Universidad de Alcalá

TEACHING GUIDE

COMPUTER STRUCTURE AND ORGANIZATION

Degree in Computer Engineering
Degree in Computer Science

University of Alcalá

Academic year 2019/2020
1st year, 2nd semester

TEACHING GUIDE

Subject name:	**Computers Structure and Organization**
Code:	**780010**
Degree:	**Graduate in Computer Engineering** **Graduate in Computer Science**
Department and knowledge area:	**Automatic. Computers Architecture and Technology**
Character:	**Basic**
ECTS Credit:	**6**
Course:	**First year, Second semester**
Teaching language:	**English only.**
Teachers:	**Antonio J. de Vicente and Juana Mª. López**
Tutorial sessions	

1. INTRODUCTION

Computers Structure and Organization is a first year, second semester, mandatory and 6 ECTS subject.

The main aim of this subject is getting the knowledge about the main blocks and their interrelationships to compound Von Neumann architecture. Different blocks design will be presented in order to assess overall efficiency. Moreover, several assembly languages will be used in laboratory classes.

This subject provides essential knowledge for oriented programming students as well as system managers. Subject contents are based on previous subjects as Computer Technology Fundamentals and will be necessary for further subjects of this study plan.

2. COMPETENCES

General skills:

CG4 Ability to define, evaluate and select hardware and software platforms for the development and implementation of systems, services and applications, according to the knowledge acquired as provided in paragraph 5 of resolution BOE-A-2009-12977.

CG6 Ability to design and develop systems or centralized or distributed architectures integrating hardware, software and networks according to the knowledge acquired as provided in paragraph 5 of resolution BOE-A-2009-12977.

CG8 Knowledge of basic materials and technologies that enable learning and development of new methods and technologies, as well as to equip them with great versatility to adapt to new situations.

CG9 Ability to solve problems with initiative, decision making, autonomy and creativity. Ability to communicate and transmit knowledge and skills of the profession of Technical Engineer.

CG11 Ability to analyze and assess the social and environmental impact of technical solutions, understanding the ethical and professional responsibility of the activity of the Technical Engineer.

Specific skills:

CIB5 Knowledge of the structure, organization, operation and interconnection of computer systems, the fundamentals of its programming and its application for solving problems of engineering.

CI9 Ability to know, understand and evaluate the structure and architecture of computers as well as the basic components that make them up.

LEARNING OUTCOMES (LO):

LO1. To describe Interrelationship between Von Neumann Architecture Blocks.

LO2. Understand how different data path design options, instruction set, control unit, memory, and input/output systems affect final performance.

LO3. To know the essential characteristics of the Von Neumann architecture and its associated programming model, differentiating the Von Neumann model from other computation models.

LO4. To apply microprogramming fundamentals.

LO5. To know cache memory systems.

LO6. Know the basic methods of synchronization in incoming/outgoing transfers.

3. CONTENTS

Block Content	Credit
Block 1: Data path Data path and clock frequency Adder Speeding up the add operation Multiply and divide operation	1,25 ECTS
Block 2: Instruction set Operation and instruction types Addressing modes Instructions coding and use frequency. Compiling process and binary compatibility	1,25 ECTS
Block 3: The Control Unit Clock frequency and instruction decoding Elemental operations Execution Instruction Chronogram Microprogramming	1 ECTS
Block 4: Memory hierarchy Memory Hierarchy Concept Cache memory Cache memory performance	1,25 ECTS
Block 5: Input / Output system Synchronization Massive storage Buses	1,25 ECTS

4. TEACHING-LEARNING METHODOLOGIES. FORMATIVE ACTIVITIES.

4.1. Credit distribution

Number of attendance hours:	28 hours: lectures 28 hours: small groups (problems solving, homework, practical sessions and deliveries) 4 hours exam (several exams) (Total 60 hours)
Number of student working hours:	90 hours: related to theory concepts study, assessment exercises, problems solving, homework activities, practices deliveries and tutorial
Total hours:	150 hours

This is a 6 ECTS subject. Formative activities for this learning process will be the following:

- Lectures
- Solving problem sessions
- Laboratory sessions
- Tutorial sessions. Both, individual and group ones

Moreover, following formative activities can be used:

- Individual or group homework.
- Attending to related to the subject conferences.

To guarantee the acquisition of competences by the student, the subject activities are distributed as:

- 3 theoretical ECTS, lectures and discussing activities.
- 3 practical ECTS, problem solving and laboratory activities

Communication and Information activities may be used as formative activities support.

4.2. Methodological strategies, teaching materials and resources

Lectures	Lectures Practical problem solving Partial exams
Homework	Individual study Problem solving Activity participation
Tutorial sessions	Tutorial sessions may be grouped or individual ones. Students ask to the teacher about related to this subject doubt during these sessions.

Students can download subject documentation from the subject Website: http://atc2.aut.uah.es/~avicente/asignaturas/eoc/temarioeoc_english.htm

5. ASSESMENT:

Preferably, a system of continuous evaluation will be offered to students. Such continuous evaluation system has characteristics of formative assessment, in order to serve as a feedback in the teaching-learning process of students. For this purpose, the following are set:

5.1. EVALUATION PROCEDURES

1. Ordinary exam: Evaluation in the ordinary exam should be based on continuous assessment criteria (Regulatory Standards of teaching and learning processes, NRPEA , Article 3) , consistent with the acquisition of the specified competencies in the subject.
    a. Continuous Assessment: students must pass laboratory practices and two practices exams. Homework must be passed too. A global exam must be passed too. Evaluation of practices and homework deliveries will take place throughout the semester.
    b. Final assessment: consist in doing and passing a final exam.

2. Extraordinary exam: two different situations arise:
    a. Students with passed homework and practices. Student can choose if previous is kept. The rest of the evaluation will be based on a final exam
    b. The student has mark or choose not to take it into account. The evaluation would consist of a full final exam.

Students need a special permission of the Direction Staff if they want to be qualified for the final evaluation process. The student must apply to the Dean of the School in the first two weeks of teaching. Students should explain the reasons that didn't allow them to follow the continuous assessment system in such form. Dean will communicate the decision within a maximum of 15 days. The request will be accepted If no reply was received.

5.2 EVALUATION CRITERIA.

Evaluation criteria should address the acquisition of skills by students. Next ones are defined**:**

EC1. Student can infer how arithmetic operations, rounding techniques are performed

EC2. Student is able to program different instruction sets, as well as design new ones.

EC3. Student has enough knowledge to design the computer data path and unit control and to differentiate among diverse computational models

EC4. Student has enough knowledge to design a control memory with different approaches

EC5. Student can design a memory system hierarchy from a performance requirement document

EC6. Student has knowledge about I/O systems, buses and different synchronization methods

5.3. ASSESSMENT TOOLS.

This section specifies the evaluation tools to be applied to each of the evaluation criteria.

- Continuous Assessment Test (CAT): consist of solving problem activities, and short question test.
- Homework Deliverables (HD): homework consists of readings about current microprocessors. It can be optional.
- Practices Deliverables (PD): practices are related to assembly language programming at laboratory sessions. Evaluation will include practical solving activities at laboratory because of the practical characteristic of this subject.
- Following activities (FA): Following activities are some sort exercise deliveries or a short test exam that assesses comprehension of previous classes.
- Global Assessment Test (GAT): Consists of problem-solving tasks, short question tests and essay question activities about characteristics and performance of computer system.

5.4 FINAL MARKS CRITERIA

This section summarizes the evaluation criteria for passing the subject.

Ordinary exam - continuous assessment

The relationship among competences, learning outcomes, criteria, instruments and marks will be as follows:

Competences	Learning Outcomes	Evaluation Criteria	Assessment Tools	Weight in Mark
CG4,CG6,CG9, CG11, CIB5	LO1-LO3	EC1-EC3	CAT1	20%
CG4,CG6,CG8, CG9, CG11	LO4-LO6	EC4-EC6	CAT2	20%
CG4,CG6,CG9, CG11, CI9	LO1-LO6	EC1-EC6	FA1-FA5, [HD]	10%
CG4,CG6,CG9, CG11, CIB5	LO2-LO3	EC2-EC3	PD	30%
CG4,CG6,CG9, CG11, CIB5, CI9	LO1-LO6	CE1-CE5	GAT	20%

It is required to pass the subject, in continuous assessment, to pass at least 3 practices of 4, as well as pass the practices exam.

As a general rule, those students in ordinary session that not submitted to the evaluation of 2 practices and at least 2 following activities will get a mark of “NOT ATTENDED”.

Ordinary exam – Final Exam

Competences	Learning Outcomes	Evaluation Criteria	Assessment Tools	Weight in Mark
CG4, CG6, CG8, CG9, CG11, CIB5, CI9	LO1-LO6	EC1-EC6	GAT	100%

Extraordinary exam

Competences	Learning Outcomes	Evaluation Criteria	Assessment Tools	Weight in Mark
CG4, CG6, CG8, CG9, CG11	LO1-LO6	EC1-EC6	GAT	70%
CG4, CG6, CG9, CIB5, CI9	LO2-LO3	EC2-EC3	PD	30%

6. REFERENCES

BASIC REFERENCES

- Computer Architecture, a quantitative approach. Sixth Edition John L. Hennessy, David A. Patterson. 2019
- Computer Organization and Architecture. William Stallings. Eighth Edition. 2011

EXTENDED REFERENCES

- Computer Organization and Design RISC-V Edition. John L. Hennessy, David A. Patterson. 2018
- Estructura y diseño de computadores. David A. Patterson, John L. Hennessy. 4ª Edición. 2011.
- Lenguaje ensamblador para computadoras basadas en Intel. 5ª Edición. 2008.
- Organización de Computadores. Carl Hamacher, Zvonko Vranesic y Safwat Zaky. McGraw Hill, 2003.
- Structured Computer Organization. Andrew S. Tanenbaum. Prentice Hall, 4th edition, 1999.