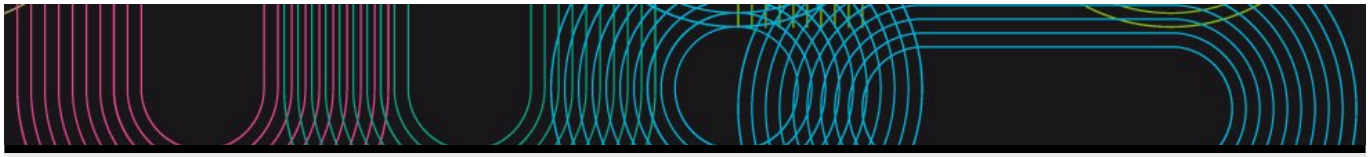

IDENTIFYING DATA				
Informatics: Computer Architecture				
Subject	Informatics: Computer Architecture			
Code	V05G303V01103			
Study programme	Degree in Telecommunications Technologies Engineering - Teaching in English			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	2nd
Teaching language	English			
Department	Telematics Engineering			
Coordinator	Llamas Nistal, Martín			
Lecturers	Anido Rifón, Luis Eulogio Costa Montenegro, Enrique Llamas Nistal, Martín Ramos Merino, Mateo Santos Gago, Juan Manuel			
E-mail	martin@uvigo.es			
Web	http://faitic.uvigo.es			
General description	Computers have become an essential tool. This fact is even more clear while studying the "Bachelor of Engineering in Telecommunications Technology" (Grado en Ingeniería de Tecnologías de Telecomunicación), where computers are not only manipulated from a user's --or specialized user's-- point of view, but also from the engineering perspective, as tools to be designed or to be integrated in more complex systems. Hence, the main motivation for the "Computer Architecture" (Arquitectura de Ordenadores) course is to provide students with an understanding of basic computer operation by studying the lower abstraction levels (over the electronic level). The subject "Computer Architecture" (Arquitectura de Ordenadores) is focused on the conventional machine level, describes the operating machine level and shows an example application for the Symbolic Machine domain through the introduction of the Database Management Systems.			

Competencies	
Code	
B3	CG3: The knowledge of basic subjects and technologies that enables the student to learn new methods and technologies, as well as to give him great versatility to confront and adapt to new situations
B4	CG4: The ability to solve problems with initiative, to make creative decisions and to communicate and transmit knowledge and skills, understanding the ethical and professional responsibility of the Technical Telecommunication Engineer activity.
C2	CE2/FB2: The basic knowledge about using and programming computers, operative systems, databases and Engineering applied software.
D2	CT2 Understanding Engineering within a framework of sustainable development.
D3	CT3 Awareness of the need for long-life training and continuous quality improvement, showing a flexible, open and ethical attitude toward different opinions and situations, particularly on non-discrimination based on sex, race or religion, as well as respect for fundamental rights, accessibility, etc.

Learning outcomes	
Expected results from this subject	Training and Learning Results

Knowledges of the main concepts related with the architecture of the computers and capacity for his handle through models.		B3 B20 B21	C3 C9 C13 C17	
Capacity for the handle of the systems of representation of the information used in the computers	A1 A2 A3 A4 A5	B3	C3 C4 C5 C8 C14 C17	D7 D15 D22
Knowledges of the types of instructions more representative and variations more notable and capacity to determine the implications of his use by part of the programmer of conventional machine		B3 B4 B14	C2 C4 C15 C17	
Knowledges of the main ways of addressing modes in assembler language and capacity for the efficient handling of these.	A1 A2	B2 B3 B4 B11 B12 B13 B15 B16 B25 B26	C2 C24	
Acquisition of skills on the design of algorithms and the construction of programs to level of conventional machine	A1 A2 A3 A4	B1 B3 B4 B4	C1 C2	D1 D2 D3 D3 D11 D18
Knowledge of the principles and fundamental components of the operating systems	A1 A3 A4 A5	B3	C1 C2 C3 C4 C18 C27 C33	D3 D9
Understanding of the main functions of the operating systems	A1 A2 A3 A5	B2 B3	C2 C16 C19	D1 D2 D3 D3 D7 D8 D9 D13 D14 D17 D18 D21
Knowledge of the fundamental aspects of the databases.	A1 A2 A3 A4 A5	B1 B2 B3 B3	C2 C2 C3 C8 C13 C22 C24	D1 D2 D3 D3 D4 D8 D9 D11 D12 D14 D16 D18 D19

Understanding of the distinct models of organisation of the information in databases	A1 A2 A3 A4 A5	B3	C2 C3 C4 C5 C8 C14 C17 C18 C21 C27 C32	D3 D7 D9 D14 D15 D22 D23
Acquisition of basic skills on the languages of query to databases	A1 A2 A3 A5	B2 B3 B4	C2 C16 C19	D1 D2 D2 D3 D3 D7 D8 D9 D13 D14 D17 D18 D21

Contents	
Topic	
1. PRELIMINARIES	Information Representation in computers. von Neumann Model. Structural, procesal and functional models
2. von Neumann Model	Components of von Neumman machine. Simple Machine. Central Processing Unit, Arithmetic and Logic Unit, memries, registries, buses. External Communication, active waiting, Introduction to addressing modes
3. Symbolic Representation and Processing .	Representation of basic data elements: integer, character, floating point. Conventions for data storage. Processing operations. Introduction to simbolic processing. Assembler language
4. Instructions and addressing	Instructions and addressing Software considerations. Registries at the conventional machine level. Lenguage for register transfer (RT level). Instruction format. Addressing modes. Stacks and subprograms. Assembler languages
5. Typical conventional machine	Structural Model. Functional Model. Set of instuctions. Addressing modes, Assembler. Examples of programmes.
6. Peripheral management	Types of peripherals. Management of variety. Models. Secondary memories. Interruptions. Service Rutines. ADM: justification.
7. Operating Systems	Operative Machine. Introduction to Operating Systems. Definition of an operating system. Interface operating system.
8. Data Bases	Introduction to Data Bases. Relational Model. Entity-relation model. Query languages. Introduction to SQL

Planning			
	Class hours	Hours outside the classroom	Total hours
Laboratory practices	22	27.5	49.5
Introductory activities	5	5	10
Problem solving	10	17.5	27.5
Lecturing	12	24	36
Self-assessment	0	3	3
Laboratory practice	4	8	12
Short answer tests	3	9	12
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
Laboratory practices	The course includes programming practices that will performed using a simple computer (SIMPLEZ) and a regular computer. Through this methodology the competencies CG3, CG4, CT2, CT3 and CE2 are developed.

Introductory activities	Presentation of the course contents, methodology, office hours, evaluation, usage of the labs, and any other issue related to the subject. Through this methodology the competences CG3 and CT3 are developed.
Problem solving	Programming, information representation, and other problems and exercises will be solved during the classes. Some must be solved by students previously at home, and they will participate actively in the solution of some other problems. Through this methodology the competencies CG, CT2 and CE2 are developed.
Lecturing	Theoretical concepts and their practical application will be introduced during the classes. Students will be encouraged to participate by alternating lectures with problem and exercise solving. Therefore, sessions will include lectures and time for exercises and problems. Through this methodology the competencies CG3, CT3 and CE2 are developed.

Personalized attention

Methodologies	Description
Lecturing	Students will have the chance to attend tutorial sessions at the teacher´s office. Teachers will establish timetables for this purpose at the beginning of the course. This schedule will be published on the subject website.
Laboratory practices	Students will have the chance to attend tutorial sessions at the teacher´s office. Teachers will establish timetables for this purpose at the beginning of the course. This schedule will be published on the subject website.
Problem solving	Students will have the chance to attend tutorial sessions at the teacher´s office. Teachers will establish timetables for this purpose at the beginning of the course. This schedule will be published on the subject website.

Assessment

	Description	Qualification	Training and Learning Results	
Self-assessment	Exam questions will be available for students, in order to perform autoevaluation.	0	B3 B4	C2
Laboratory practice	They will realise three practical exercises in the laboratory of continuous evaluation, and other three short exercises in each turn of laboratory.	50	B3 B4	C2
Short answer tests	They will realise in theory roughly 12 exercises of continuous evaluation, divided in two parts.	50	B3 B4	C2

Other comments on the Evaluation

ASSESSMENT

This subject is organized in two parts: Theory and Practice.

We consider:

-the Harmonic Average of A and B as HA(A,B)=2*A*B/(A+B). If A=B=0 then HA(A,B)=0

-the Arithmetic Average of A and B as AA(A,B)=(A+B)/2

We use the Mixed Average MA(A,B) in order to obtain grade in two different parts (A and B):

If A >= 5 and B >=5 then MA (A,B) =AA(A, B)

else {

if HA(A,B) > 3 then MA(A,B) = HA(A,B)

else MA(A,B) = AA(A,B), max. 3 (i.e. if AA(A,B)>3 then MA(A,B)=3)

}

In words, MA(A,B) is the arithmetic average if A and B are greater or equal to 5. Otherwise, MA(A,B) is the harmonic average. Besides, if the harmonic average is less than 3 then we apply the arithmetic average with a maximum possible score of 3.

The final grade for the course (FG) is as follows, according to theory grade (TG) and Practice Grade (PG): FG = MA(TG, PG). The assessment is individual.

To pass the course, FG must be greater than or equal than 5.

Both parts can be evaluated by Continuous Assessment (CA) or by Eventual Assessment (EA).

The EA will consist of Theory and Practice, and will take place in date and time officially established.

CA will consist of the tasks described in this guide, and they are not recoverable, i.e., if a student cannot follow them during the stipulated period the teacher does not have the obligation of repeating them.

If one of the parts (Theory or Practice) is passed in the First Call, the note is kept for the Second Call in which the student will only have to examine of the other part.

The CA tasks grades are only valid for the current academic course, being discarded in case the student fails the course.

THEORY

The Theory part is divided into two sub-parts: T1 and T2. T1 covers approximately 66% of the syllabus (up to theme 5 included), while T2 the 100% of the syllabus.

The Theory uses the Blended Flipped Classroom (BFC) method. In a week, one hour class takes place outside the classroom watching videos, and the other hour in the classroom answering questions, solving exercises and assessing.

* FIRST CALL EXAMS

. CONTINUOUS ASSESSMENT (CA).

In CA, the student needs to do short exercises (around 10 or 15 minutes) during the weekly class time. The grade in T1 and T2 is calculated using arithmetic average of the exercises proposed for each part (approximately 7 and 5). All of these exercises will take place in the classroom and never during the exam period. If a student does not attend to some of these exercises, they will not be repeated.

Usually almost all the weeks a short exercise will be done: those weeks that the short exercise is not done, it will be postponed for the following week, where two short exercises will be done, or one alone but with double weight.

The theory CA grade at First Call is TG=MA(T1,T2).

If a student does not pass the theory, but passes one of the two parts (T1 or T2), he/she keeps the grade of the part passed

for the Second Call Exams. If he/she does not pass the two parts, he/she will have to go to the Eventual Assessment at Second Call.

. EVENTUAL ASSESSMENT

All student that have not followed the CA will have to go to the Eventual Assessment (EA). The EA consists of two exercises T1 and T2 (one of each of the parts), to be done in 90 minutes, and a test exam (TEST) to be done in 20 minutes.

The final score is: TG=0,8*MA(T1, T2) + 0,2*TEST

* SECOND CALL EXAM

The Second Call Exam has the same structure that the First Call one.

If CA was not followed, the student will have to do T1, T2 and TEST exercises, regardless of the grades in each exercise in First Call Exam.

If the student did not pass the CA but passed T1 or T2, he/she can attend to the exam of the failed part. In this way, the grade obtained in CA is deleted, keeping the grade in the passed part. The calculation grade in theory is similar to the CA: TG=MA(T1,T2). In other case (both T1 and T2 failed), the student will have to do the Eventual Assessment (T1, T2 and TEST).

* EXTRAORDINARY CALL

It will consist of a exam similar to the one for the Eventual Assessment in the First Call.

PRACTICE

* FIRST CALL

. CONTINUOUS ASSESSMENT (CA)

The CA of Practice consists of 3 exercises P1, P2 and P3. P1 will be about Simple Computer, P2 about Basic Computer (around 60% of the syllabus) and P3 about Complete Computer (100% of the syllabus). The exercises will be done in the laboratory and will last approximately 1 hour. P1 will be around the 4th week, P2 around the 8th and P3 at the final exam day (the exam will be different for those who follow CA than for those who decide to go by EA). P1 and P2 will be held in afternoon shifts. The schedule of the midterm/intermediate exams will be approved in the Comisión Académica de Grado (CAG) and will be available at the beginning of each academic semester.

The Practice CA grade is the weighted average of these exercises: PG=0,20*P1+0,35*P2+0,45*P3

. EVENTUAL ASSESSMENT

All the students that have not followed the CA will have to present to the Eventual Assessment (EA).

The EA of Practice will consist in an exercise on the Complete Computer to be done in the laboratory in 1h (approximately).

In this case, the Practice Grade is the grade of the Eventual Assessment.

* SECOND CALL EXAM

The student will have a Second Call Exam similar to the Eventual Assessment Exam of the First Call. All the students who did not pass the practical part, having followed the CA or not, will have to go to this exam.

*EXTRAORDINARY CALL

It will consist of a exam similar to the Eventual Assessment in First Call.

GENERAL QUESTIONS

All exercises and exams of the subject are scaled from 0 to 10. The TEST Exam of Theory can be negative.

ELECTION OF CONTINUOUS ASSESSMENT:

If a student does any of the exercises of CA (Theory or Practice), then it is considered that this part is being followed by CA, not being able to go to the Eventual Assessment of First Call of this part. Note that a student can follow, if he/she wants, a part (Theory or Practice) by CA, and the another part (Practice or Theory) by Eventual Assessment.

ACTS: Students who have attended any of the CA exercises (both practice and theory) will be considered as presented and their grade will be obtained by applying the corresponding formulas.

EXAMS: To take any theory exam (T1, T2 and Eventual Assessment) or practice (P1, P2, P3 and Eventual Assessment), in first, second or extraordinary calls, all students must register through the corresponding software tool, which will be notified with a minimum of 5 calendar days.

Note: Prior to an exercise or an exam, the date and procedure for the grade review will be published sufficiently in advance.

COMMUNICATIONS WITH STUDENTS: All communications of the teaching organization will be done through the informatics tools used in the course (FAITIC, BeA and e-mail). It is understood that all students read their e-mail (e-mail registered in FAITIC) at least once a day.

ETHICAL CODE: Plagiarism is regarded as serious dishonest behavior. If any form of plagiarism is detected in any of the tests or exams, the final grade will be FAIL (0), and the incident will be reported to the corresponding academic authorities for prosecution. All students are expected to have an ethical behavior in all exams, ensuring equal opportunities for all students. If an infraction is detected in an exam, the score obtained in that test will automatically be zero (0) and a report will be issued to the School Direction to take actions. These are some examples of unethical behavior: use of electronic devices (mobile phones, tablets, computers, etc.), copy from another peer, use of unauthorized material in an exam, etc.

Sources of information

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Sergio Barrachina Mir, Maribel Castillo Cata- lán, Germán Fabregat Llueca, Juan Carlos Fernández Fer, **Introducción a la arquitectura de computadores con QtARMSim y Arduino**,

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Recommendations