COURSE DATA

DATA SUBJECT

Code: 46795
Name: Electromagnetic Compatibility
Cycle: Doctorate / Master's Degree
ECTS Credits: 3
Academic year: 2025-26

STUDY (S)

Degree	Center	Acad. year	Period
2269 - Master's Degree in Electronic Engineering	Escola Tècnica Superior d'Enginyeria	1	First quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
2269 - Master's Degree in Electronic Engineering	Electrónica Industrial	COMPULSORY

COORDINATION

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SUMMARY

This subject covers the techniques and methods for designing electronic equipment or systems while minimizing the risk of Electromagnetic Interference (EMI) issues and ensuring compliance with Electromagnetic Compatibility (EMC) regulations. Emphasis will be placed on solving real-world problems in electronic subsystems and compatibility issues in industrial installations. These concepts will be approached with a highly practical focus, applying techniques and components that help develop skills and abilities that take EMC into account in the design and validation process.

The design of electronic products requires knowledge of EMC regulations, the role of certification laboratories, and applicable design techniques. Concepts related to best practices in PCB design aimed at improving performance against radiated and conducted EMI will be covered. Measurement techniques to identify and characterize EMI will be studied, along with strategies that can be used to reduce it. Additionally, various elements, protections, and recommendations for improving the EMC of a system will be described to reduce its emissions and enhance its immunity to other devices.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

There are no specified enrollment restrictions with other subjects of the curriculum.

OTHER REQUIREMENTS

*Relationship with other subjects in the same degree program:
No enrollment restrictions have been specified with other subjects in the curriculum.

*Other types of requirements:
It is advisable for students to have a basic understanding of concepts related to electronic product design. Specifically, it is necessary to know the fundamentals related to the analysis of electronic circuits and analog and digital electronics.

COMPETENCES / LEARNING OUTCOMES

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Conduct a critical analysis, evaluation and synthesis of new ideas to solve problems in complex or unfamiliar environments within broader contexts in the field of electronic engineering and related multidisciplinary fields.

Create mathematical models and simulations in the field of electronic engineering and related multidisciplinary fields.

Demonstrate a systematic knowledge and a mastery of technical, personal, social and methodological skills in the field of electronic engineering and related multidisciplinary fields.

Design systems and processes that meet electronic, regulatory, economic, social, ethical and environmental specifications.

Gain the professional skills and cooperation abilities that are suitable for practising in the field of electronic engineering and related multidisciplinary fields.

Handle specialised software and hardware, as well as design, simulation and programming environments in the field of electronic engineering and related multidisciplinary fields.

Identify, formulate and solve problems in the field of electronic engineering and related multidisciplinary fields.

Interpret technical documentation and regulatory standards for equipment and systems in the field of electronic engineering and related multidisciplinary fields.

Know advanced techniques of energy conversion, electromagnetic compatibility and system control in the field of industrial electronics.

Project, calculate and design products, processes and installations in the field of electronic engineering and related multidisciplinary fields.

DESCRIPTION OF CONTENTS

1. Unwanted energy exchange between circuits

1.1. Energy emitters and receivers.
1.2. Parasitic elements of electronic components.
1.3. Interference coupling mechanisms.

2. Galvanic coupling

2.1. Equivalent circuit of galvanic coupling.
2.2. Coupling mechanisms.
2.3. Techniques for reducing galvanic coupling.

3. Inductive coupling

3.1. Equivalent circuit of inductive coupling.
3.2. Coupling mechanisms.
3.3. Techniques for reducing inductive coupling.

4. Capacitive coupling

4.1. Equivalent circuit of capacitive coupling.
4.2. Coupling mechanisms.
4.3. Techniques for reducing capacitive coupling.

5. Electromangetic Compatiblity (EMC) Standards

5.1. EMC directives.
5.2. Conducted EMI emissions.
5.3. Radiated EMI emissions.
5.4. Immunity to EMI.

6. Testing and test equipment

6.1. Measuring equipment.
6.2. Test facilities.
6.3. Test antennas and probes.

7. EMC system aproach

7.1. Printed circuits (PCB).
7.2. Power supplies, cables, and filters.
7.3. Electromagnetic shielding.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Theory	15,00
Laboratory	15,00
Total hours	**30,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	10,00
Independent study and work	15,00
Preparation of lessons	10,00
Preparation for assessment activities	5,00
Resolution of case studies	5,00
Total hours	**45,00**

TEACHING METHODOLOGY

The teaching methodologies to be used in the development of the course are as follows:

a) Theoretical activities.

Development of the subject by providing a global and integrative vision, analyzing in greater detail the key and m
complex aspects, and encouraging student participation at all times.

b) Practical activities.

These complement the theoretical activities with the aim of applying basic concepts and expanding them with
knowledge and experience acquired during the completion of the proposed tasks. Generally, they will be carried ou
groups to enhance students' teamwork skills. They include the following types of activities:

Laboratory practices: A series of laboratory sessions is proposed that immediately put the acquired knowledge i practice, following a sequence analogous to the theoretical content. This strategy offers two clear benefits: on the hand, fundamental concepts are better consolidated, and on the other, students' skills are developed naturally progressively.

Discussion sessions and resolution of practical cases previously worked on by the students.

c) Students' personal work.

Completion of questions and problems outside the classroom, as well as preparation for classes and poss evaluation tests. This task will be carried out individually and aims to enhance autonomous work.

The Virtual Classroom platform will be used to communicate with students. Through it, students will have acces the didactic material used in class, as well as the problems and exercises to be solved.

EVALUATION

The assessment of learning will be carried out through the following evaluation systems (SE):

***First call:**

For students who demonstrate continuous and effective participation in the proposed activities, as well as a minimum attendance of 80% of the face-to-face sessions, the assessment of their learning will be conducted as follows:

SE2 - Evaluation of practical activities: completion of the individual questionnaire and/or resolution of a practical case in the laboratory similar to those solved in the practical sessions: 50%

SE3 - Continuous assessment: submission of technical reports or result summaries, as well as work and/or projects: 50%

Students who have not demonstrated continuous and effective participation in the proposed activities or have not attended at least 80% of the face-to-face sessions must take a final theoretical-practical written exam that will replace the continuous assessment part (SE1: 50%) and complete an individual questionnaire and/or resolve a practical case related to the laboratory part (SE2: 50%).

***Second call:**

For students who do not pass or do not meet the requirements of the first call, their learning assessment will be carried out as follows:

SE1 - The assessment will be carried out through a final theoretical-practical written exam: 50%

SE2 - Evaluation of practical activities: completion of the individual questionnaire and/or resolution of a practical case in the laboratory similar to those solved in the practical sessions conducted: 50%

Copying or plagiarism of any activity that is part of the evaluation will result in the impossibility of passing the course, and the student will then be subject to the appropriate disciplinary procedures indicated in the ACTION PROTOCOL FOR FRAUDULENT PRACTICES AT THE UNIVERSITY OF VALENCIA (ACGUV 123/2020).

In any case, the system of evaluation will be ruled by the established in the Regulation of Evaluation and Qualification of the University of Valencia for Degrees and Masters. (https://webges.uv.es/uvTaeWeb/MuestraInformacionEdictoPublicoFrontAction.do?accion=inicio&idEdictoSeleccionado=5639).

REFERENCES

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