240608 - Electronic Workshop

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

Coordinators:
ROSA RODRIGUEZ MONTAÑES

Others:
ROSA RODRIGUEZ MONTAÑES - RAFAEL MARTIN LAMAIISON URIOSTE

Prior skills
Electronics

Degree competences to which the subject contributes

Specific:
1. Knowledge of electronics fundamentals.

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
All the sessions will be done at the teaching laboratory (Department of electronics). The methodology used will be the so-called PBL Project Based Learning.

Learning objectives of the subject
After following the subject, students will be able to
- design small electronics projects/systems (digital and analog).
- build simple experimental electronic systems (protoboard or solded PCB).
- operate small electronic systems.
- design low complexity PCBs (Printed Circuit Board)
### Study load

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

### Instrumentation

**Description:**
Instrumentation review. Basis of internal operation.

### Design of a source of DC voltage

**Description:**
Design of a 5VDC.

**Related activities:**
Experimental DC source with rectifier, filter and 7805 regulator.

### Design of a signal wave generator

**Description:**
Design of periodical signals based on discrete devices. Timer CI 555, OPAMP.

**Related activities:**
Experimental work.

### Design of a 3D structure based on LEDs

**Description:**
Introduction to soldering

**Related activities:**
Soldering of a 3D structure with LEDs
<table>
<thead>
<tr>
<th>Topic</th>
<th>Learning time</th>
<th>Related activities</th>
</tr>
</thead>
</table>
| **Introduction to PIC microcontrollers (Microchip)** | Learning time: 45h  
Practical classes: 12h  
Laboratory classes: 6h  
Self study : 27h | **Description:**  
Introduction to PIC microcontrollers. Internal architecture. Programming with high level language C.  
**Related activities:**  
Experimental use of PIC16F690 for controlling the 3D structure of LEDs |
| **Bluetooth technology**                  | Learning time: 7h 30m  
Practical classes: 2h  
Laboratory classes: 1h  
Self study : 4h 30m | **Description:**  
Sending information through Bluetooth modules.  
**Related activities:**  
Experimental use of a commercial Bluetooth module. |
| **Control of an external element through Bluetooth** | Learning time: 7h 30m  
Practical classes: 2h  
Laboratory classes: 1h  
Self study : 4h 30m | **Description:**  
Sending information through Bluetooth modules.  
**Related activities:**  
Experimental control of the on/off state of an external device with Bluetooth. |
| **Solar cell characterization**           | Learning time: 7h 30m  
Practical classes: 2h  
Laboratory classes: 1h  
Self study : 4h 30m | **Description:**  
Introduction to solar cells. Maximum power point.  
**Related activities:**  
Experimental characterization of a solar cell. |
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<table>
<thead>
<tr>
<th>Design of a battery charger</th>
<th>Learning time: 7h 30m</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Practical classes: 2h</td>
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<tr>
<td></td>
<td>Laboratory classes: 1h</td>
</tr>
<tr>
<td></td>
<td>Self study: 4h 30m</td>
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</table>

Description:
Introduction to battery chargers. Basic concepts.

Related activities:
Experimental control of a battery charger.

<table>
<thead>
<tr>
<th>Design of a printed circuit board (PCB)</th>
<th>Learning time: 7h 30m</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Practical classes: 2h</td>
</tr>
<tr>
<td></td>
<td>Laboratory classes: 1h</td>
</tr>
<tr>
<td></td>
<td>Self study: 4h 30m</td>
</tr>
</tbody>
</table>

Description:
Printed Circuit Boards (PCBs). Design and software.

Related activities:
Design of a simple PCB (2 sides)

Qualification system

The final mark will be obtained from 4 partial marks derived from experimental small projects performed during the course. This final mark (NFinal) will result from the averaged partial marks (NP1, NP2, NP3, NP4).

\[ NFinal = \frac{(NP1 + NP2 + NP3 + NP4)}{4} \]

There are no exams in the subject.

Bibliography