

## 29843 - Autonomous Robots

### Información del Plan Docente

<b>Academic Year</b>	2016/17
<b>Academic center</b>	110 - Escuela de Ingeniería y Arquitectura
<b>Degree</b>	440 - Bachelor's Degree in Electronic and Automatic Engineering
<b>ECTS</b>	6.0
<b>Course</b>	4
<b>Period</b>	First semester
<b>Subject Type</b>	Optional
<b>Module</b>	---

### 1. Basic info

#### 1.1. Recommendations to take this course

#### 1.2. Activities and key dates for the course

### 2. Initiation

#### 2.1. Learning outcomes that define the subject

#### 2.2. Introduction

### 3. Context and competences

#### 3.1. Goals

#### 3.2. Context and meaning of the subject in the degree

#### 3.3. Competences

#### 3.4. Importance of learning outcomes

### 4. Evaluation

### 5. Activities and resources

#### 5.1. General methodological presentation

The learning process that is designed for this subject is based on the following:

The teaching process will involve three main activities: theoretical classes, problems and laboratory practices, with increasing level of student participation.

- In the theoretical classes the teachers will present the theoretical bases autonomous robots, illustrated with

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examples.

- In the classes of problems the students will develop problems and exercises previously stated.
- Tests for monitoring the student learning at the end of each block of topics will be held.
- Lab practices will be developed in small groups where students will develop their robot and the software for controlling the robot.

### 5.2.Learning activities

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

#### **Class work: 2.4 ECTS (60 hours)**

##### **1) Presential class (type T1) (30 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) (12 hours).**

Exercises and case studies involving students, coordinated at all times with the theoretical contents will be developed. Students are encouraged to work 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: 3.6 ECTS (90 hours)**

##### **4) Practical works (T6 type) (50 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) (35 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 a direct student care, identification of learning problems, orientation in the subject, and in proposed exercises. exercises.

##### **6) Evaluation tests (T8) (5 hours).**

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

### 5.3.Program

#### Programme

1. Introduction
2. Mobile robots
3. Spatial ocalization
4. Kinematic modeling
5. Odometry
6. Concurrent programming robots and processes
7. Motion control
8. Motion control usisng 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. Toolpath generation and movements
3. Wall following using range sensors (sonar)
4. Planning and obstacle avoidance
5. Integration of software modules and hardware tuning

### 5.4.Planning and scheduling

#### Scheduling of sessions and presentation of works.

- Lectures and problem classes and practice sessions are held in the laboratory 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>

### 5.5.Bibliography and recomended resources