3. EMI reduction-cancellation techniques

3.1. Shielding

3.3. Grounding

3.3. Ferrites

3.4. EMI filters

3.5. EMC design criteria

4. EMC: measurement equipment and procedures

4.1 EMC standards

4.2. Equipment

– LISN.

– Spectrum analysers.

– Near-field probes.

– RF current probes.

– OATS

– GTEM cells.

– TEM cells.

4.3. Conformity and pre-conformity

4.4. CISPR11 and CISPR14

COMPUTER EXERCISES

1. Simulation of component non-ideality.

2. Fourier analysis of switching signals (I).

3. Fourier analysis of switching signals (II).

LEARNING RESOURCES AND BIBLIOGRAPHY

Learning resources	Bibliography
Moodle Platform	Acceso online a bibliografía: https://labur.eus/O8zEA
Labs	
Slides of the subject	
Computer practical training	