Course guide
240IAU31 - 240IAU31 - Control Technology

Last modified: 16/05/2023

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

Degree: MASTER'S DEGREE IN INDUSTRIAL ENGINEERING (Syllabus 2014). (Optional subject).

Academic year: 2023 **ECTS Credits:** 4.5 **Languages:** Catalan, Spanish

LECTURER

Coordinating lecturer: Velasco Garcia, Manuel

Others:

TEACHING METHODOLOGY

concepts, encouraging the active participation of students.
In practical classes in the laboratory, the teacher will propose pre-projects that require the use of the knowledge gained in the field of control technology and for the actuators and sensors to design prototypes that have capacities as controlled systems.

LEARNING OBJECTIVES OF THE SUBJECT

Introduce the students to the techniques of analysis and design of feedback control systems that involve both the specification and use of sensors and actuators, and communication systems that link sensors, controllers and actuators.

Students will be able to apply the technologies of sensors, actuators and where appropriate communication systems in applications and examples of control systems. This includes the specification of the characteristics required for sensors, actuators and communication systems. Students will be able to use tools and methods of analysis and technology assessment of the sensors, actuators and communication systems for control. The student will be able to assess the difficulty of using the required technology for controlling certain plants and implementing the developed controllers.

STUDY LOAD

Type	Hours	Percentage
Self study	72,0	64.00
Hours small group	13,5	12.00
Hours large group	27,0	24.00

Total learning time: 112.5 h

CONTENTS

1. Introduction to the control systems technologies.

Description:
Technological evolution. Analog Control. Computer control. Elements of a control system. Sensors, actuators, controllers, interfaces. Communications systems and interconnections. To determine the actual structure of the components of the control systems in industrial applications and in other social settings. Knowing the technological, economic and security implementation of control systems.

Specific objectives:
To know the actual structure of the components of the control systems in industrial application and other social settings. To know the technological, economic and security implementing control systems limitations.

Full-or-part-time: 1h
Theory classes: 1h

2 Introduction to the plant of practice

Description:
We will develop the model of the plant and we will imulate it in continuous and discrete ways

Specific objectives:
To adquire deep knolwledge of dynamics of the plant we will use to practice

Full-or-part-time: 2h
Theory classes: 1h
Guided activities: 1h

3 Introduction to the microprocessor

Description:
ntroduction to the microprocessor that will be used to control the study plant. Its programming environment, its input-output capabilities, and available measurement conversions.

Specific objectives:
The aim is to provide the student with the necessary skills to carry out the implementation of the control loops that will be developed throughout the course.

Full-or-part-time: 2h
Theory classes: 1h
Guided activities: 1h

4 Practical implementation of control loops

Description:
n this section the practical implementation of the following control loops will be carried out:
- PID control
- Control in space of states
- Control in space of states with observer
- Sliding control
- Control designed with robust control techniques

Each of the implementations will be carried out with the corresponding continuous and discrete simulations in order to be able to carry out a comparison between the observed behaviors and the actual behaviors. Students must deduce the causes of the divergences between expected and actual behavior.

Specific objectives:
Correctly implement the following drivers:
- PID control
- Control in space of states
- Control in space of states with observer
- Sliding control
- Control designed with robust control techniques

Full-or-part-time: 10h
Theory classes: 3h
Guided activities: 7h

5 Dynamical system identification

Description:
To lear simple techniques to identify dynamical systems

Specific objectives:
The main objective is to model and identify the parameters of a DC motor. The dynamics are nonlinear and students must implement the necessary elements to carry out a linearization.

Full-or-part-time: 4h
Theory classes: 1h
Guided activities: 3h

6 Pràctical implementation of controllers on identified systems

Description:
Once the dynamic model has been identified, several control loops on the system will be closed in a practical way

Specific objectives:
Implement in a practical way the following drivers on the identified system:
- PID control
- Control in space of states
- Control in space of states with observer
- Sliding control
- Control designed with robust control techniques

Full-or-part-time: 6h
Guided activities: 6h

6 Remote monitorization

Description:
Methods of data transmission and representation for industry 4.0

Specific objectives:
Implement a remote management and remote monitoring system for one of the control plants.

Full-or-part-time: 8h
Theory classes: 2h
Guided activities: 6h

GRADING SYSTEM

The skills and abilities acquired will be assessed based on the assignments and questionnaires.
During the term of the 2020-2021 academic year, and as a result of the health crisis due to Covid19, the grading method will be:
Arithmetic mean of the tests and deliverable to Athena.
During the spring semester of the 2019-2020 academic year, and as a result of the health crisis due to Covid19, the qualification method will be:
Arithmetic mean of the tests and deliverable on athena.

EXAMINATION RULES.

The assessment tests will be carried out with all the written documentation (books and notes) that the students want to bring.