Course guide
320043 - PSCTR - Control System Programming in Real-Time

Last modified: 19/04/2023

Unit in charge:	Terrassa School of Industrial, Aerospace and Audiovisual Engineering
Teaching unit:	707 - ESAII - Department of Automatic Control.

Degree:	BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Optional subject).

Academic year: 2023   **ECTS Credits:** 6.0   **Languages:** Catalan

LECTURER

Coordinating lecturer:	Ramon Sarrate Estruch
Others:	Josep Cugueró Escofet, Rita M. Planas Dangla

PRIOR SKILLS

Industrial informatics, Control engineering

REQUIREMENTS

TEACHING METHODOLOGY

·Sessions of theoretical content.
· Sessions of practical work.
· Independent work and study exercises and case studies.
· Preparation and evaluated in group activities.
The professor will introduce the theoretical foundations of the subject, concepts, and methods illustrating them with appropriate examples to facilitate their understanding.

LEARNING OBJECTIVES OF THE SUBJECT

The course aims at:
· Being aware of the issues involved in the implementation of computer control systems.
· Providing basic knowledge on computer multitask programming technology
· Getting to know realtime operating systems
· Introducing to the practical implementation of control and supervisory applications

STUDY LOAD

Type	Hours	Percentage
Self study	90,0	60.00
Hours small group	30,0	20.00
Hours large group	30,0	20.00

Total learning time: 150 h

CONTENTS

1. Introduction to realtime systems

Description:
- Course goals
- Definitions and goals
- Characteristics of a realtime system

Full-or-part-time: 8h
Theory classes: 3h
Self study : 5h

2. Time management

Description:
-Definitions and concepts
- Time management services SOTR
- Periodic code execution

Full-or-part-time: 17h
Theory classes: 3h
Laboratory classes: 4h
Self study : 10h

3. Task management

Description:
- Invocation and scheduling mechanisms
- Task states
- QNX multitask programming

Full-or-part-time: 23h 30m
Theory classes: 3h 30m
Laboratory classes: 10h
Self study : 10h

4. Task interaction

Description:
-Introduction
- Shared resources access
- Message passing
- Task synchronization
- Shared resourcess access protocols

Full-or-part-time: 80h 30m
Theory classes: 16h 30m
Laboratory classes: 14h
Self study : 50h

5. Peripheral device management

Description:
- Peripheral devices
- Register programming
- Peripheral device interaction

Full-or-part-time: 14h 30m
Theory classes: 2h 30m
Laboratory classes: 2h
Self study : 10h

6. Realtime operating systems

Description:
- What's an operating system?
- What's a realtime operating system?
- RTOS example: QNX

Full-or-part-time: 6h 30m
Theory classes: 1h 30m
Self study : 5h

ACTIVITIES

LECTURES

Full-or-part-time: 22h
Theory classes: 22h

LABORATORY SESSIONS

Full-or-part-time: 30h
Laboratory classes: 30h

EXERCICES

Full-or-part-time: 4h
Theory classes: 4h

EXAMS

Full-or-part-time: 4h
Theory classes: 4h

SELF STUDY

Full-or-part-time: 90h
Theory classes: 90h

GRADING SYSTEM

Written exams 50% (20% mid-term exam, 30% second-term exam)
Laboratory 50%
Other deliveries (optional problem solving): 10% global score improvement

BIBLIOGRAPHY

Basic:
- Laplante, Phillip A. Real-time systems design and analysis: an engineer's handbook. 2nd ed. New York: IEEE, 1997. ISBN 0780334000.
- Burns, A.; Wellings, A. Sistemas de tiempo real y lenguajes de programación. 3ª ed. Madrid: Addison Wesley, 2003. ISBN 8478290583.
- Burns, A.; Davies, G. Concurrent programming. Wokingham: Addison Wesley, 1993. ISBN 0201544172.

Complementary:
- Krten, Rob. Getting started with QNX Neutrino 2: a guide for realtime programmers. Ontario: PARSE, 1999. ISBN 0968250114.
- Krten, Rob. The QNX cookbook: recipes of programmers. Ontario: PARSE, 2003. ISBN 0968250122.