SUBJECT TEACHING GUIDE

M1692 - Development of Software for embedded systems

Master's Degree in computing engineering

Academic year 2021-2022

1. IDENTIFYING DATA					
Degree	Master's Degree in computing engineering			Type and Year	Compulsory. Year 1
Faculty	Faculty of Sciences				
Discipline	SOFTWARE ENGINEERING				
Course unit title and code	M1692 - Development of Software for embedded systems				
Number of ECTS credits allocated	6	Term		Semester based (1)	
Web	http://www.istr.unican.es/asignaturas/dsw_empotrados				
Language of instruction	Spanish	English Friendly	Yes	Mode of delivery	Face-to-face

Department	DPTO. INGENIERÍA INFORMÁTICA Y ELECTRÓNICA
Name of lecturer	MICHAEL GONZALEZ HARBOUR
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Other lecturers	HECTOR PEREZ TIJERO

3.1 LEARNING OUTCOMES

- - To know and to be able to apply the fundamental concepts and techniques of embedded systems software development , in which the system has a strong relationship with a reactive physical operating environment
- To identify the limitations as well as the functional and extra-functional requirements to be validated that make embedded systems different from general-purpose computer systems
- To know how to approach the development of software for embedded systems according to the way of addressing the interaction with their operating environment, whether driven by events or by time
- To master methodologies, techniques, patterns and useful standards for software development of embedded systems, both at the architectural definition level and at its implementation and validation

4. OBJECTIVES

To achieve the learning outcomes

6. COURSE ORGANIZATION

CONTENTS	
1	1. Introduction. Embedded Systems. Scheduling of software applications in reactive systems: time and event driven. Models for scheduling resources such as time, energy, memory, and physical characteristics. Variations to the development process. The role of model-driven software development.
2	2. Platforms for embedded systems. Bare machine: cyclic executives. Event-driven operating systems. Resource reservation. Space and time partitioning. Hardware-software partitioning. Platforms based on concurrent programming languages. Distributed embedded systems.
3	3. Specification and software requirements analysis for embedded systems. Introduction. Requirements specification in reactive systems. UML/MARTE. Use Case Maps. RDAL/AADL
4	4. Architectural design in embedded systems. Introduction. Design based on control models. Component-based design. Architecture description languages. AADL. Analysis and code generation. Architectural patterns. Real-Time patterns
5	5. Implementation of embedded systems software. Installing and configuring the development environment. Basic use of input/output devices. Characterizing the platform. Automatic code generation. Embedded system project.
6	Final evaluation

7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Exercises: Presentation of solutions to short exercises solved at home	Work	No	Yes	20,00
Lab assignments: Assesment of lab assignments and reports.	Laboratory evaluation	No	Yes	30,00
Final exam: Practical exercises on the computer. Notes and books are allowed during the final exam, but not electronic media such as laptops, tablets and mobile phones.	Written exam	Yes	Yes	50,00
TOTAL				100,00

Observations

There is a single annual evaluation period. If the subject is not passed in the ordinary evaluation activities carried out in the first or the second quarters, an extraordinary evaluation will be available in September.

If the maximum number of highest grades (“Matricula de Honor”) is reached in the ordinary evaluation period, students following the extraordinary evaluation will not be eligible to this grade.

The weighted average for lab assignments and exercises has a minimum mark of 4.0.

Observations for part-time students

Part-time students can present the reports on the exercises and lab assignments up to the end of the academic period.

8. BIBLIOGRAPHY AND TEACHING MATERIALS

BASIC

“Embedded System Design: Embedded Systems Foundations of Cyber-Physical Systems”. Peter Marwedel. Springer, 2010

“Real-Time Systems: Design Principles for Distributed Embedded Applications”. Hermann Kopetz. Springer, 2011