240607 - Development of Applications Based in Microcontrollers

Coordinating unit: 240 - ETSEIB - Barcelona School of Industrial Engineering
Teaching unit: 710 - EEL - Department of Electronic Engineering
Academic year: 2017
Degree: BACHELOR'S DEGREE IN INDUSTRIAL TECHNOLOGY ENGINEERING (Syllabus 2010). (Teaching unit Optional)
BACHELOR'S DEGREE IN CHEMICAL ENGINEERING (Syllabus 2010). (Teaching unit Optional)
BACHELOR'S DEGREE IN MATERIALS ENGINEERING (Syllabus 2010). (Teaching unit Optional)
ECTS credits: 4.5  Teaching languages: Catalan, Spanish

Coordinator: JUAN MANUEL MORENO EGUILAZ
Others: JUAN MANUEL MORENO EGUILAZ

Teaching staff

Prior skills
Capacity to analyze electronic circuits, basic knowledge of computer science. Electronics, Computer Science

Degree competences to which the subject contributes

Specific:
1. Knowledge of electronics fundaments.

Transversal:
2. SELF-DIRECTED LEARNING. Detecting gaps in one's knowledge and overcoming them through critical self-appraisal. Choosing the best path for broadening one's knowledge.

Teaching methodology
- MD-2: Lecture class
- MD-3: Autonomous learning
- MD-5. Learning by doing.

Learning objectives of the subject

General objectives:
- A first tutorial to the world of microcontrollers, with a fundamentally practical approach.

Specific objectives:
- Know the fundamentals of microcontrollers.
- Learn to develop microcontroller based applications.
## Study load

<table>
<thead>
<tr>
<th>Total learning time: 112h 30m</th>
<th>Hours large group:</th>
<th>0h</th>
<th>0.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours medium group:</td>
<td>45h</td>
<td>40.00%</td>
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<tr>
<td>Hours small group:</td>
<td>0h</td>
<td>0.00%</td>
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<tr>
<td>Guided activities:</td>
<td>0h</td>
<td>0.00%</td>
<td></td>
</tr>
<tr>
<td>Self study:</td>
<td>67h 30m</td>
<td>60.00%</td>
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</table>
# 1. Introduction to the microcontrollers

**Description:**
- Definitions.
- Components of a microcontroller.
- History of the microcontrollers.
- Applications of the microcontrollers.
- Current trends.

**Related activities:**
- Complementary reading.

**Specific objectives:**
- Introduce the students to the world of microcontrollers.
- Know the basic components.
- Understand the past, the present and the future.

**Learning time:** 2h 15m  
  Theory classes: 1h 30m  
  Self study: 0h 45m

## 2. Hardware

**Description:**
- Architectures.
- Memories.
- Interrupts.
- Characteristic special.
- Peripherals.
- Buses of communications

**Related activities:**
- Interactive classes.
- Laboratory.

**Specific objectives:**
- Show the characteristics microcontroller hardware.
- Explain the fundamentals of hardware in order to design microcontroller based applications.

**Learning time:** 18h  
  Theory classes: 12h  
  Self study: 6h
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## 3. Software

<table>
<thead>
<tr>
<th>Learning time: 22h 30m</th>
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</thead>
<tbody>
<tr>
<td>Theory classes: 15h</td>
</tr>
<tr>
<td>Self study: 7h 30m</td>
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</tbody>
</table>

**Description:**
- Programming languages.
- The assembler language.
- The C language.
- Design methodology.
- Data structures for microcontrollers.
- The standard IEEE-754.
- Real Time Operating Systems (RTOS).

**Related activities:**
- Interactive classes.
- Laboratory.

**Specific objectives:**
- Show the characteristics of microcontroller software.
- Explain the fundamentals of software in order to develop microcontroller based applications.

## 4. Tools for the development of microcontroller based applications

<table>
<thead>
<tr>
<th>Learning time: 2h 15m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory classes: 1h 30m</td>
</tr>
<tr>
<td>Self study: 0h 45m</td>
</tr>
</tbody>
</table>

**Description:**
- Integrated Development Environments (IDEs)
- Assemblers, compilers, simulators, debuggers, etc.

**Related activities:**
- Interactive classes.
- Laboratory.

**Specific objectives:**
- Know the basic tools to develop a microcontroller based application.
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5. Applications

<table>
<thead>
<tr>
<th>Learning time: 22h 30m</th>
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</thead>
<tbody>
<tr>
<td>Laboratory classes: 15h</td>
</tr>
<tr>
<td>Self study: 7h 30m</td>
</tr>
</tbody>
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Description:
- Simulation session (1.5h + 0.75h).
- Basic experimental session (1.5h + 0.75h).
- Project I (6h + 3h).
- Project II (6h + 3h).

Related activities:
- Recommended reading.
- Laboratory.

Specific objectives:
- Practice all the acquired knowledge. 2 sessions of introduction and 2 mini-projects with microcontroller based applications will be carried out.

Qualification system

- IE.1: Written exams (partial, 25% and final, 50%): total: 75%
- IE.4: Laboratory: 25%

Regulations for carrying out activities

- It will not allow any type of documentation during the development of the written examinations for those parts concerning theoretic knowledge.

Bibliography

Basic:

Complementary: