COURSE DATA

DATA SUBJECT

Code: 34824
Name: Integrated telecommunication systems
Cycle: Undergraduate Studies
ECTS Credits: 6
Academic year: 2025-26

STUDY (S)

Degree	Center	Acad. year	Period
1402 - Degree in Telecommunications Electronic Engineering	Escola Tècnica Superior d'Enginyeria	4	Second quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1402 - Degree in Telecommunications Electronic Engineering	Optional subjects	ELECTIVES

COORDINATION

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SUMMARY

Integrated Systems. The course is elective Telecommunications quarterly basis and is given in the fourth year, second quarter, of Engineering Degree in Telecommunication Electronics. The academic program consists of a total of 6 ECTS.

It is topically related to the subject Digital Systems and its general objective is to build on the techniques for the analysis and synthesis of digital systems already known, bringing new methodologies and tools to successfully address the co-design of hardware-software embedded computer systems designed to end product

As interest activities can highlight the following:

- To give a proper methodology to successfully address-based system design microcontroller (firmware and hardware), paying particular attention to developing real projects in telecommunications preferably embedded applications.

- To practice languages ¿¿and programming models (C, etc.)
- To provide basic guidelines to follow in the design of optimal firmware maintenance and reusability.
- To present a professional designing platform and learn its use in detail, knowing the most important aspects to increase the productivity of Design engineers
- Not forgetting basic issues, to extende with cutting edge information on knowledge programmable devices and applications: analog - digital fusion, visual programming, codesign hard - soft, real-time applications, protocol design, multiprocessor systems, programmable platforms (PSoC) etc.

The teaching methodology is eminently practical, and consists essentially of the planned development of a project. Classes will be held prioritizing teaching of practical over theoretical. Periodically topics of interest will be addressed by additional technical seminars.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

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

OTHER REQUIREMENTS

In order to successfully address the subject, it is recommended that students have some previous knowledge acquired in the matter Digital Systems. Such prior knowledge can be mentioned the following:

- Logic simulation
- Programmable Logic Devices
- Design methodology of combinational and sequential circuit
- Skills and abilities in laboratory

Also essential are the abilities and skills acquired in the subject of Computing, which is taught in the first course.

COMPETENCES / LEARNING OUTCOMES

DESCRIPTION OF CONTENTS

1. Introduction to Integrated Telecommunications Systems

¿ Integrated System Concept.
¿ Characteristics of an Integrated System.

¿ Examples of Integrated Systems currently in existence.

2. Architecture of a Programmable System on Chip (PSoC)

¿ Internal structure of a PSoC
¿ Main features of a PSoC
¿ Comparison between the different families of PSoCs

3. Design flow with PSoC Creator

¿ Introduction to the PSoC Creator design and programming platform
¿ Hardware-firmware co-design
¿ My First Program with PSoC Creator.

4. PSoC device resources

¿ Power system
¿ Memory characteristics
¿ System clock management
¿ Timers Management
¿ GPIOs
¿ Interruptions

5. Digital peripherals and integrated digital communications

¿ Universal digital blocks (UDB)
¿ PWM control
¿ Serial communication (UART)
¿ SPI communication
¿ I2C communication

6. Analog peripherals and sensor management

¿ Delta-sigma converters (ADCs)
¿ Integrated operational amplifiers
¿ Comparators
¿ DACs

7. Bluetooth and IoT communication

¿ Features of the Bluetooth protocol

¿ Description of the BLE component in PSoC Creator
¿ Internet of Things (IoT) description and features

8. Introduction to real-time operating systems (RTOS)

¿ RTOS concept
¿ PSRC FreeRTOS
¿ Description of an application run on a FreeRTOS with PSoC

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Theory	40,00
Laboratory	20,00
Total hours	**60,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	4,00
Individual or group project	16,00
Independent study and work	20,00
Preparation of lessons	40,00
Preparation for assessment activities	2,00
Resolution of case studies	8,00
Total hours	**90,00**

TEACHING METHODOLOGY

The training activities will be developed according to the following distribution:

a) Theoretical activities.

In the theoretical classes, the topics will be developed, providing a global and integrating vision, analyzing in greater detail the key and more complex aspects, encouraging, at all times, student participation.

b) Experimental activities.

They complement the theoretical activities with the objective of applying the basic concepts and expanding them with the knowledge and experience that they acquire during the completion of the proposed works. In general they will be carried out in a group, to enhance the teamwork skills of the students. They include the following types of face-to-face activities:

- Experimental application of the concepts associated with the theory topics described above.

- Realization of a final mini-project in which the groups of students must apply the knowledge acquired to solve an application defined by the teaching team. The final mini-project will be carried out using a robotic platform that must be controlled by a microcontroller device that is capable of receiving instructions from an APP through bluetooth communication.

c) Personal work of the student.

Preparation of theoretical classes, experimental sessions and exams (study). This task will be carried out individually and tries to promote autonomous work.

d) Evaluation.

The performance of the students in the experimental sessions, a mini-project that will be presented by the groups in the last two sessions and the final theoretical / practical exam will be continuously evaluated.

e) Scheduled tutorials (individualized or in groups).

The objective of these will be to guide and resolve any doubts that appear. For this, the student must raise them, allowing him to review his work process.

EVALUATION

In the first call, the subject will be evaluated continuously, as follows:

- 1. Student work, up to 3.5 points

Evaluation based on attending experimental sessions and reviewing and rating the projects created during each of these sessions. This activity is not recoverable and non-attendance entails obtaining a score of 0 points in that session that will mediate with the rest.

- 2. Evaluation of a mini-project, up to 3.5 points

The mini-project will be carried out in groups and will be graded through a presentation and demonstration of functionality that will take place during the final sessions of the course. To receive a grade for this part, attendance at all laboratory sessions is mandatory.

- 3. Final exam of the subject, up to 3.0 points

The exam consisting in the resolutions of problems based on the learning and development of the subject, including theoretical and practical concepts.

In order to pass the subject it will be necessary to obtain a minimum grade of 4 (out of 10) on average in the evaluation of the mini-project and the final exam of the subject. The final grade will be the sum of the three sections and a minimum grade of 5 points over the total of 10 points must be obtained to pass the subject.

The e-learning platforms (Virtual Classroom) will be used as communication support with the students. Through it, you will have access to the teaching material used in class, as well as the tasks to be solved.

In the second examination period, a final exam covering theoretical and practical content (up to 6.5 points) will be held for those who have not achieved the minimum grade in the Student's Work or in the Course Exam. If the Mini-Project Evaluation section was not passed in the first examination period, an exam (up to 3.5 points) must be taken, which will consist of programming the PSoC development kit to meet specific requirements. A grade of 4 out of 10 must be obtained in both exams to be averaged with the other parts. The final grade will be the sum of the two sections. A grade of 5 out of 10 must be obtained to pass the course. If a student does not attend any of the exams, the grade for the corresponding examination period will be "not presented."

In any case, the evaluation system will be governed by what is established in the Evaluation and Qualification Regulations of the Universitat de València for Degrees and Masters (https://webges.uv.es/uvTaeWeb/MuestraInformacionEdictoPublicoFrontAction.do?accion=inicio&idEdictoSeleccionado=5639). The copying or clear plagiarism of any activity that is part of the assessment will result in the inability to pass the course, followed by the appropriate disciplinary procedures indicated in the PROTOCOL OF ACTION AGAINST FRAUDULENT PRACTICES AT THE UNIVERSITY OF VALENCIA (ACGUV 123/2020).

REFERENCES

- Wolf, W. ¿Computers as Components: Principles of Embedded Computing System Design¿ The Morgan Kaufmann Series in Computer Architecture and Design, 3º Ed. 2012. ISBN 0123884365
- Ashby, R. ¿Designer's Guide to the Cypress PSOC¿ Embedded Series. Ed. Newnes, 2005. ISBN 0750677805
- A. Dent and B. J. Blalock, ¿Mixed-signal Embedded Systems Design: A Hands-on Guide to the Cypress PSoC. Burlington, MA: Newnes¿, 2022.
- Pont, M. ¿Embedded C¿. ACM Press, Addison Wesley, 2002. ISBN 020179523X
- Pedroni, V.A ¿Circuit Design and Simulation with VHDL¿, The MIT Press, 2º Ed. 2010. ISBN 0262014335
- Vahid, F., Givargis, T. ¿Embedded System Design: a Unified Hardware/Software Introduction¿. Ed. John Wiley & Sons. 2002. ISBN 0471386782
- http://www.psocdeveloper.com/forums/
- PSoC 4 Architecture TRM (Technical Reference Manual): https://www.infineon.com/cms/en/product/microcontroller/32-bit-psoc-arm-cortex-microcontroller/