COURSE DATA

Data Subject	
Code	34824
Name	Integrated Telecommunication Systems
Cycle	Grade
ECTS Credits	6.0
Academic year	2018 - 2019

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
MARTOS TORRES, JULIO	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

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

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. Nombre de la unidad temática

NOMBRE DE LA UNIDAD TEMATICA

Plan Presentation
  Objectives, scope, methodology, resource description
  Programming and control
  Documentation and presentation
Introduction to Development Tools

Hardware development platforms: a brief description
Introduction to ANSI C languages

2. Nombre de la unidad temática

Technical Seminar 1: MSC - 51
Core Architecture
Differential aspects PSoC environment
Description of Practical Session 1
Presentation Phases 1 and 2 of the plan
Algorithmic analysis of communication processes TX and RX
Control strategies "Polling vs. ISR"
Evaluating alternatives: low and high level implentación
Conclusions
Running the Practical Session 1

3. Nombre de la unidad temática

Technical Seminar 2: Peripheral MSC - 51
Standard architecture
PSoC Blocks environment
Practical Session description 2-3
Presentation phases 3 and 4 of the plan
o algorithmic analysis of unified communication processes
o design or specifications of exercise 1, compact version
Conclusions
Running the Practical Session 2

4. Nombre de la unidad temática

Technical Seminar 3
Basic techniques of construction and debugging of firmware
Verification Meeting of phases 1 and 2 of the plan:
Simulation and debugging
Improving optimization
Conclusions

5. Nombre de la unidad temática

Technical Seminar 4: Introduction to Embedded Systems
Design Metrics
Project management: time and cost as design constraints
Approaches to IC technologies, processor architectures and tools development
Aspects to consider for the Project
Conclusions

Running the Practical Session 3

6. Nombre de la unidad temática

Technical Seminar 5
Building modular firmware. Advanced debugging
Verification Meeting of phases 3 and 4 of the plan:
Simulation and debugging
Improving optimization
Conclusions

7. Nombre de la unidad temática

Description of Practical Session 4
Presentation phase 5 of the plan
- Specifications of exercise 1, modular version
- Evaluating alternatives
- Conclusions

Running the Practical Session 4

8. Nombre de la unidad temática

Technical Seminar 6: Languages and Models of Computation
Sequential Programming Model
Model and variants with datapath FSM, concurrency and hierarchy
Other advanced models
Practical examples
Conclusions
Practical Session Description 5-6
Presentation phase 6 of the plan
- Design specifications of exercise 2

9. Nombre de la unidad temática

Technical Seminar 7: Introduction to Real Time Applications
Restrictions concerning time
Multitasking
Designing delays
Code architectures: superloop, event triggered, time triggered
Schedulers: cooperative vs. hybrid
Aspects to consider for our Project
Conclusions
Running the Practical Session 5

10. Nombre de la unidad temática

Verification Meeting phases 5 and 6 of the plan:
- Simulation and debugging
- Improving optimization
- Conclusion

11. Nombre de la unidad temática

Description of Practical Session 7
- Presentation phases 7 and 8 of the plan
- Specifications 3 and 4 exercises
- Program Design specifications for the PROJECT
- Specifications, methodology and evaluation criteria
- Discussion and conclusions

Running the Practical Session 6

12. Nombre de la unidad temática

Nombre de la unidad temática

Nombre de la unidad temática

Nombre de la unidad temática

Verification meeting phases 7 and 8 of the plan:
- Simulation and debugging
- Improving optimization
- Conclusions

Project Monitoring Meeting

Running the Practical Session 7

13. Nombre de la unidad temática

Technical Seminar 8: Introduction to SoC
- Reconfigurable Logic vs SoC
- Some issues about co-design methods and tools
- Brief overview on PSoC families
- Examples of application

Project Monitoring Meeting

Running the Practial Session 8

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 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.

In classrooms sessions, practical activities to develop in the laboratory sessions will be discussed in detail. The expected technical difficulties will be discussed and resolved, using the typical media and appropriate design tools. People will move from class to the computer lab if the development of the subject requires it.

Periodically, topics of interest will be addressed by additional technical seminars.

The course makes extensive use of the tools for distance learning, such as email, news, and others provided by the Virtual Classroom.

In order to make a success of the teaching methodology described, students have the following documents: teaching guide, transparencies of each topic, practical script, transparencies of the seminars, additional information.

EVALUATION

The evaluation will consist of an oral presentation and defense of an individual course project, and will consist of the development of firmware for an application known since the beginning of course. Both valuation criteria as practical issues of the test will be known by students well in advance. They will be evaluated according to the following scheme:

F1: FUNCTIONAL ASSESSMENT REGARDING SPECIFICATIONS (weighting 40%)

- Does it in functionality
- Does it in performance?
- Does it in resources?

F2: METHODOLOGY (weighting 20%)

- Reusability / modularity / flexibility
- Readability / maintainability

F3: DOMAIN OF DEVELOPMENT TOOLS (weighting 20%)

- Editing, designing, building the source code
- Debugging techniques

F4: KNOWLEDGE OF HARDWARE PLATFORM AND OTHERS (weighting 20%)

- Families PSoC / MCS - 51
- Other features supported. Methods, tools, additional testbenches
- Additional knowledge about the seminars that were given during course

To pass the course a minimum score of 5/10 must be obtained. Assistance or not at sessions will not have direct impact on the evaluation process.

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