COURSE DATA

Data Subject	
Code	34824
Name	Integrated Telecommunication Systems
Cycle	Grade
ECTS Credits	6.0
Academic year	2019 - 2020

Study (s)

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

Subject-matter

Degree	Subject-matter	Character
1402 - Degree in Telecommunications Electronic Engineering	22 - Optional subjects	Optional

Coordination

Name	Department
SUAREZ ZAPATA, ADRIAN	242 - Electronic Engineering
TORRES PAIS, JOSE GABRIEL	242 - Electronic Engineering

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 circuits
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:

Logical reasoning
Analysis and synthesis of problems: algorithms
Programming languages
Structured programming
Modules and functions
Data types

Finally, both the project-oriented teaching methodology used such as the location at the end of the syllabus, it is highly recommended to master the basics of the subject "Project Management", in particular:

Documentation on a project
Standardization and certification
Process Assessment, Planning and Programming
Processes Execution, Control and Closure

Financial management of projects

OUTCOMES

LEARNING OUTCOMES

As learning outcomes, this course allows for the following capabilities

1. To analyze and desig product specifications
2. To plan properly the architecture of an electronic system product oriented with strong design constraints as well as the interrelation between the different elements
3. To analyze and design modules, subsystems, circuits, libraries and IP-based platform microprocessor and / or reconfigurable
4. To desig firmware for concurrent and real time applications
5. To select and use designing tools, for synthesizing and debugging projects to allow a proper development of electronic products
6. To choose service providers for electronic prototyping
7. In addition to addressing the technical solution of the project, it must be properly managed using an appropriate methodology and specifically designed for projects

In addition, this subject also lets to acquire the following social skills:

- Properly enunciate the technical specification of a system projects digital electronic
- Employ skillfully design and verification tools for microcontroller based projects
- Make designs using different platforms: programmable logic devices, microprocessors, microcontrollers or other computational alternatives
- Develop a suitable methodology to design and implement algorithms in actual projects, ensuring the reusability and facilitating team work
- Make appropriate design decisions as a profesional designer does

As a complemment to the specific objectives mentioned above, during the course, several generic skills will be promoted:

- Experience in laboratory work, encouraging and working with hardware devices tools
- Knowledge of the scientific method to solve practical problems
- Capacity for analysis and synthesis
- Ability to argue from rational and logical criteria
- Ability to communicate correctly and organized
- Ability to develop a problem in a systematic and organized manner
- Ability to build correctly a written document that defines a project
- Ability to manage information
- Ability to plan and manage time
- Ability to work in group
- Interpersonal relationship skills

- Appropriate use of scientific technical terms

DESCRIPTION OF CONTENTS

1. Introduction to Integrated Telecommunications Systems

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)

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

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

PSoC device resources
Power system
Memory characteristics
System clock management
Timers Management
GPIOs
Interruptions

5. Digital peripherals and integrated digital communications

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

Analog peripherals and sensor management:
 Delta-sigma converters (ADCs)
 Integrated operational amplifiers
 Comparators
 DACs

7. Bluetooth communication

Bluetooth communication:
 Features of the Bluetooth protocol
 Description of the BLE component in PSoC Creator

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

Introduction to real-time operating systems (RTOS)
 RTOS concept
 PSRC FreeRTOS
 Description of an application run on a FreeRTOS with PSoC

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	30,00	100
Laboratory practices	20,00	100
Classroom practices	10,00	100
Attendance at events and external activities	4,00	0
Development of group work	14,00	0
Development of individual work	2,00	0
Study and independent work	10,00	0
Readings supplementary material	10,00	0
Preparation of evaluation activities	2,00	0
Preparing lectures	10,00	0
Preparation of practical classes and problem	30,00	0
Resolution of case studies	8,00	0
TOTAL	**150,00**	

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 tl
This activity is not recoverable and non-attendance entails obtaining a score of 0 points in that session that will mec

rest.

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

The mini-project will be carried out in a group and will be qualified through a presentation and demonstration of op
will take place during the last two sessions of the course.

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

The exam consisting in the realization of a project based on the learning and development of the subject, as well as
to theoretical / practical questions.

In order to pass the subject it will be necessary to obtain a minimum grade of 4 (out of 10) on average in both the e
sessions, the mini-project and the exam. The final grade will be the sum of the three sections and a minimum grade
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,
have access to the teaching material used in class, as well as the tasks to be solved.

In the **second call**, both a final exam of the theoretical and practical content taught in the classroom (up to 3.5 poin
exam on experimental work (up to 3.5 points) will be held. The latter will consist of programming a robotic platfor
PSoC to meet specific specifications. Both exams will have the same weight as in the first call and a score of 4 out
obtained in both exams in order to be evaluated.

The final grade will be given, as in the first call, for the sum of the three sections. A grade of 5 points over the total
must be obtained to pass the subject. In the case of not taking the final exam, the qualification in the corresponding
“not presented”.

In any case, the evaluation system will be governed by what is established in the Evaluation and Qualification Regu
Universitat de València for Degrees and Masters
(https://webges.uv.es/uvTaeWeb/MuestraInformacionEdictoPublicoFrontAction.do?accion=inicio&idEdictoSelecc

REFERENCES

Basic

- 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
- Pont, M. Patterns for Time-Triggered Embedded Systems. ACM Press, Addison Wesley, 2001. ISBN 0201331381

- 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

Additional

- http://www.cypress.com/
- http://www.psocdeveloper.com/forums/
- Getting Started. Creating Applications with Keil uVision 4 (http://www.keil.com)
- Atmel Microcontroller Data Book. Atmel Co, 2010. (http://www.atmel.com)
- Ball, S.R. Embedded mP Systems: Real World Design, 3 Ed. Newnes Elsevier Science, Burlington (MA), 2002. ISBN 0750675349
- Floyd T., Fundamentos de Sistemas Digitales, 9ª edición, Ed. Pearson Education, 2007, ISBN 8483220857
- Wakerly, J.F. Diseño digital. Principios y prácticas. 3º Ed. Pearson Education, Mexico, 2001. ISBN 9701704045

ADDENDUM COVID-19

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

1. Contenidos

Se mantienen los contenidos inicialmente recogidos en la guía docente, tanto en las clases de teoría como en las de laboratorio.

2. Volumen de trabajo y planificación temporal de la docencia

Se mantiene el peso de las distintas actividades marcadas en la guía docente original.

Las sesiones de teoría se mantienen con la misma duración aproximada, pero al enviarse al estudiante las presentaciones explicadas por el profesor y los ejercicios resueltos, el estudiante tiene libertad para realizar las actividades programadas de acuerdo con su propia programación.

Las sesiones de laboratorio se agrupan en una única franja horaria, dado que al ser la docencia no presencial no existen limitaciones de ocupación de laboratorios.

Las sesiones correspondientes al miniproyecto se llevarán a cabo de forma síncrona manteniendo la planificación temporal docente tanto en días como en horario.

3. Metodología docente

La docencia de las clases de teoría se sustituye por la subida al aula virtual de presentaciones de diapositivas acompañadas de audios grabados por los profesores. Las dudas se pueden trasladar a los docentes a través de un foro común habilitado para cada uno de los diferentes temas.

Las tutorías se realizan por email o por videoconferencia a petición del estudiante, asegurando una atención en 48h laborables máximo por correo electrónico.

Respecto a la docencia de los laboratorios y de miniproyecto, todos los alumnos cuentan con la herramienta de programación necesaria para trabajar los contenidos de la asignatura. Los alumnos están agrupados en equipos de tres y cada uno de estos grupos cuenta con un kit de desarrollo con el que pueden llevar a cabo estas sesiones, por lo que se mantiene la metodología original, pero llevada a cabo de forma online y dando soporte a través de las herramientas de videoconferencia y foro del aula virtual. Los alumnos suben los resultados de cada sesión a través de una tarea del aula virtual.

4. Evaluación

Se mantiene el sistema de evaluación, adaptándolo a las metodologías online:

*En primera convocatoria la materia se evaluará de manera continua:

1. Trabajo del alumno, hasta 3,5 puntos (35 %)

Se valora el trabajo del alumno a partir de los resultados obtenidos en las tareas y otras herramientas online, la asistencia a las sesiones presenciales previas a la entrada en vigor del estado de alarma y participación en las sesiones síncronas de videoconferencia del aula virtual.

2. Evaluación de un miniproyecto, hasta 3,5 puntos (35 %)

El miniproyecto será calificado mediante la evaluación continua de las sesiones destinadas a dicha tarea y mediante una demostración y entrega de una presentación final que se llevará a cabo mediante una demostración llevada a cabo por cada uno de los grupos mediante la herramienta de videoconferencia del aula virtual en la franja horaria de las sesiones planificadas en última semana de clases según el calendario oficial.

3. Examen final de la asignatura, hasta 3,0 puntos (30 %)

El examen final de la asignatura consistirá en las dos partes originales: 1) la realización de un proyecto con la herramienta de programación facilitada en la asignatura, basado en el diseño y programación de un proyecto de Sistema Integrado; 2) Se propondrá un cuestionario tipo test diferente para cada alumno a partir de una selección aleatoria de entre un banco de preguntas de la misma dificultad. La entrega de dicha prueba de evaluación se llevará a cabo mediante la entrega del proyecto a través de una tarea y un cuestionario de aula virtual.

Para superar la asignatura será necesario obtener una nota mínima de 4 (sobre 10) de media tanto en las sesiones experimentales, el miniproyecto y el examen. La nota final será la suma de los tres apartados y se deberá obtener una calificación mínima de 5 puntos sobre el total de 10 puntos para aprobar la asignatura.

* En segunda convocatoria:

En la segunda convocatoria se realizará tanto un examen final de los contenidos teóricos y prácticos impartidos en el aula (hasta 3 puntos, 30 %) como un examen sobre el trabajo experimental (hasta 3,5 puntos, 35 %). Este último consistirá en la programación de una plataforma robótica basada en PSoC para que cumplan unas especificaciones concretas. Ambos exámenes tendrán el mismo peso que en la primera convocatoria y se deberá obtener una calificación de 4 sobre 10 en ambos exámenes para poder ser evaluado.

La nota final vendrá dada, al igual que en la primera convocatoria, por la suma de los tres apartados. Se deberá obtener una calificación de 5 puntos sobre el total de 10 puntos para aprobar la asignatura. En el caso de no presentarse al examen final, la calificación en la convocatoria correspondiente será de “no presentado”.

5. Bibliografía

Se mantienen las lecturas recomendables disponibles en las bases de datos que tiene suscrita la UV y a la que se puede acceder mediante VPN:

Ashby, R. Designer's Guide to the Cypress PSOC Embedded Series. Ed. Newnes, 2005. ISBN 0750677805.

Vahid, F., Givargis, T. Embedded System Design: a Unified Hardware/Software Introduction. Ed. John Wiley & Sons. 2002. ISBN 0471386782

Se sustituyen los manuales recomendados por las presentaciones de diapositivas con audio que se suben al aula virtual.

Se hace especial hincapié en la revisión de la lectura de los recursos referenciados en las presentaciones diapositivas ya que son proporcionadas por Cypress Semiconductors y son de carácter abierto y gratuito.