Universidad Zaragoza

Academic Year/course: 2021/22

30396 - Communications electronics laboratory

Syllabus Information

Academic Year: 2021/22
Subject: 30396 - Communications electronics laboratory
Faculty / School: 110 - Escuela de Ingeniería y Arquitectura
Degree: 581 - Bachelor's Degree in Telecomunications Technology and Services Engineering
ECTS: 6.0
Year: 4
Semester: Second semester
Subject Type: Optional
Module:

1. General information

1.1. Aims of the course

The subject and its expected results respond to the following approaches and objectives:

- Methodologies, strategies, skills and techniques are gradually introduced for the design of telecommunications systems, as well as for digital design that is used as the basic technology.

- Theoretical-practical information on communication systems design is provided, with specific focus in its digital implementation. Implementation of signal processing for communication is studied from a practical perspective. Interpretation and use of technical information is practiced.

- The design and debugging of electronic systems, this is developed in the laboratory with extensive use of measurement equipment and CAD tools.

- To increase analysis, troubleshooting and tuning skills applied to electronic circuits: a complex prototype is developed and assembled, based on a digital system in FGPA and a printed circuit board for the analog interface.

- Increase teamwork habits, such as active participation within the team, the development of leadership skills and the ability to integrate efforts to achieve a common goal.

- Improve the ability to write technical reports and to present them in a useful and orderly manner.

These approaches and objectives are aligned with some of the Sustainable Development Goals, SDG, of the 2030 Agenda (https://www.un.org/sustainabledevelopment/es/) and certain specific goals, in such way the acquisition of the learning outcomes of the course provides training and competence to the student to contribute to a certain extent to their achievement:

- Goal 7: Ensure access to affordable, safe, sustainable and modern energy for all.

Target 7.3 By 2030, double the global rate of improvement in energy efficiency.

Target 7.b By 2030, expand infrastructure and improve technology to provide modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing States and developing countries without littoral, in line with their respective support programs.

- Objective 9: Industry, innovation and infrastructures.

Target 9.4 By 2030, modernize infrastructure and reconvert industries so that they are sustainable, using resources more efficiently and promoting the adoption of clean and environmentally sound industrial technologies and processes, and ensuring that all countries take measures in accordance with their respective capabilities.

1.2. Context and importance of this course in the degree

Electronics is the main background technology in telecommunications.

This course belongs to the electronic systems itinerary, where inherently electronic subjects (analog, digital and communications) and others dedicated to the practical application of design are developed.

In this case, the practical use of signal processing algorithms for communications, their prototyping and implementation by means of Digital Electronics is of special relevance.

The laboratory work allows to reinforce the basic concepts of telecommunication theory: digital modulations, communication systems and signal theory from a useful and fundamentally applied perspective.

In Digital Electronics Laboratory, what has been learned in electronic subjects is put into practice, together with learning in digital systems, through the realization of a project throughout all its phases. It is an opportunity to complete and round off learning, to integrate different technologies, apply them to real systems, but above all it is the opportunity to fully develop a project, achieving a finished product. On the other hand, and as explained at various points in this guide, the methodology used makes students acquire social and professional competences of great value for an engineer and which are otherwise difficult to achieve.

1.3. Recommendations to take this course

It is recommended previous course on electronics subjects: "Analog Electronics" (4th semester), "Digital Electronics" (4th semester), as well as "Electronic Systems with Microprocessors" (5th semester) and "Communications Electronics "(6th semester).

2. Learning goals

2.1. Competences

Upon passing the subject, the student will be more competent to:

Combine general and specialized knowledge of Engineering to generate innovative and competitive proposals in professional activity (C1)

Solve problems and make decisions with initiative, creativity and critical thinking (C4)

Communicate and transmit knowledge, abilities and skills in Spanish (C5)

Analyze and assess the social and environmental impact of technical solutions acting with ethics, professional responsibility and social commitment (C7)

Information management, management and application of technical specifications and legislation necessary for the practice of Engineering (C9)

Apply information and communication technologies in Engineering (C11)

Build, operate and manage systems for capturing, transporting, representing, processing, storing, managing and presenting multimedia information, from the point of view of electronic systems (CSE1)

Design circuits for analog and digital electronics, analog-digital and digital-analog conversion, radio frequency, power supply and electrical energy conversion for telecommunication and computing applications (CSE5)

2.2. Learning goals

To pass this course, the student must demonstrate the following results:

Knowledge on electronic techniques for the implementation of analog and digital modulations.

Knowledge on CAE tools to aid design in Communications Electronics.

Capability to design small electronic communication systems, including: design from a specification and assembly, prototype, measure and characterize electronic communication modules or systems.

Master the laboratory instruments of communications electronics.

Present his work to a specialized audience.

Acquired teamwork habits, such as active participation within the team and the ability to integrate efforts to achieve a common goal.

2.3. Importance of learning goals

Competencies in design are an essential part of training in the specialty of electronic systems.

Through the strategy of "doing to learn" these competencies of electronic design, simulation, assembly, verification and tuning of prototypes are developed while practicing the theoretical bases of communication systems, digital modulations, signal processing and using CAD tools for simulation, and building a working prototype.

On the other hand, professional skills and attitudes are developed thanks to teamwork. The presence in the degree of this type of subject is essential to acquire a clear vision of electronics applied to communication systems. Practical skills, at the implementation level, are of great importance for an engineering professional and are valued in companies.

3. Assessment (1st and 2nd call)

3.1. Assessment tasks (description of tasks, marking system and assessment criteria)

The student must demonstrate that he has achieved the expected learning result through the following assessment activities. Given the 100% practical nature of the subject, a continuous evaluation is proposed in the first call (in accordance with the condition of exceptionality that is included in article 9.4 of the Regulation of Learning Evaluation Norms). For the second call, a global test is established in the terms specified below.

1. First call: continuous evaluation

Learning in the organized around the realization of a project, which is the result of evaluable activities:

1. - Evaluation of the development of the project: 40%. It will be assessed using periodic project progress checks. In addition, throughout their development, students will have to make specific reports that will take the form of deliverables or presentations The preparation work, the work developed during the sessions and the results obtained will be valued.
2. - Project prototype: 40%. The quality of the solution, the degree of finish and the success of the operation will be assessed.
3. - Report and final presentation 20%. Each group will have to present a report describing the project and the work carried out throughout its completion, from initial investigations, proposed circuits, design decisions to final prototype validation. The suitability of all these aspects will be taken into account and a global assessment of the quality of the project will be made. The quality of the presentation, efficiency in communication and adaptation to the work presented will be valued.
4. Second call: test

Examination, resolution of design problems related to aspects and subsystems presented in the realization of the project.

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

The learning methodology is based on projects carried out by groups of students. The process is guided throughout its development and throughout the different methodologies used.

Theoretical presentations (M1) are included to add contents on components, circuits and design methods, specific key points will be presented and developped in seminar sessions (M2).

Learning on computer simulation tools and design tools, as well as on electronic assembly and debugging, is formalized in practice sessions (M8, M9). Some of these practical sessions are presented as stand-alone problems whose solution will be reused in the project (M5).

Other non-contact type methods for theoretical and practical studies (M12, M14) are also used.

The background work of students is the development of a guided project, through which they will acquire the desired skills with teacher supervision (M6). individual tutorials are planned and work in group are scheduled to monitor the development of projects (M10).

Evaluation is also a time of learning and one of its main moments is the presentation of the project by the group (M7, M11).

4.2. Learning tasks

Because of the methodology to be applied, the program takes the form of a schedule of activities to be developed while the groups advance in the design. The theoretical aspects will be introduced as needed for the development of design.

4.3. Syllabus

1. Statement. Presentation of the methodology.
2. Specifications, planning and objectives.
3. Preliminary design:
   Block Diagram, Selection of technologies.
   Legal Considerations (regulations). technical considerations (electrical, thermal, etc.).
   Channel Analysis and implications for electronic design.
4. Electronic design of the transmitter. Component selection. Construction of the prototype.
5. Electronic design of the receiver. Component selection. Construction of the prototype.
6. Installation and set-up the communications link. Assessment of compliance with specifications.
7. Data sheet of the system.
8. Final presentation of the system.

4.4. Course planning and calendar

Given the nature of the subject, all face-to-face sessions take place in an electronics laboratory where all the planned activities will be developed. The calendar and schedule of these sessions will follow what is established by the EINA, as well as the calendar for the presentation of projects during the examination period. Communications Electronics Laboratory is a subject belonging to the subject of the same name, has 6 ECTS credits and is taught in the second semester of the fourth year of the Degree. It is a mainly practical subject, in which learning is the result of the development of a specific electronic communications project. For this reason, the classes take place entirely in a laboratory. The face-to-face time in the

laboratory forms the core of the subject's effort. The start and end dates of the classes, as well as the dates and times of the classes, will be made public at the beginning of the course, depending on the timetables set by EINA.

4.5. Bibliography and recommended resources

Moodle will be used to structure the activities of the subject, as a container to deposit all the important documents related to the methodology and technical items, as well as a channel of information with the students.

The main source of information is technical information mainly supplied by manufacturers and distributors of both electronic components and CAD tools. This information will be available in the classroom through an internet connection.

http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=30396