Course guide
340378 - ARCO-I4O01 - Computer Architecture

Last modified: 17/05/2023

Unit in charge:	Vilanova i la Geltrú School of Engineering
Teaching unit:	701 - DAC - Department of Computer Architecture.

Degree: BACHELOR'S DEGREE IN INFORMATICS ENGINEERING (Syllabus 2018). (Compulsory subject).

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

LECTURER

Coordinating lecturer: Eva Marín Tordera

Others: Eva Marín Tordera

PRIOR SKILLS

It is recommendable to have studied ESC2.

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
1. CEFB6. Adequate knowledge of the concep of business, institutional and legal framework of company. Organization and Management.
2. CEFC2. Ability to plan, conceive, develop, manage informatic projects, services and systems in all areas, leading their implementation and continuous improvement assassing their economic and social repercussions.
3. CEFC7. Knowledge, design and efficient use of data types and structures the most appropriate to resolve problems.
4. CEFC8. Ability to analyze, to design, to construct and to maintain applications in a well built, secure and efficient way choosing the most adequated paradigms and languages.
5. CEFC9. Ability to know, understand and assess computer structure and architecture, as well as basic components forming them.
6. CEFC14. Knowledge and application of fundamentals principals and basic techniques of parallel, concurrent, distributed and real time programming.
7. CEFC17. Ability to design and evaluate computer interfaces that guarantee accessibility and usability of informatic systems, services and applications.

Transversal:
8. SUSTAINABILITY AND SOCIAL COMMITMENT - Level 3. Taking social, economic and environmental factors into account in the application of solutions. Undertaking projects that tie in with human development and sustainability.

TEACHING METHODOLOGY

Theory classes are conducted using the resources available in the classroom (whiteboards, multimedia equipment) and are based on oral exposure by teachers of content on the subject under study (expository method). In some cases, there will be lectures based on the participation and involvement of students through short-term activities in the classroom, such as direct questioning, student presentations on specific topics or resolution of problems related to the theoretical exposed. Also the teacher will solve classroom exercises and propose collection exercises for students to prepare them independently. These exercises will be solved in class by the students individually or in groups.
Small group classes are:
- Laboratory classes: be performed on school computer classrooms. The student must take practice prepared (read and understand the statement of the practice from a script that was previously found in digital campus), and sometimes if indicated shall make a preliminary report. The practices will be individual.

LEARNING OBJECTIVES OF THE SUBJECT

The main objectives of this course are:
· Programming in assembly language processor (RISC and CISC) ''and link with high-level languages
· Introduction to Linear segmented processors and multiprocessors
· Architecture Graphic Cards

STUDY LOAD

Type	Hours	Percentage
Self study	90,0	60.00
Hours large group	45,0	30.00
Hours small group	15,0	10.00

Total learning time: 150 h

CONTENTS

1. Introduction

Description:
Performance, CPI, Speed-up, Amdhal's Law, Power, Consumption

Related activities:
Activity 1: Introduction problems

Full-or-part-time: 8h
Theory classes: 1h
Practical classes: 1h
Self study : 6h

2. Introduction to MIPS. Assembly language

Description:
Introduction to MIPS assembler. Type of data. Memory addressing. Translation from assembler to C and from C to assembler

Related activities:
Activity 1: Assembler problems

Full-or-part-time: 21h
Theory classes: 2h
Practical classes: 5h
Laboratory classes: 2h
Self study : 12h

3. Assembler MIPS-Suboutines

Description:
Subroutines in MIPS. Instructions, steps in a subroutine, nested subroutines, the stack.

Related activities:
Activity 1: Subroutine problems
Activity 2: Practice assembler MIPS. Practice 1: Subroutines in MIPS

Full-or-part-time: 31h
Theory classes: 3h
Practical classes: 6h
Laboratory classes: 4h
Self study : 18h

4. Introduction to pipelining, parallelism and multiprocessors

Description:
4.1 Pipelining
4.2 Parallelism
4.3 Scalar and vector processors
4.4 Graphic cards architecture

Related activities:
Activity 1: Pipelining problems
Activity 2. Practice with the pipeline MIPS processor. Practice 2. The MIPS pipelining processor con Simula3MSv4_12
Activity 3: Directed work
Activity 4: Knowledge test

Full-or-part-time: 22h
Theory classes: 2h
Practical classes: 4h
Laboratory classes: 2h
Guided activities: 2h
Self study : 12h

5. Memory

Description:
Review of memory cache. Policies on failure, writing policies. Main Memory (from the basic cell to the DDR), refresh, DIMM DDR.

Related activities:
Activity 1: Memory problems
Activity 2: Practice assembler MIPS. Practice 3: Software Memory Cache

Full-or-part-time: 20h
Theory classes: 2h
Practical classes: 4h
Laboratory classes: 2h
Self study : 12h

6. Input/Output

Description:
Review of Input/Output studied in ESC2 extended to RAIDs, flash memories, buses, performance of the I/O system.

Related activities:
Activity 1: I/O problems

Full-or-part-time: 20h
Theory classes: 2h
Practical classes: 4h
Laboratory classes: 2h
Self study : 12h

GRADING SYSTEM

Partial knowledge 1er test *0,25+ problems * 0.1 + 0.25 * Laboratory + complementary work* 0.1 + partial knowledge 2nd Test * 0.3> = 5
The second partial exam can be a 2nd partial exam with a weight of 30% or a final exam with a weight of 55% in order to recover the first partial (the student chooses what to do). In this second case the formula is:
Problems * 0.1 + Laboratory * 0.25 + complementary work * 0.1 + Final knowledge test * 0.55> = 5
The 1st and 2nd partial knoeledge tests are reevaluable (o final)

EXAMINATION RULES.

Activities 1, 2 and 4 are in person.
Activity 3 is non-attendance, although there may be a short presentation in class.
In the activities that take place in the qualifying group will be the same for all group members

BIBLIOGRAPHY

Basic:
- Patterson David A.; Hennessy John. Computer organization and design : the hardware/software interface. 6th ed. Oxford, GB: Morgan Kaufmann, 2021. ISBN 9780128201091.

RESOURCES

Computer material:
- Software proporcionalt a l'assignatura. Software provided in the course: QtSpim i MipsIT