

29844 - Real-Time Systems

Syllabus Information

Academic year: 2023/24

Subject: 29844 - Real-Time Systems

Faculty / School: 110 - Escuela de Ingeniería y Arquitectura

Degree: 440 - Bachelor's Degree in Electronic and Automatic Engineering

ECTS: 6.0

Year: 4

Semester: First semester

Subject type: Optional

Module:

1. General information

The objective of the subject is to train the student in the programming techniques of real-time embedded systems that are used in complex systems that perform concurrent activities. We study how to integrate the different activities of a system (control of each actuator, mission, console, communications) in such a way that both temporal and functional requirements are met.

This subject builds on the knowledge acquired in the course Fundamentals of Computer Science and Programmable e-Electronic Systems.

This objective is aligned with targets 9.5 and 9.c of Sustainable Development Goal 9, SDG, of the 2030 Agenda (<https://www.un.org/sustainabledevelopment/es/>).

2. Learning results

- Know and apply real time system development techniques. In particular: Real-time applications concurrent, real-time kernels, task-based application analysis and scheduling (Deadline Monotonic).
- Have a working knowledge of the above aspects of real-time system development. The subject has a large practical component and a real application will be developed on a processor using a core and the C language.

3. Syllabus

- Introduction to real-time systems.
- The F28377S.
- Real Time Operating Systems. Concurrency.
- Time Measurement and Control.
- SYS-BIOS. Concurrency and Time
- Planning with static priorities: Deadline Monotonic.
- Shared resources and communications between tasks.
- Inheritance protocols and priority ceiling.
- Aperiodic tasks.
- Advanced topics. Planning with dynamic priorities.
- Advanced topics. Distributed systems.
- Fault tolerance.

4. Academic activities

- Participative lectures (30 hours).
- Problem classes and case resolution (15 hours).
- Laboratory practices (15 hours). There will be five three-hour sessions in which the working groups will develop a project.
- Personal study and work (86 hours).
- Assessment tests. (4 hours).

5. Assessment system

- Project (60%): Students will be organized in groups of two. The project will consist of the development of a real-time embedded system: a mobile robot. The mechanical part, actuators, sensors and electronics will not be the subject of the project except for interconnections or small signal adaptation details. The following will be the object of the project:

modeling or identification of components, design and implementation of controllers and servos, microcontroller programming, tuning and verification of requirements. The project should be defended by team members with an oral presentation incorporating a demonstration of the proper functioning of the developed device. The grade will take into account the group work developed and the contribution of each member . Grading from 0 to 10 points, representing 60% of the overall grade. The defense will be carried out in the framework of the global tests of the Official Calls.

- Final Exam (40%): Composed of theoretical-practical questions and problems, to be carried out in the Official Calls. Grading from 0 to 10 points; it will represent 40% of the student's overall grade A minimum grade of 3.5 points must be obtained to pass . The correctness of the answers will be assessed, developments, designs and results