Last update: 13-07-2018

820130 - TCEE - Control Techniques

Coordinating unit: 295 - EEBE - Barcelona East School of Engineering

Teaching unit: 709 - EE - Department of Electrical Engineering

Academic year: 2018

Degree: BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
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ECTS credits: 6 Teaching languages: Catalan, Spanish

Teaching staff

Coordinator: Matas Alcala, Jose

Degree competences to which the subject contributes

Specific:

1. Understand automatic regulation and control techniques and their application to industrial automation.

Transversal:

4. EFFECTIVE USE OF INFORMATION RESOURCES - Level 3. Planning and using the information necessary for an academic assignment (a final thesis, for example) based on a critical appraisal of the information resources used.

Teaching methodology

The course uses master classes by 70%, problem analysis in a 20% and work with Matlab by 10%.

Learning objectives of the subject

To study the control of feedback systems, while introducing input-output relationships in the electric and electromechanical systems, along with the time-domain response.

Study load

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

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Content

Theme 1. Type of systems and modelling of systems

Learning time: 4h 30m

Theory classes: 2h
Laboratory classes: 0h 30m
Self study : 2h

Description:
The most common types of physical systems are described and the principles for developing its mathematical modelling are exposed. Also, the equivalence between the different systems is explained.

Specific objectives:
The identification of physic systems
The modelling of systems
The understanding of the equivalence between systems.

Theme 2. Feedback systems.

Learning time: 5h 40m

Theory classes: 2h
Laboratory classes: 1h
Self study : 2h 40m

Description:
The concept of feedback systems is introduced, its representation, dynamical properties, stability and response to perturbations are described.

Specific objectives:
Understanding of the achievements of feedback systems
Understanding the main properties of feedback systems

Themes 3 to 5. Transient response of 1rst and 2nd order systems. Analysis of steady state errors.

Learning time: 36h

Theory classes: 12h
Practical classes: 4h
Self study : 20h

Description:

The transient response of first and second order systems for different kind of inputs. The steady state response is also analyzed.

Specific objectives:
Understand to which parameters depend the transient response of first and second order systems.
Understand le sources of error at steady state and the ways to improve it.

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Themes 6 and 7. Root locus. Design of controllers in the LGR domain	Learning time: 28h 32m Theory classes: 3h 12m Practical classes: 2h Self study : 23h 20m

Description:
The analysis of the evolution of the roots of a system due to feedback is carried out using the root locus method. Controllers as P, PD, PI, PID, lag and lead are designed using the root locus.

Specific objectives:
Calculate the root locus.
Design feedback controllers using the root locus.

Themes 8 and 9. Bode and Nyquist diagrams	Learning time: 17h Theory classes: 6h Laboratory classes: 1h Self study : 10h

Description:
Calculate de Bode diagram and understand the stability criteria using the Nyquist diagram.

Specific objectives:
Calculate de Bode diagram.
Understand the stability criteria in the frequency domain.

Theme 10. Design in the frequency domain of compensators	Learning time: 34h Theory classes: 12h Laboratory classes: 2h Self study : 20h

Description:
The controllers P, PI, lead and lag are designed in the frequency domain

Specific objectives:
The design of feedback controllers in the frequency domain

Qualification system

The evaluation will be conducted through the assessment by the teacher, with the following weights assigned to evaluated activities:
First partial exam: 25%, Second partial exam: 30%, Third partial exam: 30%, Laboratory practice: 20%.
This subject will not have a re-evaluation exam.

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Regulations for carrying out activities

The attendance to the laboratory sessions is mandatory.

Bibliography

Basic:

Ogata, Katsuhiko. Ingeniería de control moderna. 5a ed. Madrid [etc.]: Pearson Educación, cop. 2010. ISBN 9788483226605.

Kuo, Benjamin C. Sistemas de control automático. México: Prentice Hall Hispanoamericana, 1996. ISBN 9688807230.

Gomariz Castro, S. Biel Sole, D. Matas Alcalá, José. Reyes Moreno, M. Teoría de Control. Diseño Electrónico. Alfaomega,

Complementary:

Ogata, Katsuhiko. Problemas de ingeniería de control utilizando MATLAB. Madrid: Prentice Hall Iberia, 1999. ISBN 8483220466.