COURSE DATA

DATA SUBJECT

Code: 36901
Name: Mobile Robotics
Cycle: Undergraduate Studies
ECTS Credits: 6
Academic year: 2025-26

STUDY (S)

Degree	Center	Acad. year	Period
1404 - Degree in Industrial Electronic Engineering	Escola Tècnica Superior d'Enginyeria	4	First quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1404 - Degree in Industrial Electronic Engineering		

COORDINATION

GIRBES JUAN VICENT

SUMMARY

The Mobile Robotics course is part of the elective courses for the Bachelor's Degree in Industrial Electronic Engineering. It consists of a total of 6 ECTS credits and is taught during the first four months of the fourth year of the degree. Its main objective is to introduce mobile robots as autonomous agents capable of navigating through different environments to perform tasks. It also introduces the main concepts of the field (sensors, actuators, algorithms, etc.) and teaches the mathematical foundations and basic techniques for modeling, simulation, planning, and control in mobile robotics and autonomous navigation applications.

The course has a mixed theoretical and experimental nature, so practical content is complemented by theoretical content. To this end, various projects are carried out to acquire knowledge and familiarize students with different types of tools, procedures, and methodologies used in the field.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

There are no specified enrollment restrictions with other subjects of the curriculum.

OTHER REQUIREMENTS

To successfully complete this course, it is recommended that students possess prior knowledge, both theoretical and practical, taught in the subjects of Mathematics, Physics, Dynamics and Control, and Digital Control.

COMPETENCES / LEARNING OUTCOMES

DESCRIPTION OF CONTENTS

1. Robotic Systems Modeling

1.1 Introduction

1.2 Kinematic Modeling of Robots

1.3 Dynamic Modeling of Robots

1.4 Simulation of Robotic Systems

1.5 Problems

2. Sensors and Actuators in Robotics

2.1 Introduction

2.2 Sensors

2.2.1 Proprioceptive Sensors

2.2.3 Exteroceptive Sensors

2.3 Actuators

2.3.1 Linear Actuators

2.3.2 Rotary Actuators

2.4 Problems

3. Control of Robotic Systems

3.1 Kinematic vs. Dynamic Control

3.2 Path-Following Control

3.3 Path-Following Control

3.4 Other Control Methods

3.5 Problems

4. Autonomous Navigation

4.1 Introduction

4.2 Localization

4.2 Mapping

4.3 Planning

4.3.1 Global Planning

4.3.2 Local Planning

4.4 Problems

5. Lab Practices

Session 1: Introduction to Modeling and Simulation of Mobile Robots (Part 1)

Session 2: Introduction to Modeling and Simulation of Mobile Robots (Part 2)

Session 3: Kinematic Control of Mobile Robots (Part 1)

Session 4: Kinematic Control of Mobile Robots (Part 2)

Session 5: Autonomous Navigation of Mobile Robots (Part 1)

Session 6: Autonomous Navigation of Mobile Robots (Part 2)

Session 7: Lab Exam

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Theory	40,00
Laboratory	20,00
Total hours	**60,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	40,00
Independent study and work	0,00
Preparation of lessons	30,00
Preparation for assessment activities	20,00
Resolution of case studies	0,00
Total hours	**90,00**

TEACHING METHODOLOGY

THEORY CLASSES: Theory classes will be taught in a lecture-based format. The professor will ask relevant questions before class to determine the level of knowledge students have acquired through the prior preparation work for each topic. Students will have access to teaching materials related to the course content (slides, articles, web addresses, references for further information, etc.) through the Virtual Classroom, an application developed by the Universitat de València that provides easy and guided access to different types of teaching and/or administrative resources.

PROBLEM-SETTING CLASSES: Problem-setting classes will be taught in the theory classroom. Problem-

setting classes will address some of the most significant problems included in the course's problem-setting sheets. As with the theory classes, students will have access to all problem-setting teaching materials in the Virtual Classroom.

LABORATORY CLASSES: Laboratory classes will be taught in the Center's laboratories. The teacher will assess the students' knowledge and understanding of the practice. This assessment will be conducted using a computer.

EVALUATION

The assessment will be carried out as follows:

1. (T) A written test will be taken on the dates indicated in the official calendar. The exam will consist of various theoretical and practical questions related to the syllabus content, and will be of a similar difficulty to the questions and problems addressed in class.
2. (L) The practical sessions will be assessed by solving a practical case study in the laboratory.
3. (P) A presentation of a project for the design of a mobile robot and the development of an autonomous navigation application.

The final grade will be calculated using the following equation:

GRADE = (T + L + P) / 3

To be graded, a minimum grade of 4 must be achieved in each section.

To pass the course, students must obtain a final grade of 5 or higher.

Clearly copying or plagiarizing any activity included in the assessment will result in the inability to pass the course. Students will then be subject to the appropriate disciplinary procedures outlined in the PROTOCOL FOR DEALING WITH FRAUDULENT PRACTICES AT THE UNIVERSITY OF VALENCIA (ACGUV 123/2020).

In any case, the assessment system will be governed by the University of Valencia's Assessment and Grading Regulations for Bachelor's and Master's Degrees (https://webges.uv.es/uvTaeWeb/MuestraInformacionEdictoPublicoFrontAction.do?accion=inicio&idEdictoSeleccionado=5639).

REFERENCES

- Lynch, Kevin M. and Park, Frank C. (2017). Modern Robotics: Mechanics, Planning, and Control. Cambridge University Press.
- Siciliano, B., Khatib, O. (2016). Handbook of Robotics. Springer.
- Siegwart, R., Nourbakhsh, I. R., Scaramuzza, D. (2011). Introduction to autonomous mobile robots. MIT press.