Teaching Guide				
Identifying Data				2020/21
Subject (*)	Computer Structure		Code	614G01012
Study programme	Grao en Enxeñaría Informática			
Descriptors				
Cycle	Period	Year	Type	Credits
Graduate	1st four-month period	Second	Obligatory	6
Language	SpanishEnglish			
Teaching method	Hybrid			
Prerequisites				
Department	Enxeñaría de Computadores			
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Web				
General description	Computer architecture, organization and design. Introduction to the main performance metrics. Evaluation and optimization of the performance in the building blocks that compound a computer. Introduction to parallel and storage sytems.			
Contingency plan	1. Modifications to the contents - No changes 2. Methodologies *Teaching methodologies that are maintained - Lectures will be carried out through Microsoft Teams. - Laboratory practice and problem solving sessions will be addressed using Microsoft Teams and evaluated online. - Objective test will be an online test using Moodle. *Teaching methodologies that are modified - None 3. Mechanisms for personalized attention to students - E-Mail: Daily. Used for addressing questions and requesting virtual meetings. - Moodle: Daily. It contains the online resources the students need. - Microsoft Teams: Daily. Used for addressing questions and requesting virtual meetings in real time. Weekly big group sessions following the Faculty schedule, and small group sessions on demand. 4. Modifications in the evaluation *Evaluation observations: - No changes 5. Modifications to the bibliography or webgraphy - No changes. Everything is available online at Moodle			

Study programme competences / results

Code	Study programme competences / results
A15	Capacidade de coñecer, comprender e avaliar a estrutura e a arquitectura dos computadores, así como os compoñentes básicos que os conforman.
B1	Capacidade de resolución de problemas
C6	Valorar criticamente o coñecemento, a tecnoloxía e a información dispoñible para resolver os problemas cos que deben enfrontarse.
C7	Asumir como profesional e cidadán a importancia da aprendizaxe ao longo da vida.

Learning outcomes			
Learning outcomes	Study programme competences / results		
Know, understand and ability to evaluate the computer structure and architecture, as well as the components that compound them.	A15	B1	C6 C7

Contents	
Topic	Sub-topic
1. Performance evaluation	1. Introduction 2. Definition of performance metrics 3. Performance evaluation and comparison 4. Measurement techniques and benchmarks
2. Instruction level parallelism	1. Introduction 2. Instruction level dependences and parallelism 3. Hazards 4. MIPS pipeline
3. Branch management	1. Static techniques 2. Dynamic techniques 3. Branch delay
4. Memory systems	1. Introduction 2. Main memory 3. Memory hierarchy
5. Caches	1. Introduction 2. Operation of the cache system 3. Cache performance metrics 4. Optimization techniques
6. Virtual memory	1. Introduction 2. Pagination 3. Segmentation
7. Storage systems	1. Basics 2. Types of storage systems 3. RAID
8. Buses: connection of I/O and CPU/Memory	1. Introduction 2. Buses and interconnection 3. Examples of standard buses

Planning				
Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student?s personal work hours	Total hours
Guest lecture / keynote speech	A15	29	37	66
Problem solving	A15 B1	10	20	30
Laboratory practice	A15 C6	20	30	50

Objective test	C7	3	0	3
Personalized attention		1	0	1
(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.				

Methodologies	
Methodologies	**Description**
Guest lecture / keynote speech	This type of sessions are master classes complemented with the usage of audiovisual media and the introduction of debating with students phases. The objective is to transfer knowledge and ease the learning process. There will be presentations about the main contents of the subject. Usually, this type of sessions will be an starting point for other activities related to the same topic. In this type of sessions, it will be promoted the adquisition of knowledge associated to compentence A15.
Problem solving	In this type of classes, the teacher will solve several problems which will reinforce the knowledge acquired in the keynote speeches. This type of session will promote the acquisition of compentences A15 and B1 as they improve the capacity of the student to solve computer architecture problems.
Laboratory practice	This type of sessions propose computer driven activities that reinforce the knowledge acquired in other types of sessions. They will allow the familiarization of the student with practial aspects of the subject. The sessions will be completed with a set of self-evaluation tests which let students to find out if they have acquired the skills associated to a particular session. This type of sessions will promote the acquistion of competence A15, as the laboratory activities requires that the student can solve computer architecture problems. As he has to use its knowledge to solve the problems, it also acquires competence C6.
Objective test	This activity evaluates the knowledge and the capacity acquired by the students in this subject. It is written final exam which includes questions to evaluate objectively students. This test check the acquisition of competence A15. In general, all the evaluation activities promote the acquistion of competence C7, as it places value on learning.

Personalized attention	
Methodologies	**Description**
Problem solving Laboratory practice	The personalized attention in the laboratory and the problem solving sessions is important to guide the students in their development and learning process. Besides, this attention will serve to validate and evaluate the work of the students in the different stages of their development. It is also recommended that students attend to tutorials when they need it.

Assessment			
Methodologies	**Competencies / Results**	**Description**	**Qualification**
Problem solving	A15 B1	There will be several tests to evaluate the capacity of the students to solve problems autonomously and creatively.	40
Laboratory practice	A15 C6	There will be several tests to evaluate the capacity of the students to solve practical problems using the tools introduced in the lab sessions.	20

Objective test	C7	It will be checked that the student has acquired the knowledge introduced in the master classes, and that he is able to solve similar problems to those seen in the problem solving sessions.	40
Others			

Assessment comments
The tests related to problem solving are the 40% of the final grade, the tests related to the laboratory sessions are the 20% and the final exam is the remaining 40%. The student has to reach at least a 50% of the total grade to pass the subject. If the student doesn't attend to the tests associated to the laboratory sessions or problem solving sessions, it will lose this part of the grade for the first attempt. It cannot recover it. In the second attempt, the student can obtain the 100% of the grade, including that one associated to the above mentioned tests. The student will be graded as "absent" if they don't attend to the final exam. The part-time students and those that are allowed by the university to not attend to the classes will make the same evaluation tests and exams than the other students. We will make sure that their schedules are compatible with the period of time within they have to attend to classes.

Sources of information	
Basic	- Patterson, D. A. y Hennessy, J. L. (2011). Estructura y Diseño de Computadores. La interfaz hardware/software. Reverté - Hennessy, J. L. y Patterson, D. A. (2011). Computer architecture. A quantitative approach. Morgan Kaufmann
Complementary	- Hamacher, C., Vranesic, Z., Zaky, S. y Manjikian, N. (2011). Computer Organization and Embedded systems. McGraw-Hill - Patterson, D. A. y Hennessy, J. L. (2005). Computer organization and design: The hardware/software interface. Morgan Kaufmann - Stallings, W. (2009). Computer Organization and Architecture: Designing for Performance. Prentice Hall - Kernighan, R. (1991). El lenguaje de programación C. Prentice Hall - F. García, J. Carretero, J. D. García y D. Expósito (2009). Problemas Resueltos de Estructura de Computadores. Paraninfo

Recommendations
Subjects that it is recommended to have taken before
Programming I/614G01001 Fundamentals of Computers/614G01007
Subjects that are recommended to be taken simultaneously
Operating Systems/614G01016
Subjects that continue the syllabus
Concurrency and Parallelism/614G01018
Other comments

(*)The teaching guide is the document in which the URV publishes the information about all its courses. It is a public document and cannot be modified. Only in exceptional cases can it be revised by the competent agent or duly revised so that it is in line with current legislation.