Course guide
340621 - ROVI - Robotics and Vision

Last modified: 19/05/2026

Unit in charge: Vilanova i la Geltrú School of Engineering
Teaching unit: 707 - ESAII - Department of Automatic Control.

Degree: MASTER'S DEGREE IN AUTOMATIC SYSTEMS AND INDUSTRIAL ELECTRONICS (Syllabus 2012). (Optional subject).

Academic year: 2026 **ECTS Credits:** 5.0 **Languages:** Spanish

LECTURER

Coordinating lecturer: LUIS MIGUEL MUÑOZ MORGADO

Others: Primer quadrimestre:
LUIS MIGUEL MUÑOZ MORGADO - R30G1

PRIOR SKILLS

Previous knowledge on programming, control theory and automation

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Transversal:
1. TEAMWORK. Being able to work as a team player, either as a member or as a leader. Contributing to projects pragmatically and responsibly, by reaching commitments in accordance to the resources that are available.
2. EFFECTIVE USE OF INFORMATION RESOURCES. Managing the acquisition, structure, analysis and display of information from the own field of specialization. Taking a critical stance with regard to the results obtained.

TEACHING METHODOLOGY

Master classes, and participative Active Learning, Learning and Projects based problems, and case study.

LEARNING OBJECTIVES OF THE SUBJECT

Understand the fundamentals of mathematical models of the robots
Understand the fundamentals of machine vision systems
Learning to program applications of computer vision
Learning to program robots and teleoperation tasks with robot manipulators
Learn the techniques associated with mobile robots and its applications

STUDY LOAD

Type	Hours	Percentage
Hours large group	30,0	22.22
Hours small group	15,0	11.11
Self study	90,0	66.67

Total learning time: 135 h

CONTENTS

(ENG) -Mathematics of vision and robotics

Description:
(ENG) Spatial Transformations
Quaternions
Kinematics models

Specific objectives:
(ENG) Knowing the mathematical tools necessary for the disciplines of robotics and vision.

Related activities:
(ENG) MP1, MP2, PR1, PR2, A1

Full-or-part-time: 6h
Theory classes: 6h

(ENG) -Visió per ordinador

Description:
(ENG) Introduction to computer vision
Image acquisition and processing
Segmentation and recognition
Deep Learning

Specific objectives:
(ENG) Learn the fundamentals of computer vision systems and the techniques applied to robotics.

Related activities:
(ENG) MP1, MP2, PR4, A1

Full-or-part-time: 6h
Theory classes: 6h

(ENG) -Interaction and Teleoperation

Description:
(ENG) Man-Machine interaction
Teleoperation
Programming by demonstration
Vistual and augmented reality

Specific objectives:
(ENG) Aprendre els fonaments dels sistemes d'interacció persona-màquina i la Teleoperació

Related activities:
(ENG) MP1, MP2, PR5, A1

Full-or-part-time: 4h
Theory classes: 4h

(ENG) -Autonomous Robots

Description:
(ENG) Wheeled mobile robots
Walking robots
Plannning
Social robots

Specific objectives:
(ENG) Learn the basics of mobile robots and autonomous planning techniques.

Related activities:
(ENG) MP1, PR3, A1

Full-or-part-time: 4h 30m
Theory classes: 4h 30m

(ENG) -Miniproject

Description:
(ENG) Mini-project to choose
-MP1: Autonomous navigation of a mobile robot
Description:
Develop an application so that a mobile robot can navigate autonomously in an unknown environment using its sensors and actuators to carry out a previously defined task.
-MP2: Vision-guided robotic manipulation
Description:
Develop an application so that an industrial robot can perform a part manipulation task automatically with the help of computer vision.

Full-or-part-time: 12h 30m
Laboratory classes: 12h 30m

(ENG) -Laboratory practices

Description:
(ENG)
PR1: Practice 1: Coordinate Transformations
PR2: Practice 2: Manipulator Kinematics
PR3: Practice 3: Mobile Robots
PR4: Practice 4: Vision
PR5: Practice 5: Human-Robot Interaction

Full-or-part-time: 10h
Theory classes: 10h

ACTIVITIES

-Activity A1

Description:
Oral presentation of a theoretical/practical topic of your choice

Full-or-part-time: 2h
Theory classes: 2h

GRADING SYSTEM

The final qualification is:
NF = 0,3XEx + + 0,1XPresentation + 0,6XTeam Group
re-evaluation of the individual test

BIBLIOGRAPHY

Basic:
- K.S. Fu, K.S.; Gonzalez, R.C.; Lee, C.S.G. Robótica: control, detección, visión e inteligencia. Madrid: McGraw-Hill, 1988. ISBN 8476152140.
- Springer handbook of robotics [on line]. 2nd ed. Cham: Springer International Publishing, 2016 [Consultation: 28/04/2022]. Available on: https://link.springer.com/book/10.1007/978-3-319-32552-1. ISBN 9783319325521.
- Craig, John J. Introduction to robotics: mechanics and control [on line]. 3rd ed. Essex: Pearson Education, 2014 [Consultation: 14/02/2024]. Available on: https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?pq-origsite=primo&docID=5174674. ISBN 9781292040042.
- Gómez de Gabriel, Jesús Manuel [et al.]. Teleoperación y telerrobótica. Madrid [etc.]: Pearson Education, 2006. ISBN 9788483222966.
- Ollero Baturone, Aníbal. Robótica: manipuladores y robots móviles. Barcelona: Marcombo Boixareu, 2005. ISBN 8426713130.
- Escalera Hueso, Arturo de la. Visión por computador: fundamentos y métodos. Madrid [etc.]: Prentice Hall, 2001.

Complementary:
- Davies, E. R. Computer & machine vision : theory, algorithms, practicalities [on line]. 4th ed. Oxford: Elsevier, 2012 [Consultation: 14/02/2024]. Available on: https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?pq-origsite=primo&docID=872584. ISBN 9780123869081.