Course guide
240IAU33 - 240IAU33 - Industrial and Service Robotics

Unit in charge: Barcelona School of Industrial Engineering
Teaching unit: 707 - ESAII - Department of Automatic Control.
Degree: MASTER'S DEGREE IN INDUSTRIAL ENGINEERING (Syllabus 2014). (Optional subject).
Academic year: 2023 ECTS Credits: 4.5 Languages: Catalan

LECTURER
Coordinating lecturer: Santamaria Navarro, Angel
Others: Palomo Avellaneda, Leopold

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES
Specific:
CEEAUTS. Design, project and program robotic systems for industrial and service applications.

TEACHING METHODOLOGY
Lectures, practical classes in computer classroom.
Teaching materials will be written in English.

LEARNING OBJECTIVES OF THE SUBJECT
Students attending this course must be able to:
a) Analyze the logical correctness of robotics manufacturing systems.
b) Program simple tasks for collaborative robots
c) Describe different robotic system architectures and middleware.
d) Implement basic robotic applications using the Robotic Operating system middleware
e) Know and understand common perception systems and navigation pipelines
f) Describe the control schemes for visual servoing and for teleoperator systems.

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self study</td>
<td>72,0</td>
<td>64.00</td>
</tr>
<tr>
<td>Hours small group</td>
<td>13,5</td>
<td>12.00</td>
</tr>
<tr>
<td>Hours large group</td>
<td>27,0</td>
<td>24.00</td>
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</tbody>
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Total learning time: 112.5 h
## CONTENTS

### 1. Robotic applications

**Description:**
1.1. Robotic manufacturing systems  
1.2. Robotization of logistics' warehouses  
1.3. Collaborative robots  

**Full-or-part-time:** 3h  
Theory classes: 3h

### 2. Implementation of Robotic systems using ROS

**Description:**
2.1. Basic concepts and development tools  
2.2. Communication using topics and services  
2.3. Modelling and visualization  

**Related activities:**
P2: ROS: Detecting the object poses using the ArUcO library I  
P3: ROS: Detecting the object poses using the ArUcO library II  

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

### 3. Common robotic modules

**Description:**
3.1. Sensing  
3.2. Robot kinematics and dynamics  
3.3. Control  
3.4. Visual Servoing  
3.5. Planning and Navigation  

**Related activities:**
P1: ROS - Detecting the object poses using the ArUcO library I  
P2: ROS - Detecting the object poses using the ArUcO library II  
P3: Advanced teleoperation with the UR3 robot  

**Full-or-part-time:** 24h  
Theory classes: 12h  
Self study: 12h

## GRADING SYSTEM

Final assessment = (Practicals + Tutorial deliverables + Final Exam)/3  
Re-evaluation = A new final work and final exam will substitute the corresponding marks.
BIBLIOGRAPHY

Basic: