Course guide
820221 - RIVC - Industrial Robotics and Computer Vision

Unit in charge: Barcelona East School of Engineering
Teaching unit: 707 - ESAII - Department of Automatic Control.
Degree: BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Compulsory subject).
Academic year: 2023
ECTS Credits: 6.0
Languages: Catalan, Spanish

LECTURER
Coordinating lecturer: SEBASTIAN TORNIL SIN
Primer quadrimestre:
ANTONI GRAU SALDES - Grup: M11, Grup: M12, Grup: M13, Grup: M14, Grup: M15, Grup: M16, Grup: M17
SEBASTIAN TORNIL SIN - Grup: M11, Grup: M12, Grup: M13, Grup: M14, Grup: M15, Grup: M16, Grup: M17

Others:
Primer quadrimestre:
ANTONI GRAU SALDES - Grup: M11, Grup: M12, Grup: M13, Grup: M14, Grup: M15, Grup: M16, Grup: M17
EDMUNDO GUERRA PARADAS - Grup: M11, Grup: M13, Grup: M14
SEBASTIAN TORNIL SIN - Grup: M11, Grup: M12, Grup: M13, Grup: M14, Grup: M15, Grup: M16, Grup: M17
SUSANA ADRIANA VELAZQUEZ LERMA - Grup: M15, Grup: M16, Grup: M17

Segon quadrimestre:
ANTONI GRAU SALDES - Grup: T11, Grup: T12, Grup: T13, Grup: T14
SEBASTIAN TORNIL SIN - Grup: T11, Grup: T12, Grup: T13, Grup: T14
SUSANA ADRIANA VELAZQUEZ LERMA - Grup: T13, Grup: T14

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 (30%), supervised problem solving (10%), and individual autonomous work (60%).
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>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
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<tbody>
<tr>
<td>Hours small group</td>
<td>15,0</td>
<td>10.00</td>
</tr>
<tr>
<td>Self study</td>
<td>90,0</td>
<td>60.00</td>
</tr>
<tr>
<td>Hours large group</td>
<td>45,0</td>
<td>30.00</td>
</tr>
</tbody>
</table>

Total learning time: 150 h

CONTENTS

1. Introduction to industrial robotics.

Description:

Related competencies:
CEEIA-27. Understand the principles and applications of automated systems.

Full-or-part-time: 9h
Theory classes: 3h
Self study : 6h

2. The articulated arm: morphology and components.

Description:

Related competencies:
CEEIA-27. Understand the principles and applications of automated systems.

Full-or-part-time: 9h
Theory classes: 3h
Self study : 6h
3. Modelling and control.

Description:
kinematics. Control. Trajectory generation.

Related competencies:
CEEIA-27. Understand the principles and applications of automated systems.

Full-or-part-time: 18h
Theory classes: 6h
Self study: 12h

4. Robotized cells.

Description:

Related competencies:
CEEIA-27. Understand the principles and applications of automated systems.

Full-or-part-time: 9h
Theory classes: 3h
Laboratory classes: 6h

5. Robot programming.

Description:

Related competencies:
CEEIA-27. Understand the principles and applications of automated systems.

Full-or-part-time: 17h
Theory classes: 3h
Laboratory classes: 8h
Self study: 6h

6. Applications.

Description:

Related competencies:
CEEIA-27. Understand the principles and applications of automated systems.

Full-or-part-time: 9h
Theory classes: 3h
Self study: 6h
### 7. Introduction to computer vision.

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

**Full-or-part-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.

**Full-or-part-time:** 9h  
Theory classes: 3h  
Self study: 6h

### 9. Image processing techniques.

**Description:**

**Full-or-part-time:** 27h  
Theory classes: 9h  
Self study: 18h

### 10. Programming computer vision applications.

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

**Full-or-part-time:** 16h  
Theory classes: 3h  
Laboratory classes: 7h  
Self study: 6h

### GRADING SYSTEM

The evaluation formula used in the course is the following:
- Robotics exam: 35%.
- Computer Vision exam: 35%.
- Laboratory: 15%.
- Exercises: 15%.

There is re-assessment exam in this subject.
BIBLIOGRAPHY

Basic:

Complementary: