COURSE DATA

Data Subject	
Code	34812
Name	Electronic Products Design
Cycle	Grade
ECTS Credits	6.0
Academic year	2020 - 2021

Study (s)

Degree	Center	Acad. year	Period
1402 - Degree in Telecommunications Electronic Engineering	School of Engineering	4	First term
1404 - Degree in Industrial Electronic Engineering	School of Engineering	4	First term

Subject-matter

Degree	Subject-matter	Character
1402 - Degree in Telecommunications Electronic Engineering	15 - Electronic instrumentation, equipment and products	Obligatory
1404 - Degree in Industrial Electronic Engineering	21 - Optional subjects	Optional

Coordination

Name	Department
ESTEVE GOMEZ, VICENTE	242 - Electronic Engineering
JORDAN MARTINEZ, JOSE FRANCISCO	242 - Electronic Engineering

SUMMARY

The purpose of this course is to develop concepts and methods related to the "engineering electronic equipment" with which it is possible to successfully address the design of electronic products. It is important that students be aware that all design must consider concepts like functionality, reliability or security, without losing sight of other equally important as cost, durability, maintainability or preparing the product for manufacturing and marketing according to the regulations, through proper documentation and after due protection and dissemination of technological content. Emphasis will be on design considerations and testing techniques leading to regulatory compliance relating to Electromagnetic Compatibility (EMC) of the product.

The theory classes will be taught in Spanish (or Valencian if applicable) and the practical and laboratory classes according to the information sheet available on the web of the degree

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

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

Other requirements

The background needed to follow the course of the course are those acquired in the fields of physics, mathematics and circuits and electronic and photonic components taught in previous courses.

OUTCOMES

1402 - Degree in Telecommunications Electronic Engineering

- G3 - Acquisition of the knowledge of the basic and technological subjects that allows students to learn new methods and theories and endows them with the versatility to adapt to new situations.
- G4 - Ability to solve problems with initiative, decision-making and creativity, and to communicate and transmit knowledge, abilities and skills, understanding the ethical and professional responsibility of the activity of a telecommunications technical engineer.
- G5 - Knowledge to carry out measurements, calculations, assessments, evaluations, loss adjustments, studies, reports, task planning, and other analogous work in the specific field of telecommunications.
- G9 - Ability to work in a multidisciplinary environment and in a multilingual group and to communicate, in writing and orally, knowledge, procedures, results and ideas related to telecommunications and electronics.
- G6 - Ability in the handling of specifications, regulations and norms of compulsory compliance.
- TE3 - Ability to specify, implement, document and set-up electronics, instrumentation and control equipment and systems, considering both technical aspects and the relevant regulatory requirements.
- TE8 - Ability to specify and use electronic instrumentation and measurement systems.
- TE9 - Ability to analyze and solve the problems of interference and electromagnetic compatibility.

1404 - Degree in Industrial Electronic Engineering

- CO1 - More comprehensive skills than those acquired in compulsory subjects must be acquired in elective subjects.

LEARNING OUTCOMES

1. Be able to design an electronic product using the most appropriate methodology. (GIET: G3, G4, G5, G6, G9, TE3, TE8, TE9) (GIEI: CO1)
2. Apply the acquired knowledge in order to obtain reliable and reliable quality electronic products. (GIET: G3, G4, G5, G6, G9, TE3, TE8, TE9) (GIEI: CO1)

DESCRIPTION OF CONTENTS

1. INDUSTRIAL DESIGN PROCESS.

1.1. Introduction.
1.2. Design Process.
1.2.1. Specification of requirements.
1.2.2. Physical Design.
1.2.2.1. Methodology. Modularity.
1.2.2.2. Importance of interfaces.
1.2.2.3. Computer aided design. CAD.
1.2.3. Prototyping.
1.2.4. Tests.
1.3. Rapid prototyping.
1.3.1. Concept and historical development.
1.3.2. Fundamentals and advantages of rapid prototyping.
1.3.3. The sequence of the rapid prototyping process.

2. DESIGN STANDARS

Descripció de continguts (English):
2.1. Quality.
2.1.1. Functionality
2.1.2. cost
2.1.3. Maintainability
2.1.4. utility
2.1.5. durability
2.2. Reliability.
2.2.1. Failure rate
2.2.2. Reliability calculation
2.2.3. MFBF and MTTF
2.3. Security.
2.3.1. general criteria
2.3.2. electrical Safety
2.3.3. Protections

2.4. electromagnetic Compatibility
2.4.1. EU Directive
2.4.2. specific regulations
2.5. CE

3. DESIGN CRITERIA AND TESTING OF ELECTRONIC PRODUCTS

3.1. Introduction.
3.2. Electronic circuit design.
3.2.1. Design of instrumentation and control circuits.
3.2.2. Power circuit design.
3.2.3. Printed Circuit Design.
3.3. Design layout.
3.4. Interface design.
3.5. Design of boxes and enclosures.
3.5.1. Grounding and shielding.
3.5.2. Protection against dust and moisture.
3.6. Cooling design.
3.7. Testing of the prototype.
3.7.1. Compliance tests.
3.7.2. Essays in the worst condition. Burn-in.
3.7.3. Electromagnetic compatibility tests.
3.7.4. Safety tests.

4. EMC

4.1. Introduction to electromagnetic compatibility.
4.1.1. Electromagnetic environment.
4.1.2. Basic concepts in EMC. -
4.1.3. Basic elements of the EMC.
4.2. Interference transmitters and receivers.
4.2.1. Sources of interference.
4.2.1.1. Sources of natural interference.
4.2.1.2. Artificial interference sources.
4.2.1.2. Semiconductors, sources of interference.
4.2.2. Susceptibility of electronic circuitry.
4.2.3. The electronic components from the point of view of electromagnetic compatibility.
4.2.3.1. Conductors.
4.2.3.2. Resistors.
4.2.3.3. Capacitors.
4.2.3.4. Coils and transformers.
4.3. Interference mechanisms.
4.3.1. Galvanic coupling interference.
4.3.2. Electrical coupling of interference.
4.3.3. Magnetic coupling of interference.

4.4. Design techniques of electromagnetic compatibility.
4.4.1. Earth and mass.
4.4.1.1. The connection of the mass.
4.4.1.2. Wiring industrial systems.
4.4.1.3. Techniques for reducing ground loops.
4.4.2. Shielding of electronic systems.
4.4.2.1. Absorption losses.
4.4.2.2. Reflection losses.
4.4.2.3. Multiple reflections.
4.4.3. Filtering systems.
4.4.3.1. Network filters.
4.4.3.2. Output filters.
4.4.3.3. Filters with real components.
4.4.3.4. Common Mode Filters.
4.4.3.5. Differential mode filters.
4.4.3.6. Commercial filters.
4.4.4. Multilayer PCB Design.
4.4.4.1. Crosstalk in PCB. Positioning of the components.
4.4.4.2. Power distribution. Strategies of the ground planes and power.
4.4.4.3. Pathways.
4.4.4.4. Micro islands.
4.4.4.5. Noise in the dough.
4.4.4.6. Rule 20-H.
4.4.4.7. Rule 3-W.
4.4.4.8. Basic rules on power planes.
4.4.4.9. Distributions layers.
4.4.5. Design of Power Supply PCB.
4.5. EMC Solutions sub already mounted.

5. DESIGN DOCUMENTATION.

5.1. Drafting of specifications
5.2. Design documentation
5.3. Production documentation
5.4. Plans, drawings and diagrams
5.5. And spare parts lists
5.6. Manuals and operating instructions
5.7. Test documentation3.6. Cooling design.

6. PROTECTION AND DISTRIBUTION OF DESIGN

6.1. Patent system: protection policies, patentability and infringement.
6.1.1. Introduction to IP-industrial (PI)
6.1.2. Key concepts relating to patents.
6.1.3. Requirements for patentability.
6.1.4. Protection of inventions.
6.1.5. Extension of protection to other countries.
6.1.6. Protection policy.
6.1.7. Interpretation of a patent document.
6.1.8. Patent infringement.
6.1.9. Some peculiarities.
6.2. Documentation: databases and information services technology patent offices (SPTO, EPO and others).
6.2.1. Information on the Internet.
6.2.2. Information technology services.
6.3. Transfer: transfer drafting contracts and licensing.
6.3.1. Brief introduction to the hiring
6.3.2. Technology transfer contracts.
6.3.3. Requirements for patentability.
6.3.4. Practical examples.
6.3.5. Anticompetitive rules.
6.4. Writing reports and claims.
6.4.1. Methodology claim drafting.
6.4.2. Special types of claims.
6.4.3. Formal and practical issues.

7. DPE laboratory

1 Lab design and testing of electronic products.

2 Capacitive coupling between two parallel runways circuits.

3 Inductive coupling between circuits.

4 Shield of capacitive and inductive coupling.

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	30,00	100
Laboratory practices	20,00	100
Classroom practices	10,00	100
Development of group work	8,00	0
Preparation of evaluation activities	10,00	0
Preparing lectures	37,00	0
Preparation of practical classes and problem	35,00	0
TOTAL	**150,00**	

TEACHING METHODOLOGY

In theory classes and problems the master lesson model will be used. The teacher will expose the contents of each topic through presentation and / or explanation, focusing on those key aspects for understanding the subject. (GIET: G3, G4, G5, G6, G9, TE3, TE8, ET9) (GIEI: CO1)

For laboratory practice sessions, activities will be programmed to introduce the practice to be carried out, experimental development activities and results analysis activities. The students will have practice scripts and the experimentation will be carried out entirely by them under the supervision of the teacher. (GIET: G3, G4, G5, G6, G9, TE3, TE8, ET9) (GIEI: CO1)

EVALUATION

The evaluation of student learning will take place following two models:

A **Type A:** (GIET: G3, G4, G5, G6, G9, TE3, TE8, ET9) (GIEI: CO1)

Learning assessment of students attending at least 80% of classroom theory and lab-problems will be formative and will be carried out by continuous assessment of progress and the work developed throughout the course. This will take into account:

• Participation in the class of problems in tutorials and in all planned activities and, second, solving activities (deliverables) that will be proposed in order to work independently (multiple choice tests, issues, problems numeric, seminars, exhibition of group work, etc ...).

● Assessment of laboratory practices by:

- The delivery, at the beginning of the lab sessions of the non-contact activities. The activities associated with non-contact practices are considered essential to successfully perform the same experimental setup.

- The delivery of reports and questionnaires after each practice session.

● Exam, this will consist of several issues of theoretical and practical content related to the agenda, and equally difficult issues and problems done in class.

The student who do not pass the exam on the first official announcement should be submitted for consideration by the second call. Specifically, we propose the following quantitative model:

1. Participation in the lectures, problems and associated deliverables 33%

2. Performing laboratory practices and related deliverables 17%

3. Review of theory-problems 33%

4. Laboratory examination 17%

Hence, to pass the course is considered mandatory attendance at all laboratory sessions and receive a grade of not less than 4 out of 10 on tests.

Type B: (GIET: G3, G4, G5, G6, G9, TE3, TE8, ET9) (GIEI: CO1)

Those students not to attend at least 80% of total classroom throughout the course or who wish to express, will be assessed against an alternative model that is specified as follows:

1. Review of theory-problems 50%

2. Laboratory examination 25%

3. Deliverables of theory-problems and laboratory 25%

Hence, to pass is considered mandatory to obtain a mark higher than or equal to 4 of 10 on each exam.

The evaluation on the second call is only possible through the mode B

In any case, the evaluation system will be governed by what is established in the Evaluation and Qualification Regulations of the University of Valencia for Degrees and Masters

REFERENCES

Basic

- Referència b1: Esteve, V., Jordán, J.: Equipos Electrónicos, Moliner 40 editores.

  Referència b2: Balcells, J., Daura, F., Esparza, R., Pallás, R.: Interferencias Electrónicas en Sistemas Electrónicos, Marcombo, Barcelona, 1992.

  Referència b3: Chua, C. K., Leong, K. F., Lim, C. S.: "Rapid prototyping: principles and applications", 2nd ed., World Scientific, NJ 2004.

Additional

- Referència c1: Fowler, K. R.: Electronic Instrument Design, Oxford University Press. New York, 1996. ISBN 0-19-508371-7.

  Referència c2: Ulrich, K. T., Eppinger, S. D.: "Product design and development", 3rd ed., McGraw-Hill-Irwin, NY 2004.

  Referència c3: Página web oficial de la Oficina Española de Patentes y Marcas: www.oepm.es

ADDENDUM COVID-19

This addendum will only be activated if the health situation requires so and with the prior agreement of the Governing Council

Contents

The contents initially collected in the teaching guide are maintained.

Volume of work and temporary planning of teaching

The different activities described in the Teaching Guide are maintained with the planned dedication.

The material for the monitoring of classroom theory / practical classes allows to continue with the temporary teaching planning both in days and in hours, both if the teaching is in the classroom or not.

Teaching methodology

In the classroom theory and practical classes, there will be the maximum possible attendance, always respecting the sanitary restrictions that limit the capacity of the classrooms to 50% of their usual occupation. Depending on the capacity of the classroom and the number of students enrolled, it may be necessary to distribute the students into two groups. If this situation arises, each group will attend classroom theory and practical sessions with physical presence in the classroom by rotating shifts, thus

ensuring compliance with the criteria for occupying spaces. The rotation system will be established once the actual enrollment data is known, guaranteeing, in any case, that the attendance percentage of all the students enrolled in the subject is the same. For classroom sessions and theory sessions that are not face-to-face, there will be a preferably synchronous online teaching model, as long as compatibility with other scheduled activities allows. Online teaching will be carried out by synchronous videoconference respecting the schedule, or, if not possible, asynchronous.

With respect to laboratory practices, attendance at sessions scheduled in the schedule will be totally face-to-face.

Once the actual enrollment data is available and the availability of spaces is known, the Academic Committee of the Degree will approve the Teaching Model of the Degree and its adaptation to each subject, establishing in said model the specific conditions in which it will be developed teaching the subject.

If there is a closure of the facilities for sanitary reasons that totally or partially affects the classes of the subject, these will be replaced by non-contact sessions following the established schedules.

Evaluation

The evaluation system described in the Teaching Guide of the subject in which the different evaluable activities have been specified as well as their contribution to the final grade of the subject is maintained.

If there is a closure of the facilities for health reasons that affect the development of any face-to-face evaluable activity of the subject, it will be replaced by a test of a similar nature that will be carried out in virtual mode using the computer tools licensed by the University of Valencia. The contribution of each evaluable activity to the final grade for the course will remain unchanged, as established in this guide.

Bibliography

The bibliography recommended in the Teaching Guide is kept as it is accessible.