Real time systems

Academic Year: (2023 / 2024) **Review date: 28-04-2023**

Department assigned to the subject: Computer Science and Engineering Department

Coordinating teacher: FERNANDEZ MUÑOZ, JAVIER

Type: Electives ECTS Credits : 3.0

Year : 4 Semester :

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Operating Systems (Course: 2 / Semester: 2)
Computer Architecture (Course: 3 / Semester: 1)

SKILLS AND LEARNING OUTCOMES

Complement the basic, transversal and compulsory knowledge of the Degree according to the student's preferences.

OBJECTIVES

- Understanding the specific concepts and problems related to Real-Time and Embedded Systems and the differentiated aspects with other computational systems.
- Acquiring the knowledge of the design methodologies used in Real-Time and Embedded Systems.
- Acquiring the knowledge of some important tools (development environments, programming languages, and operating systems) suitable for developing Real-Time and Embedded Systems.
- Being able to design and develop Real-Time and Embedded Systems based on microprocessors and using real-time operating systems.
- Being able to design, calculate and develop Real-Time Schedulers for Real-Time and Embedded Systems, including cyclic and rate monotonic priority-based schedulers.

DESCRIPTION OF CONTENTS: PROGRAMME

1. Introduction to Real-Time and Embedded Systems
2. Cyclic Systems and Multiprogrammed Systems
3. Cyclical Task Planning
4. Planning with Task Priorities
5. Design with Microprocessors of Embedded Architectures
6. Embedded and Real-Time System Design
7. Embedded and Real-Time Operating Systems
8. Dynamic Task Planning and Quality of Service

LEARNING ACTIVITIES AND METHODOLOGY

Theoretical lectures: The goal is for the student to obtain the cognitive specific competencies of the subject as well as the transversal competencies like analytical and abstraction skills.

Practical lectures: The goal is for the student to obtain the instrumental specific competencies of the subject as well as the transversal competencies like problem resolution and the application of knowledge.

Continuos evaluation exercises: Started at the practical lectures and finished the goal of these exercises is to complete the instrumental specific competencies and to initiate the attitudinal specific competencies as well as the transversal competencies like problem resolution and the application of knowledge.

Projects: Developed without the presence of the teacher, their goal is to complete and to integrate the achievement of all the specific and transversal competencies by developing projects where is well documented the approach to the problem, the chosen method to solve it, the obtained results and the interpretation of them.

Office hours: Individual assistance (individual tutoring) or group assistance (group tutoring) for the students given by the teacher.

Final exam: The goal is to enhance and complete the development of the cognitive and procedural specific competencies. It reflects specifically the leverage of the theoretical lectures.

ASSESSMENT SYSTEM

The exercises and exams acts as a training activity, but also as a way of measurement for the evaluation system. The evaluation system includes the evaluation of both the teacher-directed academic activities and the projects following the next weighting.

Continuous Evaluation exercises: 10%
Final projects: 40%
Final Exam: 50%

Minimum grade on the exam: 4 (over 10)
Minimum grade on the projects: 3 (over 10) on each one

% end-of-term-examination:	50
% of continuous assessment (assigments, laboratory, practicals…):	50

BASIC BIBLIOGRAPHY

- Alan Burns and Andy Wellings Real-Time Systems and Programming Languages: Ada, Real-Time Java and C/Real-Time POSIX (4th Edition) , Pearson Education , 2009

ADDITIONAL BIBLIOGRAPHY

- Arnold S. Berger Embedded Systems Design: An Introduction to Processes, Tools and Techniques (1º Edition), CRC Press, 2001
- Hermann Kopetz Real-Time Systems: Design Principles for Distributed Embedded Applications (2º Edition), Springer, 2011
- Xiaocong Fan Real-Time Embedded Systems: Design Principles and Engineering Practices, Newnes, 2015