

Academic Year/course: 2022/23

29843 - Autonomous Robots

Syllabus Information

Academic Year: 2022/23

Subject: 29843 - Autonomous Robots

Faculty / School: 110 - Escuela de Ingeniería y Arquitectura

Degree: 440 - Bachelor's Degree in Electronic and Automatic Engineering

ECTS: 6.0

Year: 4

Semester: First semester

Subject Type: Optional

Module:

1. General information

2. Learning goals

3. Assessment (1st and 2nd call)

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

The methodology followed in this course is oriented towards the achievement of the learning objectives. A wide range of teaching and learning tasks are implemented, such as: lectures, problems and practices, with increasing level of student participation.

- In the lectures, the teachers will present the theoretical bases of autonomous robots, illustrated with examples.
- In the classes of problems, the students will develop problems and exercises stated.
- Tests for monitoring the student learning at the end of each block of topics will be held.
- Practices will be developed in small groups where students will develop their robot and the software for controlling the robot.

4.2. Learning tasks

The program offered to help you achieve the expected results includes the following activities:

Classwork: 1.92 ECTS (48 hours)

1) On-site class (type T1) (26 hours).

Lectures of theoretical and practical content. The concepts and fundamentals of autonomous robots are presented, illustrated with real examples. Student participation through questions, exercises and brief discussions will be encouraged.

2) Classes of problems and resolution of cases (type T2) (4 hours).

Exercises and case studies involving students, coordinated at all times with the theoretical contents will be developed. Students are encouraged to work on the problems previously. Some of these hours may engage in learning activities assessable as specified in each course.

3) Lab (type T3) (18 hours).

Non-contact work: 4.08 ECTS (102 hours)

4) Practical works (T6 type) (36 hours).

Activities that the student will perform in groups and that the teacher will propose throughout the teaching period. In this course, each student will perform practical work in groups, and several evaluable activities.

5) Study (type T7) (60 hours).

Personal work of the student theoretical part, conducting exercises, preparation of oral presentations, and development of practical group work. The ongoing work of the student will be encouraged by the homogeneous distribution throughout the semester of the various learning activities. This includes tutorials, as direct student care, identification of learning problems, orientation in the subject, and in proposed exercises.

6) Evaluation tests (T8) (6 hours).

In addition to the qualifying function, evaluation by means of tests is also a learning tool with which the student checks the degree of understanding and assimilation reached.

4.3. Syllabus

The course will address the following topics:

Programme

1. Introduction
2. Mobile robots
3. Spatial localization
4. Kinematic modelling
5. Odometry
6. Concurrent programming robots and processes
7. Motion control
8. Motion control using range sensors
9. Sensing systems
10. Planning and navigation
11. Localization and maps
12. Robotic Projects

Laboratory practices:

1. Robot design, implementation of sensors and actuators, introduction to the robot programming environment
2. Calibration and programming of basic functions. Trajectory generation and movements
3. Wall following using range sensors (sonar).
4. Planning and obstacle avoidance
5. Integration of software modules and hardware tuning.
6. Preparation for competition. application of the developed methods and software for robot navigation in a complex scenario. The efficiency and quality of the proposed solutions will be taken into account.

4.4. Course planning and calendar

Scheduling of sessions and presentation of works.

- Lectures and problem classes and practice sessions are held according to scheduling established by the center (schedules available on their website).
- Each teacher will inform its hours of tutoring.
- The other activities will be planned depending on the number of students and will be announced in time. It will be available on <http://moodle.unizar.es>