Course guide
295120 - 295II235 - Robotic Systems

Last modified: 08/08/2024

Unit in charge: Barcelona East School of Engineering
Teaching unit: 707 - ESAII - Department of Automatic Control.

Degree: MASTER'S DEGREE IN INTERDISCIPLINARY AND INNOVATIVE ENGINEERING (Syllabus 2019). (Optional subject).
ERASMUS MUNDUS MASTER IN SUSTAINABLE SYSTEMS ENGINEERING (EMSSE) (Syllabus 2024). (Optional subject).

Academic year: 2024 **ECTS Credits:** 6.0 **Languages:** English

LECTURER

Coordinating lecturer: EDMUNDO GUERRA PARADAS

Others: Primer quadrimestre:
ANTONI GRAU SALDES - Grup: T11, Grup: T12
EDMUNDO GUERRA PARADAS - Grup: T11, Grup: T12

PRIOR SKILLS

Basic knowledge about programming, automatic control systems and computer vision.

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
CEMUEII-14. Design and manage production processes that include quality control systems using advanced characterization techniques. (Specific competence of the Advanced Manufacturing Systems specialty).

Generical:
CGMUEII-01. Participate in technological innovation projects in multidisciplinary problems, applying mathematical, analytical, scientific, instrumental, technological and management knowledge.
CGMUEII-05. To communicate hypotheses, procedures and results to specialized and non-specialized audiences in a clear and unambiguous way, both orally and through reports and diagrams, in the context of the development of technical solutions for problems of an interdisciplinary nature.

Transversal:
05 TEQ. 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.
06 URI. 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.
03 TLG. THIRD LANGUAGE. Learning a third language, preferably English, to a degree of oral and written fluency that fits in with the future needs of the graduates of each course.

TEACHING METHODOLOGY

The course combines lectures (50%) with practical activities at laboratory (50%).

LEARNING OBJECTIVES OF THE SUBJECT

Have an overall knowledge of the current development of robotics.
Know the operation, programming and applications of industrial manipulator robots. Be able to program an industrial robot manipulator.
Know the operation of mobile robots and their applications in industrial environments.
Be able to simulate and optimize a productive process that integrates robots.

STUDY LOAD

Type	Hours	Percentage
Hours small group	21,0	14.00
Hours large group	21,0	14.00
Self study	108,0	72.00

Total learning time: 150 h

CONTENTS

Introduction.

Description:
Introduction to robotics. Robot types. Applications. Economic and social issues.

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

Robot manipulators.

Description:
Fundamental problems in robot manipulation. Types of robot manipulators. Sensors and actuators. Kinematics. Trajectory generation. Dynamics. Control. Programming.

Full-or-part-time: 18h
Theory classes: 8h
Laboratory classes: 10h

Mobile robots.

Description:
Fundamental probles in mobile robotics. Locomotion: wheeled, legged and aerial robots. Kynematics and dynamics for wheeled robots. Trajectory generation and tracking. Sensors. Localization. Navigation and planning.

Full-or-part-time: 16h
Theory classes: 8h
Laboratory classes: 8h

Simulation of robotized production systems.

Description:
Petri nets. Discrete systems simulation.

Full-or-part-time: 8h
Theory classes: 4h
Laboratory classes: 4h

Seminars on advanced robotics.

Description:
Advanced manipulation. Robot programming by demonstration. Human-computer interaction. Bio-inpired robots. Social robotics.

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

GRADING SYSTEM

The final course marks will be calculated from the evaluation of: practical activities carried out at the laboratory, homework and reports.

BIBLIOGRAPHY

Basic:
- Siciliano, Bruno [et al.]. Robotics : modelling, planning and control [on line]. London: Springer, cop. 2009 [Consultation: 14/04/2020]. Available on: http://dx.doi.org/10.1007/978-1-84628-642-1. ISBN 9781846286414.
- Siegwart, Roland [et al.]. Introduction to autonomous mobile robots [on line]. 2nd ed. Cambridge: MIT Press, cop. 2011 [Consultation: 14/04/2020]. Available on: https://ebookcentral.proquest.com/lib/upcatalunya-ebooks/detail.action?docID=3339191. ISBN 9780262015356.
- Banks, Jerry [et al.]. Discrete-event system simulation. 5th ed. Upper Saddle River, NJ: Prentice Hall, 2010. ISBN 9780138150372.

Complementary:
- Corke, Peter I. Robotics, vision and control : fundamental algorithms in MATLAB® [on line]. 2nd ed. Cham: Springer International Publishing : Imprint: Springer, 2017 [Consultation: 14/04/2020]. Available on: http://dx.doi.org/10.1007/978-3-319-54413-7. ISBN 978-3319544120.
- Siciliano, Bruno; Khatib, Oussama. Springer Handbook of Robotics [on line]. 2nd ed. Cham: Springer International Publishing, 2016 [Consultation: 14/04/2020]. Available on: http://dx.doi.org/10.1007/978-3-319-32552-1. ISBN 9783319325507.