COURSE DATA

DATA SUBJECT

Code: 44287
Name: Industrial control systems
Cycle: Master's Degree
ECTS Credits: 2
Academic year: 2026-27

STUDY (S)

Degree	Center	Acad. year	Period

SUBJECT-MATTER

Degree	Subject-matter	Character

COORDINATION

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SUMMARY

This is an obligatory subject taught in the first semester of the Master Electronic Engineering. It weights 2 ECTS (European credits). The student dedication is estimated in 20 hours distributed in different theoretical and practical activities.

The subject "Control of Industrial Systems" aims to provide students with the necessary knowledge of the approach and resolution of multivariable control systems (MIMO). Throughout the course different practical problems will be presented that students must solve individually, gradually increasing their complexity. The designs obtained theoretically should be later verified by computer aided simulation. Specifically, the following contents will be the main basis of the course:

- Design of state space controllers
- Design of state space observers

The study and analysis of the theoretical concepts studied and their subsequent verification and implementation is a great interest subject, offering students the ability to solve complex control problems that can arise in companies and in any area of industry.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

There are no specified enrollment restrictions with other subjects of the curriculum.

OTHER REQUIREMENTS

Per al normal desenvolupament docent de l'assignatura és aconsellable que l'alumne tingui coneixements previs en matemàtiques i en sistemes de control clàssic.

COMPETENCES / LEARNING OUTCOMES

2199 -

Ability to specify, implement, document and set-up electronics, instrumentation and control equipment and systems, considering both technical aspects and the relevant regulatory requirements.

Capacidad para el modelado matemático, cálculo y simulación en todos los ámbitos relacionados con la Ingeniería Electrónica y campos multidisciplinares afines. En especial los de tratamiento de la señal, sistemas digitales y de comunicaciones y electrónica industrial.

Capacidad para proyectar, calcular y diseñar productos, procesos e instalaciones en todos los ámbitos de la Ingeniería Electrónica y en particular los de tratamiento de la señal, sistemas digitales y de comunicaciones y electrónica industrial.

Demostrar una comprensión sistemática de un campo de estudio y el dominio de las habilidades.

Diseñar un sistema, componente o proceso que cumpla unas especificaciones desde diferentes puntos de vista: electrónico, económico, social, ético y medioambiental.

Identificar, formular y resolver problemas de los sistemas electrónicos industriales.

Realizar un análisis crítico, evaluación y síntesis de ideas nuevas y complejas.

Ser capaz de fomentar, en contextos académicos y profesionales, el avance tecnológico, social o cultural dentro de una sociedad basada en el conocimiento.

Students should apply acquired knowledge to solve problems in unfamiliar contexts within their field of study, including multidisciplinary scenarios.

Students should be able to integrate knowledge and address the complexity of making informed judgments based on incomplete or limited information, including reflections on the social and ethical responsibilities associated with the application of their knowledge and judgments.

Students should communicate conclusions and underlying knowledge clearly and unambiguously to both specialized and non-specialized audiences.

Students should demonstrate self-directed learning skills for continued academic growth.

Take into account the economic and social context in engineering solutions, be aware of diversity and multiculturalism and ensure sustainability and respect for human rights and equality between men and women.

DESCRIPTION OF CONTENTS

1. Description of linear systems with state equations

1.1 Definition of state space equation
1.1.1 Continuous state space equation
1.1.2 Discrete state space equation
1.2 Solution of the state space equation
1.3 Stability of MIMO systems
1.4 Transfer Matrices
1.5 Discretization of continuous systems in the state space
1.6 Problems

2. Design of state space controllers

2.1 Introduction
2.1.1 State space feedback
2.1.2 Homogeneous feedback
2.2 Allocation of state feedback poles
2.2.1 Method of identifying coefficients
2.2.2 General method for pole assignment
2.3 Proportional control
2.3.1 Analog implementation
2.3.2 Digital implementation
2.4 Integral Control
2.4.1 Analog implementation
2.4.2 Digital implementation

3. Design of observers systems

3.1 Introduction
3.2 Complete observers
3.2.1 Analog implementation
3.2.2 Digital implementation
3.2.3 Analysis of the inner loop with complete observer
3.2.4 Principle of separation with complete observer

Session 1: Introduction
Session 2: Homogeneous control
Session 3: Proportional control

4. Laboratory practices

Session 1: Introduction
Session 2: Homogeneous controlSession 4: Integral control
Session 5: Homogeneous control with observer
Session 6: Proportional control with observer
Session 7: Integral control with observer

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Total hours	**0,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	0,00
Independent study and work	10,00
Preparation of lessons	10,00
Preparation for assessment activities	10,00
Resolution of case studies	0,00
Total hours	**30,00**

TEACHING METHODOLOGY

- THEORY CLASSES: Theory classes will be taught in masterfully way. Different questions will be proposed by the teacher to determinate the level of knowledge acquired by the students in the preparation work of each of the issues. Theory classes and problems will be in a classroom with computers. The student will have access to educational materials related to course content (slides, articles, web addresses, additional references, etc..), through the Virtual Classroom, an application developed by the University of Valencia which permits an easy access to different types of teaching resources and/or administrative.

- LABORATORY CLASSES: Laboratory classes will be taught in the laboratories of the Centre. The teacher will evaluate students on knowledge and understanding of the practice. This evaluation is carried out by PC.

EVALUATION

The evaluation of the subject will consist of a written test, with theoretical and practical questions, and laboratory.

REFERENCES

- Graham C. Goodwin, Stefan F. Graebe, Mario E. Salgado. Control System Design
- Sigurd Skogestad, Ian Postlethwaite. Multivariable Feedback Control: Analysis and Design