295117 - 2951232 - Mechatronics

Coordinating unit: 295 - EEBE - Barcelona East School of Engineering
Teaching unit: 710 - EEL - Department of Electronic Engineering
Academic year: 2018
Degree:
ECTS credits: 6  Teaching languages: English

Teaching staff

Others:

Prior skills

Basic analysis of mechanical systems, electrical and electronic circuits.

Teaching methodology

The methodologies used for the development of the subject are as follows:
- Lecture with multimedia support, in order to provide information to the student so synthesized and organized.
- Class participatory exhibition, in which and in order that the student is not merely a passive element in the learning process, the teacher performs direct questions or debates on points considered particularly relevant or conceptual difficulty proposed.
- Problem-based learning, either individually or in a group in which the teacher proposes solving exercises outside the classroom so that the student can assess the degree of understanding of the subject.
- In the experimental laboratory sessions the methodology adopted is that of small cooperative groups in which students acquire skills in simulation techniques and testing of circuits.

Learning objectives of the subject

That the student will be able to:
- Integrate in the design of a mechanical system the technologies of electricity, electronics, computers and communications,
- Automate the operation of mechanical systems and communicate them with their environment,
- Design mechatronic systems adapted to the needs of the product.

Study load

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
<th>Hours large group:</th>
<th>22h</th>
<th>14.67%</th>
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<tr>
<td></td>
<td>Hours medium group:</td>
<td>0h</td>
<td>0.00%</td>
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<tr>
<td></td>
<td>Hours small group:</td>
<td>22h</td>
<td>14.67%</td>
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<td></td>
<td>Guided activities:</td>
<td>4h</td>
<td>2.67%</td>
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<td></td>
<td>Self study:</td>
<td>102h</td>
<td>68.00%</td>
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## Content

<table>
<thead>
<tr>
<th>Module</th>
<th>Description</th>
<th>Learning time</th>
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</table>
| **T1.- Mechanical Systems Engineering** | **Description:**
T1.- Introduction to mechanical systems engineering  
T1.- Constructive structure of machines | **Learning time:** 21h  
Theory classes: 6h  
Self study: 15h |
| **T2.- Electric Machines and Actuators** | **Description:**
T2.- Electric machines and actuators. Revision of the machines  
T2.- Equations and static and dynamic models  
T2.- Dimensioning of electrical machines | **Learning time:** 21h  
Theory classes: 6h  
Self study: 15h |
| **T3.- Sensor elements** | **Description:**
T3.- Voltage and current sensor elements, and signal conditioning  
T3.- Temperature sensors, force, position, limit switch, acceleration, encoders, ... | **Learning time:** 14h  
Theory classes: 4h  
Self study: 10h |
| **T4.- Acquisition and Control Systems** | **Description:**
T4.- Overview to acquisition systems and control strategies  
T4.- Closed-loop control and Digital control | **Learning time:** 7h  
Theory classes: 2h  
Self study: 5h |
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## T5.- PLCs systems

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<th>Learning time: 7h</th>
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<td>Theory classes: 2h</td>
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<td>Self study: 5h</td>
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**Description:**
- T5.- Introduction to small PLCs
- T5.- Basic programming and input-output availability

## T6.- Basics communications

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<th>Learning time: 2h</th>
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<td>Theory classes: 2h</td>
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**Description:**
- T6.- Basics communications
- T6.- Differential transmissions and wireless transmissions

## T7.- Arduino and Raspberry Pi Boards

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<th>Learning time: 33h</th>
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<tr>
<td>Laboratory classes: 10h</td>
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<tr>
<td>Self study: 23h</td>
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</table>

**Description:**
- T7.- Introduction to Arduino and Raspberry Pi boards, and its programming
- T7.- Accessories shields and its connectivity
- T7.- Introduction to microcontrollers PIC and its programming

**Related activities:**
Laboratory sessions 1 to 5:
- Session 2: Arduino board II. AD conversion programming and signal acquisition.
- Session 3: Introduction to the Raspberry Pi board and its programming environment.
- Session 4: Raspberry Pi board II. Control of a stepper motor or DC with its driver.
- Session 5: Introduction to PIC microcontrollers and their programming environment. Basic programming and prototyping of the PIC microcontrollers.
The evaluation system consists on the following ratings with the partial weights:
- A Partial Test: 25%.
- A Final test: 25%.
- Laboratory: 25%.
- Monitoring exercises: 25%.

Qualification system

The realization of the different tests consists of:
- The partial or final tests are individual written tests based on the theory and problems worked on in the course.
- Laboratory activities are compulsory assistance to students. Although they are worked in groups, they will be assessed individually, considering the cooperative work mode, the degree of involvement, the rate of progress and the degree of completion of the work carried out.
- The activities of follow-up exercises are individual. They will be carried out after school hours and will usually be delivered through the ATENEA application.

Regulations for carrying out activities

Bibliography

Others resources:
Arduino boards. Raspberry Pi boards. Different commercial shields of this boards.
PC computer. Basic equipment of electronic laboratory.