340608 - SETR-R2O07 - Embedded and Real Time Systems

Coordinating unit: 340 - EPSEVG - Vilanova i la Geltrú School of Engineering
Teaching unit: 707 - ESAII - Department of Automatic Control
Academic year: 2019
Degree: MASTER'S DEGREE IN AUTOMATIC SYSTEMS AND INDUSTRIAL ELECTRONICS (Syllabus 2012). (Teaching unit Optional)
ECTS credits: 5
Teaching languages: Catalan

Teaching staff
Coordinator: Francesc Xavier Parra Llanas

Learning objectives of the subject

Study load

<table>
<thead>
<tr>
<th>Total learning time: 125h</th>
<th>Hours large group:</th>
<th>15h</th>
<th>12.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours medium group:</td>
<td>0h</td>
<td></td>
<td>0.00%</td>
</tr>
<tr>
<td>Hours small group:</td>
<td>30h</td>
<td></td>
<td>24.00%</td>
</tr>
<tr>
<td>Guided activities:</td>
<td>0h</td>
<td></td>
<td>0.00%</td>
</tr>
<tr>
<td>Self study:</td>
<td>80h</td>
<td></td>
<td>64.00%</td>
</tr>
</tbody>
</table>
The objective of the subject is to obtain that the student understands the problematic individual of the real-time systems, and the characteristics differentiate them from other computer science systems. The most important methods that they are used to develop real-time systems with a high degree of reliability, especially those that talk about in accordance with the time, the planning of the use of the resources, the prevention and the tolerance to failures, and the organization of software and her application will be learned. The control applications of processes will be contemplated of special form. Several techniques will consider to develop these applications and the mechanisms necessary will settle down to evaluate their benefits.

Will be some tools (programming languages and operating systems) adapted for the accomplishment of real-time systems and the theoretical concepts will study necessary to approach the accomplishment of computer science systems with a determinist temporary behavior.

Contents
1. Introduction to the computer science systems of real time.
   1.1 Definition of real-time system.
   1.2 Examples of real-time systems.
   1.3 Characteristics of the real-time systems.
   1.4 Type of real-time systems
   1.5 Programming of the real-time systems: Smalltalks.
2. Multiprogrammed operating systems
   2.1 Introduction.
   2.2 RTOS. Idea of deadline.
   2.3 Memory.
   2.4 Input/output.
   2.5 Processes, concurrence and communication.
   2.6 Languages and real-time operating systems.
3. Cyclical systems.
   3.1 Concepts and methodology
   3.2 Cyclical planning
   3.3 Segmentation of tasks
   3.4 Construction of the cyclical plan of execution
   3.5 Programming of the cyclical executive
4. Management of the time
   4.1 Reference systems of time
   4.2 Temporary clocks, retardations and limits
   4.3 Temporary requirements
   4.4 Tolerance to failures
5. Planning of tasks
   5.1 Concepts and methodology
   5.2 Planning with fixed priorities
   5.3 Interaction between tasks
   5.4 Planning with dynamic priorities
   5.5 Model of tasks generalized
6. Multiprogramming
   6.1 Management of processes and memory
   6.2 Synchronization and communication between processes
The qualification of the subject considers all the work carried out throughout the course. The final qualification is obtained to apply the following formula:

$$NF = 0.35 \times Q1 + 0.35 \times Q2 + 0.3 \times Q3$$

where:
- $Q1$ = mark of the first partial test.
- $Q2$ = mark of the second partial test.
- $Q3$ = mark of the laboratory practicals.
- Final $NF$ = mark of the subject.

**Bibliography**