Teaching Guide				
Identifying Data				2022/23
Subject (*)	Fundamentals of Computers		Code	614G01007
Study programme	Grao en Enxeñaría Informática			
Descriptors				
Cycle	Period	Year	Type	Credits
Graduate	2nd four-month period	First	Basic training	6
Language	SpanishGalicianEnglish			
Teaching method	Face-to-face			
Prerequisites				
Department	Enxeñaría de Computadores			
Coordinador	Sanjurjo Amado, Jose Rodrigo	E-mail	jose.sanjurjo@udc.es	
Lecturers	Beceiro Fernández, Bieito Cores González, Iván Martin Santamaria, Maria Jose Padron Gonzalez, Emilio Jose Rodriguez Osorio, Roberto Sanjurjo Amado, Jose Rodrigo Veiga Fachal, Jorge	E-mail	bieito.beceiro.fernandez@udc.es ivan.coresg@udc.es maria.martin.santamaria@udc.es emilio.padron@udc.es roberto.osorio@udc.es jose.sanjurjo@udc.es jorge.veiga@udc.es	
Web	campusvirtual.udc.gal			
General description	This subject focuses on the study of the fundamental concepts behind digital systems and computers, a computer's basic structure and how its different components work.			

Study programme competences	
Code	Study programme competences
A5	Coñecemento da estrutura, organización, funcionamento e interconexión dos sistemas informáticos, os fundamentos da súa programación e a súa aplicación para a resolución de problemas propios da enxeñaría.
A15	Capacidade de coñecer, comprender e avaliar a estrutura e a arquitectura dos computadores, así como os compoñentes básicos que os conforman.
A31	Capacidade de deseñar e construír sistemas dixitais, incluíndo computadores, sistemas baseados en microprocesador e sistemas de comunicacións.
B1	Capacidade de resolución de problemas
B3	Capacidade de análise e síntese
B7	Preocupación pola calidade
B9	Capacidade para xerar novas ideas (creatividade)
C2	Dominar a expresión e a comprensión de forma oral e escrita dun idioma estranxeiro.
C4	Desenvolverse para o exercicio dunha cidadanía aberta, culta, crítica, comprometida, democrática e solidaria, capaz de analizar a realidade, diagnosticar problemas, formular e implantar solucións baseadas no coñecemento e orientadas ao ben común.
C6	Valorar criticamente o coñecemento, a tecnoloxía e a información dispoñible para resolver os problemas cos que deben enfrontarse.

Learning outcomes			
Learning outcomes	Study programme competences		
Knowing the basic operation of the functional blocks of a computer (processor, memory, I/O, etc.)	A5 A15	B3 B7	C2 C4 C6
Knowing how to perform basic designs of components of a computer using digital systems	A15 A31	B1 B3 B7 B9	C2 C4 C6

Learning how to program a computer at a low level with an assembly language	A5	B1 B9	C2 C4 C6

Contents	
Topic	**Sub-topic**
I. Digital Systems	1. Introduction to Digital Systems. 2. Combinational systems. 2.1. Adders and subtractors. 2.2. Comparators. 2.3. Multiplexors and demultiplexors. 2.4. Encoders, Decoders and Code Converters. 2.5. ALU. 3. Sequential systems. 3.1. Flip-flops RS and D. 3.2. Designing and building synchronous sequential systems. 3.3. Counters. 3.4. Registers. 3.5. Memories.
II. Structure, Organization and operation of the basic functional blocks of a computer	4. Instruction Set Architectures (ISA). 5. The MIPS ISA. 6. Design of a CPU. 6.1. Building the Datapath. 6.2. Designing the Control Unit. 6.3. A Microprogram Control Unit. 6.4. Timing. 7. Exception handling. 8. Input/Output System

Planning				
Methodologies / tests	**Competencies**	**Ordinary class hours**	**Student?s personal work hours**	**Total hours**
Problem solving	A5 A15 A31 B1 B3 B7 B9 C2 C4 C6	10	17	27
Laboratory practice	A5 A15 A31 B1 B3	20	28	48
Guest lecture / keynote speech	A5 A15 A31 B7 C2	30	30	60
Objective test	A5 A15 A31 B1 B3 B7 B9 C2 C4 C6	3	6	9
Personalized attention		6	0	6
(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.				

Methodologies	
Methodologies	**Description**

Problem solving	Exercises are proposed to the students to be solved on their own. Then, solutions are discussed at class (problem sessions). Periodic written examinations are carried out to assess student progress. This metodology is mainly used to both gain and evaluate program competences B1, B3, B7 and B9 in relation to the competences A5, A15 and A31. Furthermore, this sessions isl also worth to assess the adquisition of the transverse competences C4 and C6. The offer of an English group also helps in the acquisition of the competence C2.
Laboratory practice	Lab sessions allow students to consolidate the knowledge they have acquired in lectures and problem sessions. This activity makes it possible to achieve program competences B1 and B3 in relation to the competences A5, A15 and A31. The offer of an English group also helps in the acquisition of the competence C2.
Guest lecture / keynote speech	Lectures about every topic covered by the course's syllabus are the usual starting points for the rest of the activities. The workflow and contents of the lectures are focus on making it easy to acquire all the core and transverse competences of this course, namely competences A5, A15 and A31, and are supported by a comprehensive bibliography. English references will help with the competence C2. The offer of an English group guarantees the acquisition of the competence C2 to all students taking this group.
Objective test	At the end of the term, a final exam will assess the part of the syllabus not covered by the previous exams. This exam will evaluate the acquisition of competences A5, A15, A31, B1 and B3, but without neglecting the rest of them, both general (B7 and B9) and transverse (C2, C4 and C6).

Personalized attention	
Methodologies	**Description**
Problem solving Laboratory practice	Personalized attention is essential to guide students in carrying out the proposed exercises and lab practices and lead them to acquire this course's competences. Furthermore, this personalized attention can assess and validate student work. Besides, tutorial attendance is recommended whenever some help is needed. Part-time Students may choose the lab group that better fits their timetables, even with the possibility of change during the term. Moreover, part-time students with an approved dispensation for non-attendance at classes only need to perform the practices corresponding to the continuous assessment of the subject.

Assessment			
Methodologies	**Competencies**	**Description**	**Qualification**
Problem solving	A5 A15 A31 B1 B3 B7 B9 C2 C4 C6	Exercises will be proposed to the students to be solved on their own. This personal work will be evaluated by written exams during the term. These exams will assess the competences B1, B3, B7 and B9 in relation to competences A5, A15 and A31, also with an eye on the traverse competences C4 and C6. Obviously, all the written exams will be in English in the English group. This way, the competence C2 is also evaluated.	30
Laboratory practice	A5 A15 A31 B1 B3	Experimental work done by the students in the lab sessions will also be evaluated. This evaluation is focused to assess the acquisition of the competences B1 and B3 in relation to the competences A5, A15 and A31.	30

Objective test	A5 A15 A31 B1 B3 B7 B9 C2 C4 C6	A written exam covering the part of the syllabus not covered by the previous exams will be carried out at the end of the term. This exam will mainly assess the competences A5, A15, A31, B1 and B3. Obviously, student in the English group will be examinated in English, so evaluating the acquisition of the competence C2.	40

Assessment comments
To pass the course in the 1st opportunity call, it is mandatory to obtain a final grade (lab sessions + problem solving exams + final objective test) at least a 50% of the maximum possible grade.The final objective test for the 2nd opportunity call will cover the complete syllabus and will provide the 70% of the final grade. The grades from the problem solving exams during the course will be discarded. The remaining 30% corresponds to the laboratory practices grade obtained during the course. Students taking advantage of the ahead December call will be evaluated using their laboratory practices grade from the previous term. The only condition to pass the course in this call is to obtain a final grade, adding this exam grade and the laboratory practices mark, equal to or greater than 50% of the maximum possible grade.Cheating at any evaluated task will directly mean a failing grade of '0' for the corresponding part of the course (lab sessions, problem solving exams or final objective test).Part-time students may choose the lab group that better fits their timetables, even with the possibility of change during the term. Moreover, part-time students with an approved dispensation for non-attendance at classes only need to perform the practices corresponding to the continuous assessment of the subject and they can choose the timetable they prefer for the written exams (problem solving).

Sources of information	
Basic	- Thomas L. Floyd (2009). Digital Fundamentals (10th Edition). Pearson International Edition - David A. Patterson, John L. Hennessy (2014). Computer organization and design : the hardware/software interface. Morgan Kaufmann Publishers - F. García Carballeira, J. Carretero, J.D. García Sánchez y D. Expósito Singh (2015). Problemas resueltos de estructura de computadores (2ª ed.). Paraninfo - Javier García Zubía (2003). Problemas resueltos de electrónica digital . Thomson
Complementary	- David M. Harris & Sarah L. Harris (2013). Digital Design and Computer Architecture. Morgan Kaufmann Publishers - Miles J. Murdocca y Vicent P. Heuring (2002). Principios de arquitectura de computadoras. Prentice Hall

Recommendations
Subjects that it is recommended to have taken before
Computer Science Preliminaries/614G01002 Discrete Mathematics/614G01004
Subjects that are recommended to be taken simultaneously
Electronics Technology/614G01005
Subjects that continue the syllabus
Computer Structure/614G01012
Other comments
We strongly recommend the use and exploitation of the teacher's office hours to get some help or advice about any topic of the course.