Universidad Zaragoza

**Academic Year/course: 2023/24**

# 30261 - Robotics

## Syllabus Information

**Academic year:** 2023/24
**Subject:** 30261 - Robotics
**Faculty / School:** 110 - Escuela de Ingeniería y Arquitectura
**Degree:** 439 - Bachelor's Degree in Informatics Engineering
**ECTS:** 6.0
**Year:** 4
**Semester:** Second semester
**Subject type:**
**Module:**

## 1. General information

The first objective is for the student to learn the basic techniques used in the development and applications of autonomous robots. The second objective is for the student to acquire the skills to carry out a robotics project, individually and in teams, designing a robot and providing it with intelligent decision-making capabilities. The Sustainable Development Goals are: Goal 3, target 3.6; Goal 9, targets 9.4 and 9.5; Goal 11, target 11.2.

It is a subject of integration of various techniques learned in different subjects of the degree (Introduction to Computers, Programming I and II, Operating Systems, Concurrent and Distributed Systems Programming, Artificial Intelligence) and other specific techniques learned in the subject itself.

## 2. Learning results

The results are:

- Learn about the fundamentals, principles and applications of autonomous intelligent robots.
- Understand the techniques of perception in robotics and their practical application.
- Apply path planning and navigation techniques in simple environments.
- Implement map building and robot localization functions.
- Select the type of robot software architecture best suited for an application.
- Be able to develop simple practical applications of intelligent robotics.

## 3. Syllabus

The contents to be developed are the following:

1. Introduction
2. Mobile robots
3. Spatial location
4. Kinematic modeling
5. Odometry
6. Concurrent processes and robot programming
7. Motion control
8. Computer Vision in Robotics
9. Navigation planning
10. Location and maps
11. Perception systems

The following practices will be carried out:

1. Robot design, implementation of sensors and actuators, introduction to the robot programming environment
2. Calibration and programming of basic functions. Generation of trajectories and movements
3. Vision-based object tracking
4. Planning and obstacle avoidance
5. Integration of software modules and hardware tuning
6. Application to the specific task of the competition

## 4. Academic activities

**Lectures:** sessions with the teacher in which the subject matter will be explained: 26 hours

**Problems and cases:** sessions to solve practical cases presented by the teacher: 4 hours

**Laboratory practice:** practical sessions in the laboratory: 18 hours

**Study of the subject, works:** 96 hours

**Assessment tests.** 6 hours

## 5. Assessment system

- **Laboratory Practices** (30% of the grade, minimum 5 out of 10).

- **Assignments and Assessable Activities** (70% of the grade, minimum 5 out of 10).

Practical group work, individual theoretical and practical exercises, oral presentations of the exercises and work, tests during the theoretical classes, and development of optional modules related to the practical work.
The student who does not submit the results on the dates established during the teaching period and does not achieve a minimum grade in each part will have to pass the corresponding subject in the Global Exams to be taken in the Official Calls.

- **Global test** (official examinations, 100% of the grade, minimum 5 out of 10).

It will be held only on the second call. It will have two parts:

1. **Laboratory practicals** (L, 30%, minimum 5 out of 10). Completion of one or more practices of the subject.
2. **Practical group work and delivery of Assignments and Evaluable Activities** (T, 70%, minimum 5 out of 10). Presentation of the practical work proposed in the term and one or more of the other evaluable activities.

**Final grade:** 0.3*L+0.7*T , if the 2 parts are passed, or the higher of the marks not passed otherwise.