Computer Structure

Academic Year: (2021 / 2022) **Review date: 28-06-2021**

Department assigned to the subject: Computer Science and Engineering Department

Coordinating teacher: GARCIA CARBALLEIRA, FELIX

Type: Compulsory ECTS Credits : 6.0

Year : 2 Semester : 1

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Programming (Course 1 - Semester 1)
Computer technology (Course 1 - Semester 2)

OBJECTIVES

The main objective of the course is to describe the main components of a computer and the basic behaviour of a computer.

Learning outcomes:

R1 Knowledge and understanding: have basic knowledge and understanding of the scientific and technological foundations of Computer Engineering, as well as a specific knowledge of computer science, computer engineering and information systems.

R5 Engineering Applications: Graduates will be able to apply their knowledge and understanding to solve problems, conduct research, and design devices or processes in the field of Computer Engineering according to criteria of cost, quality, safety, efficiency, environmental friendliness, and ethical implications. These skills include knowledge, use and limitations of computer systems, process engineering, computer architectures, computational models, equipment, practical work, technical literature and information sources.

Basic and general competencies:

CGO4 - Ability to define, evaluate and select hardware and software platforms for the development and implementation of computer systems, services and applications, according to the acquired knowledge.
CGO6 - Ability to conceive and develop centralized or distributed computer systems or architectures integrating hardware, software and networks according to the acquired knowledge.
CB2 - That students know how to apply their knowledge to their work or vocation in a professional manner and possess the competencies that are usually demonstrated through the elaboration and defense of arguments and problem solving within their area of study.

Specific competencies:

CECRI9 - Ability to know, understand and evaluate the structure and architecture of computers, as well as the basic components that comprise them.
CECRI14 - Knowledge and application of the fundamental principles and basic techniques of parallel, concurrent, distributed and real-time programming.

DESCRIPTION OF CONTENTS: PROGRAMME

The basic concepts of this course are: organization and structure of a computer; data representation; basic arithmetic; execution of instructions; assembly programming; main memory; cache memory; virtual memory; input/output systems.

1. Introduction to computers
   - Von Neumann architecture
   - Computer programming
   - Characteristic parameters of a computer
   - Computer performance

2. Data representation and basic arithmetic

- Number representation
- Floating point
- Basic arithmetic

3. Assembly programming
   - Machine instructions representation
   - Programming model of a computer
   - Data, instructions, and control flow structures
   - Addressing modes
   - Instructions format
   - Procedures and stack usage

4. Processor
   - Processor components
   - Control unit
   - Execution of instructions
   - Execution modes
   - Interrupts
   - Control unit design
   - Starting of a computer
   - Program execution time
   - Microcontrollers

5. Memory Hierarchy
   - Technology of memories
   - Memory Hierarchy concept
   - Cache memory
   - Virtual Memory

6. input/output systems
   - Input/output devices
   - Storage based on disks
   - Input/output modules
   - Input/output techniques

LEARNING ACTIVITIES AND METHODOLOGY

* Lectures: 1 ECTS. They aim to achieve the specific cognitive competences of the subject, as well as the transversal competences of analysis and abstraction.
* Practical classes: 1 ECTS. They aim to initiate the development of the specific instrumental competences, as well as the transversal competences problem solving and application of knowledge.
* Continuous evaluation exercises: 2 ECTS. Initiated during the practical classes and completed outside of them, they aim to complete the development of the specific instrumental competences and to initiate the development of the specific attitudinal competences, as well as the transversal competences problem solving and application of knowledge.
* Practical work: 1.5 ECTS. Developed without the presence of the teacher, they aim to complete and integrate the development of all the specific and transversal competences, in the resolution of two practical cases where the approach to the problem, the choice of the method of resolution, the results obtained and their interpretation are well documented.
* tutoring: TUTORIALS. Individualized assistance (individual tutorials) or in group (collective tutorials) to the students by the professor.
* Final exam: 0.5 ECTS. It aims to influence and complement the development of specific cognitive and procedural skills. It reflects especially the use of the master classes.

ASSESSMENT SYSTEM

The evaluation includes the following parts:

The continuous assessment (60 %) includes:
- Programming and laboratory projects: 30%
- Exercises and small exams to perform in the small groups: 30 %

All labs are mandatory. A student follows the continuous assessment when the student makes all lab projects.
The percentage of the final exam is: 40%. The final exam will include theoretical and practical concepts.

The minimum value for this exam will be 4.
The minimum value for the lab pojects will be 4.
The minimun value for each lab will be 2.

The final grade will be increased by 1 point to those students who complete all parts of the continuous assessment, obtain more than 7 in the continuous evaluation, and at least 4 in the final exam.

The final exam in the extraordinary period will include the theoretical and practical concepts of the course.

% end-of-term-examination:	40
% of continuous assessment (assigments, laboratory, practicals…):	60

BASIC BIBLIOGRAPHY

- Félix García, David Expósito, José Daniel García, Jesús Carretero Problemas resueltos de Estructura de Computadores, 2ª edición, Paraninfo, 2009

ADDITIONAL BIBLIOGRAPHY

- D. A. Patterson, J. L. Hennessy Computer organization and Design, Morgan Kaufmann , 2014

- J. Waldron Introduction to RISC Assembly Programming, Addison-Wesley, 1999