UAB
Universitat Autònoma de Barcelona

Intelligent Robots

Code: 106589
ECTS Credits: 6

2025/2026

Degree	Type	Year
Artificial Intelligence	OB	3

Contact

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Teachers

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Teaching groups languages

You can view this information at the end of this document.

Prerequisites

For a full understanding of the contents of the subject, it is necessary to have basic skills in programming and a good mathematical foundation. For this, you must have passed Fundamentals of Programming II and Fundamentals of Mathematics I and II. You must also understand how computational systems are organized to carry out their functions and, for this, you must have taken Fundamentals of Computing.

Objectives and Contextualisation

Robotics is the part of Engineering that applies to the development of robots, that is, machines with the ability to interact with their environment. The complexity of this interaction depends not only on the number of elements they include to act in their environment (actuators) but also on the information they can extract from the elements they use to perceive it (sensors).

Robots are intelligent depending on their ability to take advantage of information from their environment and their own experience to decide their future actions.

Depending on the actuators, a distinction can be made between manipulator robots (arms) and mobile robots (vehicles) whose development is different because they have equally different functionalities.

With this subject, students are expected to achieve the following objectives:

- Learn about the use of service robots in industry and logistics.
- Have notions of the development process of robot manipulators and robotic vehicles.
- Acquire practical skills in the development of basic manipulators and mobile robots.
- Knowing how to integrate robots into larger applications.

Competences

- Act within the field of knowledge by evaluating the social, economic and environmental impact beforehand.
- Analyse and solve problems effectively, generating innovative and creative proposals to achieve objectives.
- Conceive, design, analyse and implement autonomous cyber-physical agents and systems capable of interacting with other agents and/or people in open environments, taking into account collective demands and needs.
- Conceptualize and model alternatives of complex solutions to problems of application of artificial intelligence in different fields and create prototypes that demonstrate the validity of the proposed system.
- Identify, analyse and evaluate the ethical and social impact, the human and cultural context, and the legal implications of the development of artificial intelligence and data manipulation applications in different fields.
- Students can apply the knowledge to their own work or vocation in a professional manner and have the powers generally demonstrated by preparing and defending arguments and solving problems within their area of study.
- Work cooperatively to achieve common objectives, assuming own responsibility and respecting the role of the different members of the team.

Learning Outcomes

1. Analyse and solve problems effectively, generating innovative and creative proposals to achieve objectives.
2. Design, prototype and evaluate task-specific and environment-specific intelligent robotics systems.
3. Identify the best solutions for designing intelligent robots specialised in tasks in specific environments.
4. Identify the ethical and social impact and legal implications intelligent robotics systems have in their field of application.
5. Identify the social, economic and environmental implications of academic and professional activities for the field of knowledge.
6. Students can apply the knowledge to their own work or vocation in a professional manner and have the powers generally demonstrated by preparing and defending arguments and solving problems within their area of study.
7. Work cooperatively to achieve common objectives, assuming own responsibility and respecting the role of the different members of the team.

Content

- Introduction to robotics.
- Kinematic models of robots.
- Robot control software design.
- Robot programming.

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes

Type: Directed			
Class: Active participation in the discussions arising from the presentation of content or the proposed solutions to problems	38	1.52	1, 5, 3, 4
Practices: Development of projects in the laboratory	12	0.48	1, 2, 6, 7
Type: Supervised			
Practices: Monitoring the execution of laboratory projects	6	0.24	1, 2, 6, 7
Tutoring: Follow-up of issues arising in class	2	0.08	1, 5, 3, 4
Type: Autonomous			
Practices: Development of projects and preparation of reports	24	0.96	1, 2, 6, 7
Problems: Solving problems	24	0.96	1, 2, 6
Theory: Study	22	0.88	5, 3, 4

Teaching is structured around the following activities:

- Classroom classes: Presentation of knowledge and discussion of solutions to problems both those proposed in the same classes and those that arose during the practice.
- Laboratory practices: Teamwork sessions, all following a script and supervised by a teacher. Each session will cover a specific aspect of robot design and programming.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Assessment

Continous Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Continuous assessment assignments	25%	10	0.4	1, 2, 5, 3, 4, 6
Final exam	25%	2	0.08	1, 2, 3
Laboratory (6)	25%	6	0.24	5, 4, 6, 7
Make-up exam	50%	2	0.08	1, 2, 3
Midterm exam	25%	2	0.08	1, 2, 3

a) Procedure and assessment activities' plan

The assessment is continuous with specific activities (exams and assignments) throughout the course. These assessment activities generate a series of grades that determine the final grade.

The calculation of the final grade *n* follows the following expression:

$$n = x \cdot 50\% + p \cdot 25\% + c \cdot 25\%$$

where x is the grade for the exams; p, that for the laboratory project, and c, that for the continuous assessment.

If $x < 5$ or $p < 5$, the final grade n is, at most, a 4.5. In other words, the average of the exams and the project must be passed separately.

Exam grade x is the average of the midterm exam and the final exam.

Project grade p is obtained from the weighted average of the grades corresponding to each lab session. Six are planned. In case of non-attendance, the absent person will receive a 0 as the grade for the corresponding session.

Continuous assessment grade c is obtained from a weighted average of the problem-solving assignments completed throughout the course. There is no minimum and, therefore, the course can be passed with $c = 0$ as long as $x \cdot 50\% + p \cdot 25\% \geq 5$.

b) Assessment activities schedule

The dates of all face-to-face activities, including assessment activities, and submission deadlines will be published on the virtual campus (CV) and may be subject to possible changes in programming for reasons of adaptation to possible incidents: they will always be previously informed through the CV since it is the usual mechanism for exchanging information between teachers and students outside the classroom.

c) Re-assessment procedure

In accordance with the coordination of the Degree and the deanship of the School of Engineering, the following activities are not recoverable:

- Project, 25% of the final grade

- Continuous assessment, 25% of the final grade

The average grade of the exams can be recovered with a specific make-up exam.

d) Assessment review procedure

Assessment activities can be reviewed any time after corresponding grades are published and before the deadline for the revision of the final exam.

Should the change of a grade be agreed upon, that grade may not be modified in a later review.

No reviews will be done after the closure of the reviews of the final exam, but for the make-up exam.

e) Grading

A "non-assessable" grade is assigned to students that have not participated in any assessment activity. In any other case, not participating in an assessment activity scores 0 in the weighted average computation.

Honors will be awarded to those who obtain grades greater than or equal to 9.0 in each part, up to 5% of those enrolled in descending order of final grades. They may also be granted in other cases if they do not exceed 5% and the final grade is equal to or greater than 9.0.

f) Irregularities, copies and plagiarism

Copies are evidence that the work or the examination has been done in part or in full without the author's intellectual contribution. This definition also includes attempts to copy in exams and reports, and violations of the norms that ensure intellectual authorship. Plagiarisms refer to the works and texts of other authors that are passed on as their own. They are a crime against intellectual property. To avoid plagiarism, quote the sources you use when writing the corresponding work reports or examinations.

In accordance with the UAB regulations, copies or plagiarisms or any attempt to alter the assessment result, for oneself or for others, like e.g. letting other copy, imply a final grade for the corresponding part (exam, continuous assessment or project) of 0 in the computation of the final score and failing the course. This does not limit the right to act against perpetrators, both in the academic field and in the criminal.

The use of Artificial Intelligence (AI) technologies as an integral part of the development of the work is permitted, but not recommended, provided that the result reflects a significant contribution by the student in the analysis and personal reflection. The student must clearly identify which parts have been generated with this technology, specify the tools used and include a critical reflection on how they have influenced the process and the result of the activity. The lack of transparency in the use of AI is considered a lack of academic honesty and entails a penalty in the grade of the activity, or greater sanctions in serious cases.

g) Assessment of repeaters

There is no differentiated treatment for repeaters, but they can take advantage of their own material from the previous year provided it is informed in the corresponding reports.

h) Single assessment

This course does not have a single assessment procedure.

Bibliography

- J.J. Graig (2005) *Introduction to Robotics: Mechanics and Control*. Pearson Education International.
- R. Siegwart, I.R. Nourbaksh (2004) *Introduction to Autonomous Mobile Robots*. The MIT Press.

Software

- CoppeliaSim, EDU Version, Coppelia Robotics [https://www.coppeliarobotics.com/]
- ZeroBrane Studio, ZeroBrane [https://studio.zerobrane.com/]
- Draw.io, diagrams.net [https://app.diagrams.net/]

Groups and Languages

Please note that this information is provisional until 30 November 2025. You can check it through this link. To consult the language you will need to enter the CODE of the subject.

Name	Group	Language	Semester	Turn
(PAUL) Classroom practices	711	English	first semester	afternoon
(PLAB) Practical laboratories	711	English	first semester	afternoon
(PLAB) Practical laboratories	712	English	first semester	afternoon
(TE) Theory	71	English	first semester	afternoon