



## PRESENTACIÓN

### Breve descripción:

Compatibilidad electromagnética es una asignatura de libre elección del 1er semestre de 4º curso que tiene por objetivo proporcionar al estudiante un conocimiento práctico en los siguientes aspectos:

- Conceptos generales de Compatibilidad Electromagnética
- Fenómenos físicos que tienen lugar en los dispositivos electrónicos
- Reglas de diseño para mitigar y tener controlados los fenómenos electromagnéticos
- Principales aspectos de la normativa de EMC en Europa

### Titulación (Módulo/Materia):

- Ingeniería en Electrónica Industrial (Bloque Especializado de Electrónica Industrial/Electricidad)

### Detalles:

- **ECTS:** 4 ECTS
- **Curso, semestre:** 4.º curso, 1.º semestre
- **Carácter:** Obligatorio
- **Idioma:** -Inglés

### Profesores de la asignatura:

- Meléndez Lagunilla, Juan/Profesor colaborador
- Berenguer Pérez, Roque José/Catedrático

## COMPETENCIAS

### INGENIERÍA EN ELECTRÓNICA INDUSTRIAL

CG10 - Capacidad de trabajar en un entorno multilingüe y multidisciplinar.

CE20 - Conocimiento de los fundamentos y aplicaciones de la electrónica analógica.

CE23 - Conocimiento aplicado de instrumentación electrónica.

CE24 - Capacidad para diseñar sistemas electrónicos analógicos, digitales y de potencia.

## PROGRAMA

### Descriptive lessons:

In the subject "Electromagnetic Compatibility" 13 descriptive lessons with theoretical explanations, practical examples, demonstrations and case studies are scheduled. The mentioned lessons are indicated below:



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1. Lesson 1: What is EMC?
2. Lesson 2: Consequences of Non-EMC in analog and digital circuits
3. Lesson 3: General characteristics of electromagnetic incompatibilities
4. Lesson 4: Transition current, ground bounce and power supply decoupling
5. Lesson 5: Crosstalk
6. Lesson 6: Signal distortion due to tracks
7. Lesson 7: Ground planes
8. Lesson 8: Radiation
9. Lesson 9: Shielding
10. Lesson 10: Cables and connectors
11. Lesson 11: Electrical transients
12. Lesson 12: Emission tests
13. Lesson 13: Immunity tests

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## **Project of EMC**

The project of EMC must be developed by a group of student (2-3 students per group). The project will be focused in a certain electronic device (proposed by the lecturer or by the students). The project must have the following points:

1. Definition of the product specifications (responsibility of the lecturer or proposed by the student)
2. Identification of the standards that the product must comply with
3. Product design (block diagram, electrical circuit scheme, part list, layout, etc...)
4. Main characteristics of the parts regarding EMC
5. Construction considerations regarding EMC
6. Main characteristics of the test to perform in order to ensure the product CE certification

The groups must prepare a document with the afore mentioned items, present the main topics in public (20min) and answer to the questions.

## **Visit to interesting sites**

In order to complement the knowledge acquired in the descriptive lessons, the students will have the opportunity to visit some interesting sites regarding EMC.



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- Electromagnetic compatibility laboratory
- Anechoic chamber

## ACTIVIDADES FORMATIVAS

## EVALUACIÓN

### CONVOCATORIA ORDINARIA

The subject evaluation procedure is described below:

- Exam: 50% of the final score. The score in the exam have to be over 5 to pass the subject.
- Project of EMC: 30% of the final score. 10% documentation, 10% presentation, 10% answers to questions.
- Resolution of problems: There are 5 problems scheduled that represent 20% of the final score. 10% documentation, 10% presentation
- Extra points: They can increment a maximum of the 20 % the standard score due to the following points:
  - voluntary works: Product analysis, EMC tools, case study, etc...

### CONVOCATORIA EXTRAORDINARIA

- Exam: 50% of the final score. The score in the exam have to be over 5 to pass the subject.
- Project of EMC: 50% of the final score. 10% documentation, 20% presentation, 20% answers to questions.

## HORARIOS DE ATENCIÓN

Dr. Juan Melendez ([jmelendez@tecnun.es](mailto:jmelendez@tecnun.es)) y Dr. Roc Berenguer ([rberenguer@tecnun.es](mailto:rberenguer@tecnun.es))

- Horario de tutoría: martes y jueves de 17:50 a 18:20 en el Aula 8. También se puede tratar de concertar una reunión en un horario distinto con los profesores enviando previamente un email.

## BIBLIOGRAFÍA

- "Introduction to EMC" Clayton R. Paul [Localízalo en la biblioteca](#)
- "EMI control in the design of printed circuit boards and blackplanes" Donald R. J. White, Don White Consultants, Inc. 1982 (ISBN: 83-111787)
- "Electronic Product Design" Tony Ward and James Angus, Chapman & Hall 1996 (ISBN: 0 412 63200-4) [Localízalo en la biblioteca](#)
- "EMC and the Printed Circuit Board: Design, Theory and Layout made simple" Mark I. Montrose, IEEE Press 1999 (ISBN: 0-7803-4703-X) [Localízalo en la biblioteca](#)
- "Printed Circuit Boards Basics" Michael Flatt, Miller Freeman Books 1999 (ISBN: 0-87930-486-3) [Localízalo en la biblioteca](#)



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- "Controlling Radiated Emissions by Design, Second Edition" Michael Mardiguian, Kluwer Academic Publisher 2001 (ISBN: 0-7923-7978-0) [Localízalo en la biblioteca \(versión online\)](#)
- "EMC for product designers: meeting the european directive" Tin Williams, Newnes 2001 (ISBN: 0-7506-4930-5) [Localízalo en la biblioteca \(versión online\)](#)