Course guide
230091 - DSBM - Systems Based on Microprocessors Design

Last modified: 25/05/2023

Unit in charge:	Barcelona School of Telecommunications Engineering
Teaching unit:	710 - EEL - Department of Electronic Engineering.

Degree:	BACHELOR'S DEGREE IN TELECOMMUNICATIONS TECHNOLOGIES AND SERVICES ENGINEERING (Syllabus 2015). (Compulsory subject).

Academic year: 2023   **ECTS Credits:** 6.0   **Languages:** Catalan

LECTURER

Coordinating lecturer:	Consultar aquí / See here: https://telecos.upc.edu/ca/estudis/curs-actual/professorat-responsables-coordinadors/responsables-assignatura
Others:	Consultar aquí / See here: https://telecos.upc.edu/ca/estudis/curs-actual/professorat-responsables-coordinadors/professorat-assignat-idioma

PRIOR SKILLS

Basic analysis of electronic circuits.
Basic knowledge of digital electronics.
Knowledge of C programming.

REQUIREMENTS

DIGITAL DESIGN - Precorequisite

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Transversal:
07 AAT N2. SELF-DIRECTED LEARNING - Level 2: Completing set tasks based on the guidelines set by lecturers. Devoting the time needed to complete each task, including personal contributions and expanding on the recommended information sources.

TEACHING METHODOLOGY

Lectures
Laboratory sessions
Team assignments (at home)
Individual work
Continuous assessment evaluation
Final assessment evaluation

LEARNING OBJECTIVES OF THE SUBJECT

Programming, analysis and design of microprocessor / microcontroller based systems.

STUDY LOAD

Type	Hours	Percentage
Hours small group	26,0	17.33
Self study	85,0	56.67
Hours large group	39,0	26.00

Total learning time: 150 h

CONTENTS

T1-Introduction

Description:
Subject description. Digital electronics context. Digital implementation options. Basic CPU system structure. Software execution.

Full-or-part-time: 1h 58m
Theory classes: 1h
Self study : 0h 58m

T2-Compilation and debugging

Description:
Software and Firmware. Code generation. Code load. Debugging.

Full-or-part-time: 5h 50m
Theory classes: 3h
Self study : 2h 50m

T3-Electrical compatibility

Description:
Static and dynamic characteristics. Requirements and performance parameters. Compatibility in interconnections. Buses. Usage of open collector/drain in busses.

Full-or-part-time: 14h 28m
Theory classes: 5h
Self study : 9h 28m

T4-The CPU

Description:
Control unit and datapath. Von Neumann and Harvard structures. Instruction cycle. Microprogram. Speed and power metrics. CPU optimization. External buses. Endianness.
Memory hierarchy. Cache memory. Protection and virtual memory.

Full-or-part-time: 13h 36m
Theory classes: 7h
Self study : 6h 36m

T5-Memory subsystem

Description:
Memory classification. Typical SRAM and ROM signals. Decoding. DRAM memories and others.

Full-or-part-time: 14h 28m
Theory classes: 5h
Self study : 9h 28m

T6-Timing

Description:
content english

Specific objectives:
Requirements to evaluate. Timing and read/write evaluation. DRAM timing.

Full-or-part-time: 14h 28m
Theory classes: 5h
Self study : 9h 28m

T7-Input/Output

Description:
Peripheral connections. I/O map. Registers. Polling and interrupt synchronization. RSIs. Execution context. Masking. Latency.
Exceptions. Peripheral examples: Timers, Converters, Communications.

Full-or-part-time: 11h 40m
Theory classes: 6h
Self study : 5h 40m

T8-Programming model

Description:
Tasks and events. CPU usage. Operating systems. Processes. Real time systems. Scheduling. Process synchronization.

Full-or-part-time: 4h 20m
Theory classes: 1h 30m
Self study : 2h 50m

Laboratory

Description:
ARM Cortex M4 system development. Development environment. Peripheral access. Interrupts. Timing measurements. Threads.

Full-or-part-time: 58h
Laboratory classes: 26h
Self study : 32h

GRADING SYSTEM

50% Final exam
30% Laboratory sessions
20% Continuous assessment evaluation

In the reassessment exam, only the theory contents are reassessed, so the resulting grade from the reassessment will be:

70% Reassessment Exam
30% Previous laboratory work

BIBLIOGRAPHY

Basic:
- Clements, Alan. Microprocessor systems design : 68000 hardware, software, and interfacing. 3rd ed. Boston [etc.]: PWS, cop. 1997. ISBN 0534948227.
- Cabestany, J.; Madrenas, J.; Masana F.; Salazar, J. ; Pol, C.. Disseny de sistemes digitals amb microprocessadors [on line]. 2a ed. Barcelona: Edicions UPC, 2000 [Consultation: 07/05/2020]. Available on: http://hdl.handle.net/2099.3/36234. ISBN 8483013657.

Complementary:
- Catsoulis, J. Designing embedded hardware [on line]. 2nd ed. Beijing [etc.]: O'Reilly, 2005 [Consultation: 07/05/2020]. Available on: https://ebookcentral.proquest.com/lib/upcatalunya-ebooks/detail.action?docID=540710. ISBN 0596007558.
- Li, Qing; Yao, Caroline. Real-Time concepts for embedded systems. San Francisco: CMPBooks, cop. 2003. ISBN 1578201241.
- Tanenbaum, Andrew S. Structured computer organization [on line]. 6th ed. Boston: Pearson, 2013 [Consultation: 07/05/2020]. Available on: https://ebookcentral.proquest.com/lib/upcatalunya-ebooks/detail.action?docID=5173727. ISBN 9780273775331.