The course wants to introduce students to theoretical and practical aspects of the industrial robotics, with special emphasis on the manipulating robots.

Students should after this course know different applications of robotic systems as well as to be able to describe mechanical robotic structures and systems. They should also be familiar with the involved mathematics and with the simple robot control systems.

Learning objectives of the subject

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Students should after this course know different applications of robotic systems as well as to be able to describe mechanical robotic structures and systems. They should also be familiar with the involved mathematics and with the simple robot control systems.
The main objective of the course is to provide students with the skills and the needed knowledge to use industrial robots in their future professional performance.

### Study load

<table>
<thead>
<tr>
<th>Total learning time: 75h</th>
<th>Hours large group: 30h</th>
<th>40.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours medium group: 0h</td>
<td>0.00%</td>
</tr>
<tr>
<td></td>
<td>Hours small group: 0h</td>
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<tr>
<td></td>
<td>Guided activities: 0h</td>
<td>0.00%</td>
</tr>
<tr>
<td></td>
<td>Self study: 45h</td>
<td>60.00%</td>
</tr>
</tbody>
</table>
## Content

### Module 1: Introduction

**Description:**
1. Brief history
2. Classification of robots
3. Elements of robots, joints, links, actuators, and sensors

**Learning time:** 7h 30m
- Theory classes: 3h
- Self study: 4h 30m

### Module 2: Some involved mathematics

**Description:**
4. Position and orientation of a rigid body
5. Homogeneous transformations
6. Introduction to D-H parameters and its physical significance, orientation of Gripper
7. Direct and inverse kinematics serial robots
8. Examples of kinematics of common serial manipulators.

**Learning time:** 15h
- Theory classes: 6h
- Self study: 9h

### Module 3: Principles of Robot Control

**Description:**
10. Calculation of a link velocity and acceleration.
11. Calculation of reactions forces.
12. Trajectory-following control.

**Learning time:** 12h 30m
- Theory classes: 5h
- Self study: 7h 30m
Module 4: Robot Programming

**Description:**
13. Robot programming methods
14. Robot programming languages
15. Requirements of a programming robots system
   - Flow Control
   - Task Control

**Related activities:**
To program a robot in order to robotize a proposed industrial task included in an automated production system.

Module 5: System integration and robotic applications

**Description:**
17. Robotic applications.

Qualification system

- Final Exam (written and individual): 45%
- Lab work (in groups): 30%
- Deliverable exercises: 25%

All those students who can not attend the partial exam, or if you want to improve your result, you will have the option to recover it through an additional written test that will be made the same day fixed for the final examination. The qualification of this test Conversion will be between 0 and 10, and replace the partial exam as long as it is superior.
Bibliography

Basic:


Complementary:
