

## Perception and Manipulation

**Credits: 4 Semester 3 UJI Compulsory: Yes**

<b>Format</b>	Lectures 20 h	Examples 10 h	Private study 85 h
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**Lectures: P. J. Sanz**

This course is an indispensable piece of connection between robotic systems and the real world, where physical interaction is crucial. The way we interact with the universe surrounding a robot, is strongly influenced by the ability of perception of the environment implemented in it. Thus, during the physical interaction related to the ability to manipulate their environment, the robot may incorporate more robust and efficient resources to the extent that it is capable to combine different types of sensory information from different perceptual channels. We show that the combination of vision, force / torque and tactile feedback, is a powerful mechanism to attack complex problems of robotics, handling impossible to solve properly this multi-sensorial without cooperation.

### Contents:

The following subjects will be treated:

- Introduction to Artificial Perception.
- Perception-Action Integration.
- Gripping and Handling Robotics.
- Autonomous vs. teleoperated manipulation.
- Introducing Learning Tasks grip.
- Sensory Fusion Technical Information in the Context of Robotic Grasp.
- Case Study-1: Jaume, the Robot Assistant UJI.
- Case Study-2: Towards Autonomous Intervention Underwater Robotics.

### Objectives

- Train to solve real problems of perception-based robotic manipulation for dynamic unstructured environments.
- Facilitate and promote the development of programming robots to task level.
- Instruct both on remote-as autonomous systems.
- Improving all aspects of sensory and motor integration, considering also the inspiration in biological systems.

**Assessment:** 20% continuous assessment, 80% from end of semester examination.

**Practical Work:** laboratory

### Recommended texts:

- RR Murphy. "Introduction to AI *Robotics*." MIT Press, 2000.
- RC Arkin. "Behavior-Based *Robotics*." MIT Press, 1998.
- MT Mason and JK Salisbury. "Robot Hands and the Mechanics of *Manipulation*." MIT Press, 1985.
- Murray RM, Z. Li & SS Sastry. "A Mathematical Introduction to Robotic *Manipulation*." CRC Press, 1994.
- JA Franklin, TM Mitchell & S. Thrun (ed.). "Recent Advances in Robot Learning". Kluwer Academic Publishers, 1996.

### Further readings:

will be provided by the lecturer