820221 - RIVC - Industrial Robotics and Computer Vision

Degree competences to which the subject contributes

Specific:
2. Understand the principles and applications of automated systems.

Transversal:
3. EFFECTIVE USE OF INFORMATION RESOURCES - Level 2. Designing and executing a good strategy for advanced searches using specialized information resources, once the various parts of an academic document have been identified and bibliographical references provided. Choosing suitable information based on its relevance and quality.

Teaching methodology

The course is based on lectures (20%), supervised problem solving (20%), individual homework (30%) and group homework (30%).

Learning objectives of the subject

The general objective of the course is the presentation of two key technologies used in automated productive environments: industrial robotics and computer vision.

From the students perspective, the specific objectives associated with the field of industrial robotics are the following:
- Know the structure and basic operation of industrial manipulator robots.
- Know the main applications of industrial robots.
- Know the technology of the different elements that make up a robot.
- Know and know how to apply the physical principles necessary for the design and control of robots.
- Know how to program basic tasks in a commercial industrial robot.

Regarding the area of computer vision, the objectives are:
- Know the physical elements that make up an artificial vision system.
- Know the basic steps involved in image processing.
- Know the standard techniques of image processing.
- Know how to program vision applications.

<table>
<thead>
<tr>
<th>Study load</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>150h</td>
<td>45h</td>
<td>0h</td>
<td>15h</td>
<td>90h</td>
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<tr>
<td></td>
<td>30.00%</td>
<td>0.00%</td>
<td>10.00%</td>
<td>0.00%</td>
<td>60.00%</td>
</tr>
</tbody>
</table>
## Content

| 1. Introduction to industrial robotics. | **Learning time:** 9h  
Theory classes: 3h  
Self study: 6h |
|----------------------------------------|------------------|
| **Description:**  

| 2. The articulated arm: morphology and components. | **Learning time:** 9h  
Theory classes: 3h  
Self study: 6h |
|-------------------------------------------------|------------------|
| **Description:**  

| 3. Modelling and control. | **Learning time:** 18h  
Theory classes: 6h  
Self study: 12h |
|--------------------------|------------------|
| **Description:**  

| 4. Robotized cells. | **Learning time:** 9h  
Theory classes: 3h  
Laboratory classes: 6h |
|---------------------|------------------|
| **Description:**  
| **5. Robot programming.** | **Learning time:** 17h  
Theory classes: 3h  
Laboratory classes: 8h  
Self study: 6h |
| --- | --- |
| **Description:**  

| **6. Applications.** | **Learning time:** 9h  
Theory classes: 3h  
Self study: 6h |
| --- | --- |
| **Description:**  

| **7. Introduction to computer vision.** | **Learning time:** 9h  
Theory classes: 3h  
Self study: 6h |
| --- | --- |
| **Description:**  
Definitions. Application domains. Industrial applications of computer vision. |

| **8. Image acquisition and processing systems.** | **Learning time:** 9h  
Theory classes: 3h  
Self study: 6h |
| --- | --- |
| **Description:**  
Components of a computer vision system. Optical devices. Illumination systems. Specialized hardware for image processing. |

| **9. Image processing techniques.** | **Learning time:** 27h  
Theory classes: 9h  
Self study: 18h |
| --- | --- |
| **Description:**  
10. Programming computer vision applications.

<table>
<thead>
<tr>
<th>Learning time: 16h</th>
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<tbody>
<tr>
<td>Theory classes: 3h</td>
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<tr>
<td>Laboratory classes: 7h</td>
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<tr>
<td>Self study: 6h</td>
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</tbody>
</table>

**Description:**
Programming computer vision applications using MATLAB.

**Qualification system**

The evaluation formula used in the course is the following:
- First exam: 35%
- Second exam: 35%
- Laboratory: 20%
- Exercises: 10%

The students will be able to access the re-assessment test that meets the requirements set by the EEBE in its Assessment and Permanence Regulations (https://eebe.upc.edu/ca/estudis/normatives-academiques/documents/eebe-normativa-avaluacio-i-permanencia-18-19-aprovat-je-2018-06-13.pdf)

**Bibliography**

**Basic:**


**Complementary:**

