Course guide
295902 - ISCA - Implementation of Automatic Control Systems

Last modified: 02/10/2025

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

Degree: BACHELOR'S DEGREE IN BIOMEDICAL ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR'S DEGREE IN CHEMICAL ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR'S DEGREE IN ENERGY ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR'S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR'S DEGREE IN MATERIALS ENGINEERING (Syllabus 2010). (Optional subject).

Academic year: 2025 **ECTS Credits:** 6.0 **Languages:** Catalan, Spanish, English

LECTURER

Coordinating lecturer:

Others:

PRIOR SKILLS

Basic knowledge of automatic control and programming.

TEACHING METHODOLOGY

ISCA is based on practical learning, through the development of a project that will be designed during the course.

This course studies Automatic Control and mechatronics at a practical level; theory is presented wherever necessary but is not emphasized. More emphasis is placed on physical understanding rather than on mathematical formalism. Several practical examples are discussed throughout the course; one of them forms the basis for a final project.

LEARNING OBJECTIVES OF THE SUBJECT

Mechatronics is an engineering discipline to study the synergistic combination of mechanical engineering, electronics engineering, control engineering, and computer engineering.

This course covers the fundamental areas of science and technology on which a mechatronics design is based. This includes mathematical modeling of complex dynamical systems, analysis of mathematical models using computer simulations, measurement systems (sensors and signal conditioners), actuators, continuous-time controller design and its real-time digital implementation, and networked control systems. The focus is on the role of each of these areas in the overall design process and how these key areas are integrated to form a successful mechatronics system design.

The instructional objectives are:
- To enable students understanding the modern mechatronics components.
- To present the underlying principles and alternatives for mechatronics systems design.
- To provide students with hands-on experience of mechatronics technology for diverse applications.
- To develop the student?s ability to evaluate appropriate technology and devise realistic industrial systems.

STUDY LOAD

Type	Hours	Percentage
Self study	90,0	60.00
Hours small group	45,0	30.00
Hours large group	15,0	10.00

Total learning time: 150 h

CONTENTS

1. Modeling of dynamic systems

Description:
Principles of Physical modelling. Parameters identification. Model simulation.

2. Control system design

Description:
Continuous-time controller design and its real-time digital implementation

3. Implementation of control algorithms in microcontrollers using MATLAB/Simulink

Description:
Implementation of control algorithms in microcontrollers of different technologies (Arduino, Raspberry Pi, etc.) using the MATLAB/Simulink programming environment

4. Introduction to automated guided vehicles

Description:
Introduction to automated guided vehicles: Structure and programming

GRADING SYSTEM

The final course mark is based on four evaluations:

1. Description and scope of the work (37,5%).
2. Development and evolution of the work during the course (37,5%).
3. Project Presentation (12,5%).
4. Technical report (12,5%).

According to the specific EEBE academic regulations, sections 2.2.b and 2.2.c, this subject is considered as continuous assessment methodology and, therefore, is not subject to reevaluation.

BIBLIOGRAPHY

Basic:
- Ljung, Lennart; Glad, Torkel. Modeling of dynamic systems. Englewood Cliffs: PTR Prentice Hall, 1994. ISBN 9780135970973.
- Nise, Norman S. Control systems engineering. 6th ed., international student version. Hoboken: John Wiley & Sons, cop. 2011. ISBN 9780470646120.
- MATLAB Embedded Coder. User's guide [on line]. Natick: The MathWorks, 2007 [Consultation: 27/08/2018]. Available on: https://rophoenixmakerevolution.files.wordpress.com/2015/09/eml_ug.pdf.
- Franklin, Gene F; Powell, J. David; Emami-Naeini, Abbas. Feedback control of dynamic systems. 5th ed. Upper Saddle River, New Jersey: Prentice Hall, cop. 2006. ISBN 9780135071816.
- MATLAB Coder. User's guide [on line]. Natick: The MathWorks, Inc, 2011 [Consultation: 29/05/2020]. Available on: https://www.mathworks.com/help/pdf_doc/coder/coder_ug.pdf.