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340130 - ENCO-K6O07 - Control Engineering

Coordinating unit: 340 - EPSEVG - Vilanova i la Geltrú School of Engineering

Teaching unit: 707 - ESAII - Department of Automatic Control

Academic year: 2019

Degree: BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Teaching unit Optional)
BACHELOR'S DEGREE IN ELECTRONIC SYSTEMS ENGINEERING (Syllabus 2010). (Teaching unit Optional)
BACHELOR'S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2009). (Teaching unit Optional)

ECTS credits: 6 Teaching languages: Catalan, Spanish, English

Teaching staff

Coordinator: Pau Martí i Colom

Learning objectives of the subject

The subject â¿¿Engineering of Controlâ¿¿ tries:
- Standardization of knowledge of the first students in Control Engineering on the analysis of control systems in continuous time in the temporary domain and frequency as well as discrete time.
- To make the grade students in the technical analysis of control systems in space of states and their application in the process control for computers.
- To make the grade pupils in designing a digital automatic control system within an industrial environment based on initial specifications on any system.
- To make students aware of the environmental impacts arising from their performance in the design and improvement of systems of regulation and control

Study load

Total learning time: 150h	Hours large group:	15h	10.00%
	Hours medium group:	0h	0.00%
	Hours small group:	45h	30.00%
	Guided activities:	0h	0.00%
	Self study:	90h	60.00%

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Content

Automatic control in the space of states. Continuous systems

Learning time: 14h

Theory classes: 10h
Other activities: 1h
Self study (distance learning): 3h

Description:

Objectives

The specific objective of the subject is to show the possibility of using a state space to be able to define with the minimum necessary information the behaviour of a process, as well as to determine what possibilities exist to be able to control it and to observe it from the outside.

Contents

1. - Model of state.
2. - Methods of obtaining of the state model.
3. - Solution of the equation of state of linear systems.
4. - Controllability.
5. - Observability.

Activities, knowledge, abilities, aptitudes

The pupils will have to be able of:

- To describe the control systems in continuous time by the route of state variables.
- To solve equations of state for systems in continuous time.
- To formulate the representations external and internal in state variables.
- To determine the controlable subsystem inside a control system.
- To determine the not-observable subspace inside a control system.

Commentaries

The development of the subject can be followed through [Dom02].

A theoretical complement, as well as of exercises and examples], [Oga99] and [Bro91 are [Oga98]

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Automatic control for state refeeding. Continuous systems

Learning time: 10h

Theory classes: 8h
Other activities: 2h

Description:
Objectives
The specific objective of the item is designing control structures across the state feedback. The necessary elements can be calculated through very different techniques.

Contents
1. - Refeeding of state.
2. - Control of monovariable systems.
3. - Multivariable system control.

Activities, knowledge, abilities, aptitudes
The pupils will have to be able of:
- To calculate the refeeding matrix.
- To design control systems by the route of refeeding of the state.
- To design control elements de for allocation of poles and estimation of the state.
- To design control systems for partially controlable systems.
- To design control systems for systems with non-zero slogan.

Commentaries
The development of the subject can be followed through [Dom02]. A theoretical complement, as well as of exercises and examples], [Oga99] and [Bro91 are [Oga98]

Automatic control in the state space. Discreet systems

Learning time: 17h

Theory classes: 11h
Other activities: 6h

Description:
Objectives
The specific objective of the subject is to redefine the technique of the space of state for sampled systems.

Contents
1. - Solution of the homogenous equation
2. - Calculation of the transition matrix.
3. - Solution of the complete equation.

Activities, knowledge, abilities, aptitudes
The pupils will have to be able of:
- To formulate the control systems in discreet time by the route of state variables.
- To solve equations of state for systems in discreet time.

Commentaries
The development of the subject can be followed through [Dom02].
A theoretical complement, as well as of exercises and examples], [Oga99] and [Bro91 are [Oga98]

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Automatic control for state refeeding. Discreet systems	Learning time: 15h Theory classes: 10h Other activities: 5h

Description:

Objectives

The specific objective of the subject is to recover the characteristics of control and observability for the case of sampled systems. Also the idea of refeeding in sampled systems moves.

Contents

1. - Control in discreet time.
2. - Observability in discreet time.
3. - First of refeeding.

Activities, knowledge, abilities, aptitudes

The pupils will have to be able of:

- To study the control of a system.
- To determine the not-observability of a system.
- To determine the matrix of refeeding of sampled systems of control.

Commentaries

The development of the subject can be followed through [Dom02].

A theoretical complement, as well as of exercises and examples], [Oga99] and [Bro91 are [Oga98]

Qualification system

The qualification of the subject considers all the work carried out throughout the course, and simultaneously it gives a final opportunity of election of evaluation to those students who have not followed the course with the sufficient dedication. In particular, the qualification is obtained choosing the second partial test or the final test

4/15 C1 + 4/15 C2 + 4/15 C3 + 3/15 C4

or

12/15 C5 + 3/15 C4

where:

C1=mark of the first partial test.

C2=mark of the second partial test.

C3=mark of the third partial test.

Average C4=mark of the laboratory practices.

C5=mark of the final test.

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Bibliography

Basic:

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Isidori, Alberto. Nonlinear control systems. 3rd ed. Berlin [etc.]: Springer-Verlag, 2001. ISBN 3-540-19916-0.

Ogata, Katsuhiko. Ingeniería de control moderna [on line]. 4a ed. Madrid: Pearson Educación, 2003 [Consultation: 26/07/2019]. Available on: <http://www.ingebook.com/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=1259>. ISBN 84-205-3678-4.

Vaccaro, Richard J. Digital control : a state-space approach. New York [etc.]: McGraw-Hill, 1995. ISBN 0-07-066781-0.

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