Last update: 12-04-2019

340372 - ESC1-I2O01 - Computer Structure I

Coordinating unit: 340 - EPSEVG - Vilanova i la Geltrú School of Engineering

Teaching unit: 701 - AC - Department of Computer Architecture

Academic year: 2019

Degree: BACHELOR'S DEGREE IN INFORMATICS ENGINEERING (Syllabus 2018). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN INFORMATICS ENGINEERING (Syllabus 2010). (Teaching unit Compulsory)

ECTS credits: 7,5 Teaching languages: Catalan, Spanish

Teaching staff

Coordinator: Xavier Masip Bruin

Others: Xavier Masip Bruin
Eva Marín Tordera

Prior skills

Knowledge on SISA architecture concepts, as well as basic knowledge on SISA assembler programming.

Requirements

Introducció als Computadors (Introduction to Computers) subject already taken

Degree competences to which the subject contributes

Specific:

1. CEFB4. Basic knowledge of use and computer programming, as well as of operating systems, data base and generally informatic programs with engineering applications.
2. CEFB5. Knowledge of informatic systems, its structure, function and interconnection, as well as fundamentals of its programming.
3. CEFC9. Ability to know, understand and assess computer structure and architecture, as well as basic components forming them.
4. CEFC7. Knowledge, design and efficient use of data types and structures the most appropriate to resolve problems.

Transversal:

5. SELF-DIRECTED LEARNING - Level 1. Completing set tasks within established deadlines. Working with recommended information sources according to the guidelines set by lecturers.
6. TEAMWORK - Level 1. Working in a team and making positive contributions once the aims and group and individual responsibilities have been defined. Reaching joint decisions on the strategy to be followed.

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Teaching methodology

The course includes theory, problems and laboratory sessions. The first two are given in the classroom while the practical sessions are held in the computer classrooms of the center.
The theory sessions will be conducted using the resources available in the classroom (whiteboards, multimedia equipment, etc.) and are based on oral presentation of the contents of the subject under study (lecture method) by the lecturer. In some cases, sessions based on students participation through short-term activities in the classroom will be made, such as direct individual questions, student presentations on selected topics or resolution of problems linked to the theoretical concepts previously presented in the theory sessions.
The problems sessions are split into those in which the lecturer solves problems aiming at solidifying the newly acquired concepts in the theory lectures and those sessions in which students team up to solve problems, which then will be presented as a method for the entire group. The exercises will be given to students from the existing collection of previous tests or new problems proposed by the lecturer.
Finally, the lab sessions will be held in the computer classrooms of the center. Students must bring the practice to make ready (i.e., read and understand the statement of the practice from a guide that is previously uploaded in the digital campus). Students make then a small test (about 5 minutes) on the practice followed by the work on the computer. The practices will be individual handled.

Learning objectives of the subject

The basic objective of the course is to understand the basic operation of a computer at programmer-level machine language, and the basic data structures that can be stored in a computer.

CEFB4: Basic knowledge of the use and programming of computers, operating systems, database and software with applications to engineering
CEFB5: Knowledge of the structure, operation and interconnection of computer systems as well as the basics of programming.
CEFC7: Understanding, design and use of efficient data types and data structures best suited to solve a problem.

Study load

Total learning time: 187h 30m	Hours large group:	45h	24.00%
	Hours medium group:	0h	0.00%
	Hours small group:	30h	16.00%
	Guided activities:	0h	0.00%
	Self study:	112h 30m	60.00%

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Content

1. Computer technology

Learning time: 9h

Theory classes: 1h
Practical classes: 2h
Laboratory classes: 0h
Self study : 6h

Description:
1.1. Introduction
1.2. Under the program: Hierarchical computer description at different abstraction levels
1.3. Performance monitoring
1.4. Multiprocessors
1.5. The pitfalls

Related activities:
Activity 1: Computer design problems
Activity 2: Lab session 0: Introducing the programming envirnoment

Specific objectives:
Getting basic knowledge about functional blocks within a computer. Understanding about different elements building the programmin environment for a processor.

2. SISA-I

Learning time: 22h

Theory classes: 2h
Practical classes: 6h
Laboratory classes: 2h
Self study : 12h

Description:
2.1. SISA-I overall architecture
2.2. SISA-I instructions
2.3. SISP-I-1 processor

Related activities:
Activity 1: Assember SISA-I problems
Activity 2: Lab session 1

Specific objectives:
Knowledge about the SISA-I architecture. Catch up concepts previously obtained about SISA-I assembler programming

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(ENG) 3. Entrada/Sortida

Learning time: 20h

Theory classes: 2h
Practical classes: 4h
Laboratory classes: 2h
Self study : 12h

Description:
3.1. SISA-F main characteristics
3.2. SISA-F Assembler
3.3. Undsigned and signed binary representation
3.4. Integers in SISA-F. Floating point representation

Related activities:
Activity 1: SISA-F programming problems
Activity 2: Lab session 2

Specific objectives:
Getting knowledge in unsigned and signed binary representation, using floating point representation. Descriptio of SISA-F instructions as well as discussion on the differences at the architectural level between SISA-I and SISA-F

4. Assembler SISA-F: Complex data structures

Learning time: 42h

Theory classes: 4h
Practical classes: 8h
Laboratory classes: 4h
Guided activities: 2h
Self study : 24h

Description:
4.1. Memory access at byte level
4.2. Bits processing and loops programming
4.3. Pointers and complex data structures

Related activities:
Activity 1: Problems about unsigned and signed numbers representation
Activity 2: Problems about if, while (salts, beq, bne, jump), case, switch
Activity 3: Lab session 3

Specific objectives:
Getting knowledge in simple and complex data structures, loop programming and iterative programming resources. Particular attention is devoted to managing pointers, vectors, matrixes and structs.

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5. Subroutines

Learning time: 29h

Theory classes: 3h
Practical classes: 4h
Laboratory classes: 2h
Guided activities: 2h
Self study : 18h

Description:
5.1. Introducció
5.2. Storing the processor state
5.3. Delivering values
5.4. Passing variables
5.5. Local variable
5.6. Summing up

Related activities:
Activity 1: Problems about subroutines
Activity 2: Lab session 4

Specific objectives:
Knowledge on subroutines managing, programming and execution

6. Input/Output

Learning time: 24h

Theory classes: 2h
Practical classes: 4h
Laboratory classes: 4h
Guided activities: 2h
Self study : 12h

Description:
6.1. Exceptions
6.2. Input/Output Interruptions
6.3. System calls

Related activities:
Activity 1: I/O problems
Activity 2: Lab session on exceptions
Activity 3: Lab session on system calls

Specific objectives:
Programming I/O devices, through exceptions and interruptions

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(ENG) 7.Accessibilitat	Learning time: 37h 30m Theory classes: 3h 45m Practical classes: 7h 30m Laboratory classes: 3h 45m Guided activities: 1h 30m Self study : 21h

Qualification system

Final mark = Intermediate examination*0,2 * problems*0,2 + laboratory*0,2 + Final examination*0,4

Bibliography

Basic:

Patterson, David A. Computer organization and design : the hardware/software interface. 5th ed. Burlington [etc.]: Elsevier Morgan Kaufmann, 2014. ISBN 9780124077263.