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.
### Study load

<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>Total learning time: 150h</td>
<td>45h</td>
<td>0h</td>
<td>15h</td>
<td>0h</td>
<td>90h</td>
</tr>
</tbody>
</table>

- **Hours large group:** 45h (30.00%)
- **Hours medium group:** 0h (0.00%)
- **Hours small group:** 15h (10.00%)
- **Guided activities:** 0h (0.00%)
- **Self study:** 90h (60.00%)
<table>
<thead>
<tr>
<th>Content</th>
<th>Learning time: 9h</th>
</tr>
</thead>
</table>
| **1. Introduction to industrial robotics.** | Theory classes: 3h  
Self study: 6h |
| **Description:** | History of industrial robotics. Economical and social aspects. The industrial manipulator robot. Statistics. Associations and manufacturers. |

| **2. The articulated arm: morphology and components.** | Theory classes: 3h  
Self study: 6h |

| **3. Modelling and control.** | Theory classes: 6h  
Self study: 12h |

| **4. Robotized cells.** | Theory classes: 3h  
Laboratory classes: 6h |
| **Description:** | Robot selection. Robot location. Terminal elements. Adapting and sensing the environment. |
### 5. Robot programming.

**Description:**

**Learning time:** 17h
- Theory classes: 3h
- Laboratory classes: 8h
- Self study: 6h

### 6. Applications.

**Description:**

**Learning time:** 9h
- Theory classes: 3h
- Self study: 6h

### 7. Introduction to computer vision.

**Description:**
Definitions. Application domains. Industrial applications of computer vision.

**Learning time:** 9h
- Theory classes: 3h
- Self study: 6h

### 8. Image acquisition and processing systems.

**Description:**
Components of a computer vision system. Optical devices. Illumination systems. Specialized hardware for image processing.

**Learning time:** 9h
- Theory classes: 3h
- Self study: 6h

### 9. Image processing techniques.

**Description:**

**Learning time:** 27h
- Theory classes: 9h
- Self study: 18h
10. Programming computer vision applications.

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

Bibliography

Basic:

Complementary: