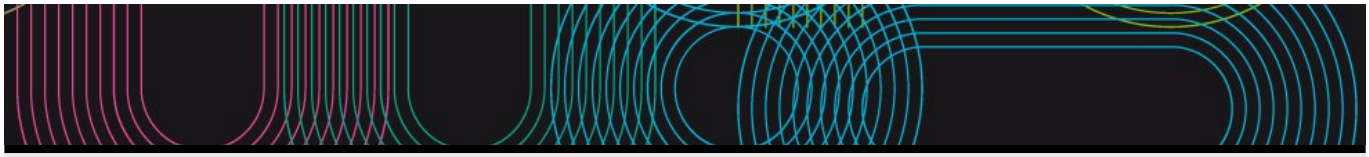

IDENTIFYING DATA				
Application Design with micro-controllers				
Subject	Application Design with micro-controllers			
Code	V05G300V01921			
Study programme	Degree in Telecommunications Technologies Engineering			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	1st
Teaching language	Spanish Galician			
Department				
Coordinator	Costas Pérez, Lucía			
Lecturers	Costas Pérez, Lucía Valdés Peña, María Dolores			
E-mail	lcostas@uvigo.es			
Web	http://cursos.faitic.uvigo.es/tema1415/claroline/course/index.php			
General description	Design and development of microcontroller-based applications, including design methodologies to develop real time applications, peripheral components configuration and connectivity. The scope of these contents will be adapted to the academic level reached by the students. Teachers will speak in spanish or galician language. Exams will be written in spanish.			

Competencies	
Code	
C58	(CE58/OP1) The ability to design hardware and software systems based on microcontrollers.
C59	(CE59/OP2) The ability to use software tools for microcontrollers simulation.

Learning outcomes	
Expected results from this subject	Training and Learning Results
Ability to know in deep the configuration methodologies of real time microcontrollers.	C58
Ability to know in deep the hardware design of the microcontroller-based electronic systems.	C58
Ability to know in deep the software design of the microcontroller-based electronic systems.	C58 C59
Ability to go deeper into the development of microcontroller-based electronic systems.	C58 C59

Contents	
Topic	
Introduction. Previous topics review.	Introduction. Previous topics review. PIC18F45K20. Internal Structure. Arithmetic and Logic Unit. Control Unit. Program memory. Data memory. Peripherals. Watch Dog Timer (WDT).
Instruction set. Addressing modes.	Introduction: Instruction Set. Transfer Instructions. Arithmetic Instructions. Logic Instructions. Jumps. Addressing Modes.
Timers.	Introduction. Timers/Counters: TMR0/TMR1/TMR2/TMR3.
Excepctions and interrupts.	Introduction. Excepctions. Interrupts. Interrupt Response. Registers.
Analog interface.	Introduction. ADC. ADC Operation. Analog Comparator Module.
Compare Mode.	Introduction. Capture Mode. Compare Mode. PWM. ECCP1: Enhanced Mode.
MSSP: Master Synchronous Serial Port SPI. I2C	Introduction. Registers. SPI Mode. I2C Mode.
Power-Managed modes.	Introduction. Different Modes. Switching between modes.

Input/Output.	Introduction. I/O Structure. Ports (A B C D E). Configuration Registers. Parallel Slave Port. Signal Coupling.

Planning

	Class hours	Hours outside the classroom	Total hours
Laboratory practises	12	38	50
Master Session	12	33	45
Troubleshooting and / or exercises	5	15	20
Tutored works	7	22	29
Short answer tests	2	0	2
Short answer tests	2	0	2
Practical tests, real task execution and / or simulated.	2	0	2

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies

	Description
Laboratory practises	The students will perform simulations and electronic circuits. The student develops the competencies CE58 and CE59.
Master Session	The lecturer will explain in the classroom the subject contens. The student develops the competency CE58.
Troubleshooting and / or exercises	The lecturer will solve exercices related to the subject contebts. The student develops the competencies CE58 and E59.
Tutored works	The students have to develop a project in groups. The lecturers will help and monitor them. The student develops the competencies CE58 and CE59.

Personalized attention

Methodologies	Description
Tutored works	The Laboratory teacher will resolve the doubts of students in his office at the schedule established and published on the school website.
Laboratory practises	The Laboratory teacher will resolve the doubts of students in his office at the schedule established and published on the school website.
Master Session	The teacher will resolve the doubts of students at the schedule established and published on the school website.
Troubleshooting and / or exercises	The teacher will resolve the doubts of students at the schedule established and published on the school website.

Assessment

	Description	Qualification	Training and Learning Results
Tutored works	The group of students will be asked to elaborate a report related to the project they have to carry out. The lecturer will also assess individually the student's work developed during the laboratory sessions. Competencies CE58 and CE59 are assessed.	20	C58 C59
Short answer tests	Exam to evaluate the knowledge acquired by the student after the first part of the subject. It is carried out in a classroom session. Competency CE58 is assessed.	25	C58
Short answer tests	Exam to evaluate the knowledge acquired by the student related to the second part of the subject. Competency CE58 is assessed.	25	C58
Practical tests, real task execution and / or simulated.	Laboratory exam. It is related to the lab sessions and carried out in the laboratory. The student has to deal with some real and/or simulated tasks and answer several questions. Competencies C58 and CE59 are assessed.	30	C58 C59

Other comments on the Evaluation

CONTINUOUS ASSESSMENT: A continuous assessment learning scheme will be offered to the students: - Two partial exams will be held related to the theory (A sessions). - The laboratory work will be assessed by means of an exam (B sessions). - The student has to elaborate a report describing the monitored project (C sessions). The first partial exam will take place in the classroom after the first six sessions approximately. It will last ninety minutes. If the student passes this part, he/she is not required to retake it. In this case, after finishing the term, he/she has to take only the second partial exam. The date will be specified in the academic calendar. Teachers will speak in spanish or galician language. Exams will be written in spanish. In partial exams, a minimum score (5 out of 10) is required in order to get a pass. The laboratory exam will take place at the

laboratory during the last session. In order to assess the monitored project, the lecturer will consider the quality of the final report (60%), the work in the laboratory and the student□s behavior (40%). To pass the subject, it is necessary that the mark of each one of the exams or the monitored project are equal or greater than 5 over 10. The final mark (FM) is calculated as the weighted average of the three individual marks. The formula will apply a weight of 50% to the theory mark (TM), a 30% to the laboratory mark (LM) and a 20 % to the project mark (PM): FM = 0,5*TM + 0,3*LM + 0,2*PM (1) The mínimum passing score required in order to get a pass in the subject is 5. In case the students do not pass any of the tasks of the subject, the final mark (FM2) will be: FM2= Minimum{4.5, FM}

Being FM the mark applying (1). When a student takes the first partial exam, it is considered that he/she choose the continuous assessment scheme and he/she will be assessed in June. FINAL EXAM: Students who refuse the continuous assessment scheme will be assessed by means of a final exam to evaluate the theory. The exam will be the same for them as for the students who fail the first partial exam. The assessment of the laboratory for these students will be carried out by means of a laboratory exam. The date will be fixed within the examination period. In this case, the final mark (FM) is calculated as the weighted average of the two individual marks. The formula will apply a weight of 50% to the theory mark (TM) and a 50% to the laboratory mark (LM): FM = 0,5*TM + 0,5*LM (2) To pass the subject, it is necessary that the mark of each one of the exams are equal or greater than 5 over 10. The minimum passing score required in order to get a pass in the subject is 5.

In case the students do not pass any of the tasks of the subject, the final mark (FM2) will be: FM2= Minimum{4.5, FM} Being FM the mark applying (2). IMPORTANT REMARK: Students who refuse the continuous assessment scheme have to contact the lecturer at least two weeks before the exam date. It is necessary to organize the laboratory exams. SECOND OPORTUNTY: The assessment policy in this call follows the scheme described in the previous section (FINAL EXAM).

Sources of information

Basic Bibliography

http://ww1.microchip.com/downloads/en/DeviceDoc/41303F.pdf, **PIC18FXXK20 Data Sheet**,

Complementary Bibliography

F. E. Valdés Pérez, R. Pallás Areni, **Microcontroladores. Fundamentos y Aplicaciones con PIC.**, Marcombo,

http://ww1.microchip.com/downloads/en/DeviceDoc/52116A.pdf, **PICkit□ 3 In-Circuit Debugger/Programmer User□s Guide**,

http://ww1.microchip.com/downloads/en/DeviceDoc/41370C.pdf, **PICkit□ 3 Debug Express PIC18F45K20 □ MPLAB® C Lessons**,

Recommendations

Subjects that it is recommended to have taken before

Programmable Electronic Circuits/V05G300V01502
Electronic Instrumentation and Sensors/V05G300V01621