67222 - Advanced Electronic Systems

Información del Plan Docente

Academic Year	2016/17
Academic center	110 - Escuela de Ingeniería y Arquitectura
Degree	527 - Master's in Electronic Engineering
ECTS	8.0
Course	1
Period	First semester
Subject Type	Compulsory
Module	---

1.Basic info

1.1.Recommendations to take this course

No additional recommendations are necessary because of the master's access requirements.

1.2.Activities and key dates for the course

The schedule of the activities for the course will be defined by the University of Zaragoza and the Engineering and Architecture School in the academic calendar (which will be available in the Center's website).

With information purposes:

- Class sessions: first semester (Fall).
- Masterclasses and problem-solving sessions: masterclasses and problem-solving sessions are scheduled each week in the classical classroom or the computer room.
- Hands-on activities in the laboratory: students will attend to laboratory sessions and deliver related reports.
- Study delivery: information about the schedule and delivering condition will be provided in the classroom.
- Exam: Exams will be scheduled by the Center for the 1 st call and 2 nd call, respectively.

2.Initiation

2.1.Learning outcomes that define the subject

The student, in order to pass the course, will have to show her/his competence in the following skills:

Ability to identify and classify different kind of advanced analog and digital electronic systems as well as their control and operation modes.

Knowledge to design analogic systems and electronic of instrumentation for advanced applications.

Knowledge to design advanced digital systems based on programmable devices.

Knowledge of several industrial, domestic and medical applications of the aforementioned systems, being able to perform

an in-depth design of these systems.

Knowledge of basic electromagnetic for advanced electronic applications, electromagnetics' laws in integral and differential forms as well as their meaning, the boundary conditions for electromagnetic fields, their static formulation and their experimental basis.

Ability to handle and understand the basic tool of numerical solution of electromagnetic systems. In particular, he/she knows how to use these tools to understand the behavior of electronic systems.

Knowledge of the electromagnetics' equation in the low frequency regime (quasi-static approach) by rewritten them into diffusion equations, he/she knows how to apply them in low-frequency cases and he/she is able to perform successfully different laboratory activities for their verification.

Knowledge of the concepts and experimental procedures mentioned in electromagnetic regulations.

2.2.Introduction

"Advanced Electronic Systems" constitutes a part of the compulsory subject area of the University Master's in Electronic Engineering. This is a subject of 8 ECTS which corresponds to 200 student's working hours.

This subjects is focused on the advanced learning on analog and digital electronic systems as well as applied physics for electronic system about electromagnetics. This subject addresses the analysis and design of electronic stages for amplification and instrumentation and the design of digital systems by means of programmable digital devices for applications of industrial and communication technologies. Furthermore, this subject also address the application of the differential form under the quasi-static regime of electromagnetics' laws as a tool for the analysis and design of electronic system.

3.Context and competences

3.1.Goals

The main goal of this subject is to educate students in advanced aspects of analogic and digital electronic systems as well as the knowledge on techniques of analysis, simulation and its main applications. Moreover, knowledge on electromagnetics for advanced electronic systems based on classical laws of electromagnetics in differential form as well as numerical tools based on finite element analysis will be provided. Furthermore, activities aimed at becoming more familiar with the laboratory instruments as well as several practical applications will take place.

3.2.Context and meaning of the subject in the degree

This subject frames within the compulsory master's subject area. Knowledge gained in this subject is useful for the degree, in particular for both optional specialties, "Power electronic systems" and "Electronics for intelligent ambient". In that way, principles for analysis and design of analogic, digital and power advanced electronic systems working at frequencies comprised from the industrial range to communication systems will be provided.

3.3.Competences

Basic competences

CB6. Understanding and having knowledge which provides the basis for being creative in the implementation and/or application of ideas, often, in a research context.

CB7. Students know how to apply the knowledge gained and its possibilities to solve problems in new or poor known environments within larger contexts (or multidisciplinary ones) related to the subject area.

CB8. Ability to assess and select the adequate scientific theory as well as the correct methodology within the fields of study to define judgements from incomplete or limited information including, when pertinent and required, a thought about the social responsibility or ethics associated with the proposed solution for each case.

General competences

CG1. Ability to physical-mathematical model, calculate and simulate in technological and engineering centers, in particular, for research purposes, development and innovation on scope of application related with the electronic engineering and close multidisciplinary fields.

CG4. Ability to address with success the completion of the PhD studies in the Electronic Engineering area.

Specific competences

CE1. Ability to analyze and design advanced analog system for signal processing, intelligent electronic instrumentation and sensing systems.

CE2. Ability to devise and implement advanced digital systems based on programmable devices, configurable logic devices and integrated circuits, with proficiency on hardware description tools.

CE3. Ability to analyze and design components and advance power electronic systems for the high-efficiency energy processing.

3.4.Importance of learning outcomes

Knowledge, skills and abilities gained with this subject as well as the remainder ones of the Master's in Electronic Engineering, should allow the student to create the competences previously reported as well as to address with success the completion of the PhD studies in the Electronic Engineering area or to discharge properly a professional job in the aforementioned area.

4.Evaluation

The student must prove that they have achieved the expected learning results by means of the following assessment activities:

Exams of theoretical and practical questions.

At the end of each subject's part, a test including questions related to the theoretical concepts as well as the hands-on activities will be performed.

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Each part will be marked separately in the scale from 0 to 10 points. The weighting mark (C1) of each part will be calculated and it will suppose 50% of the single overall mar for the student's assessment.

Assessment of hands-on activities and related reports:

The work implemented in the hands-on activities as well as the related reports will be assessed. With respect to the hands-on activities, the following aspects will be considered:

- Preparation in advance of the hands-on activities.
- Correct handling of the laboratory's instrumentation or the simulation tools.
- Degree of fulfilment of proposed tasks.

With respect to the work associated with the hands-on activities, it will consists of a brief as well as the answer for certain question related to its completion.

Each part will be marked in the scale from 0 to 10 points. The weighting mark (C2) of each part will be calculated and it will suppose 50% of the single overall mar for the student's assessment.

Single overall mark:

The single overall mark will be calculated as C1 + C2, provided that the mark in the exam of each part is equal or higher mark to 3. In another case, the single overall mark will be the minimum of C1 + C2 and 4. The subject will be passed for the overall score mark equal or higher to 5.

5.Activities and resources

5.1.General methodological presentation

The teaching and learning process will take place at three main levels: masterclasses, problem-based learning and hands-on activities, with increasing participation of students.

1. The fundamentals of advanced analog and digital electronic systems and electromagnetics' laws will be explained in the masterclasses.
2. Problem solving and illustrative examples will take place in the practical sessions with the cooperation of students.
3. Hands-on activities will be performed in the laboratory in small groups, they include both laboratory and finite-element simulations.

5.2.Learning activities

Classroom activities (3.2 ECTS, 80 hours)

A01 Masterclasses (40 hours)

This activity is intended to present the basics of the course illustrated with examples. This activity will take place on-site in the classical classroom or the computer room.

A02 Developing and resolution of problems (20 hours)

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In this activity, a set of illustrative examples will be explained with participation of students. This activity will take place on-site in the classical classroom or the computer room.

A03 Laboratory sessions (18 hours)

Lab sessions will consist of computer-based simulation sessions or practical arrangements of electronic systems. This activity will take place on-site in the computer room or the laboratory.

A08 Evaluation activities (2 hours)

Evaluation comprises the examination and the assessment of the laboratory-based activities.

Non-classroom activities (4.8 ECTS, 120 hours)

A06 Reports of the lab sessions (40 hours)

This activity is programmed to prepare the reports of the lab sessions. Reports will be made by groups of two students.

A07 Study (80 hours)

This activity comprises study time oriented to progress in the course, preparation for the hands-on activities as well as the exams and tutoring.

5.3.Program

- T1: Advanced analog electronic systems.
- T2: Advanced digital electronic systems.
- T3: Applied physics for advanced electronic systems.

5.4.Planning and scheduling

Schedule for on-site sessions and reports' deadline.

Schedule for the masterclasses, problem-solving sessions and laboratory sessions will be planned by the center (it will be shown in the
Center's website). The remainder activities will be planned depending on the amount of students and the schedule will be provided in advance.

5.5.Bibliography and recomended resources

Basic learning resources:

- Classroom notes, exercises and wording of the laboratory sessions will be available in http://moodle2.unizar.es

Reference books:

- P. Horowitz, W. Hill: "The Art of Electronics". Cambridge. University Press, 1989.
- J.I. Artigas, L.A. Barragán, C. Orrite, I. Urriza: "Electrónica Digital. Aplicaciones y problemas con VHDL",

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Prentice-Hall, 2002.
- C.T.A Johnk, "Teoría electromagnética. Campos y ondas", Limusa-John Wiley and Sons, 1999.

Complementary books:

- Pease, R. A., "Troubleshooting analog circuits", Butterworth-Heinemann, 1991.
- J.F. Wakerly: "Digital Design: Principles and Practices", Prentice Hall International, 2006.
- D.K. Cheng, "Fundamentos de electromagnetismo para ingeniería". Pearson Education, 1998.