DEGREE CURRICULUM

FUNDAMENTALS OF CONTROL THEORY

Academic year 2014-15

BASICS OF THE CONTROL THEORY 2014-15

Subject's general information

Subject name	Fundamentals of Control Theory
Code	102124
Semester	1r Q Avaluació Continuada
Typology	Obligatòria
ECTS credits	6
Theoretical credits	0
Practical credits	0
Office and hour of attention	A determinar
Department	Informàtica i Enginyeria Industrial
Modality	Presencial
Important information on data processing	Consult this link for more information.
Language	Idioma Percentatge d'ús Anglès 10.0 Castellà 10.0 Català 80.0
Degree	Degree in Automation and Industrial Electronic Engineer
Office and hour of attention	A determinar
E-mail addresses	claria@diei.udl.cat jribo@diei.udl.cat

BASICS OF THE CONTROL THEORY 2014-15

Francisco Claria Sancho
Josep Ribo Pablo

Subject's extra information

For a proper development of the teaching, is needed that the student has already reach the basic knowledge of general topics like differential equations, Laplace's Transforms and previous knowledge in Dynamics, Circuit's Theories and Electronics In order to reach the evaluations in a satisfactory level is recommended to be present at the lecture sessions and to have an active participation in them. Apart, is recommended that the student solves by its own the proposed exercises and the regular crosscheck of the bibliography.

The subject is defined to form specialists in Automation; it develops the theoretical basic knowledge in terms of Automation Controls that will be used as a basis for the learning of other graduation subjects and the future professional exercise. The study of the subject implies that the student is getting the basic needed knowledge to understand, analyze, design and evaluate Automation Control Systems. For that, is necessary to introduce to the student the Linear Control systems by the classic analysis techniques and system designs in the time-domain and frequency-domain performances.

Learning objectives

see competences

Competences

Degree-specific competences

- Knowledge of automatic regulation and control techniques and their application to industrial automation.
- Ability to design control and industrial automation systems.
- Knowledge of the basis and applications of robotic systems.
- Ability to design analogical, digital and high-power electronic systems.
- Knowledge and ability to make models and simulate systems.

Degree-transversal competences

- Ability to resolve problems and elaborate and defend arguments inside their field of study.
- Ability to gather and interpret relevant data in their field of study, and to emit judgements that include a reflection on relevant themes of a social, scientific or ethical nature.

Subject contents

1st subject: Basic Concepts. Physical systems mathematical modeling. Open and closed loop controls. Analysis and synthesis of control systems.

2nd subject: Mathematical models. Linearization. Laplace Transform. Linear time-invariant system resolution (L.T.I)

3rd subject: Control systems representation. External representation. Transfer function. Block diagrams, Signal Flow diagrams.

Mason's rule, internal representation, state-variable modelling.

4th subject: Physical systems mathematical modeling. Dynamic systems representation, electrical, mechanical, thermal and hydraulic systems.

5th subject: Time domain analysis. Typical input signals, convolution, Impulse Response. First and second order systems.

Superior order systems. Basic actions of control, Stability Routh Criteria

6th subject: Stationary response. Precision, system's error measuring. Sensibility

7th subject: System analysis by root-locus system. Root contour.

8th subject: Design techniques of control systems by root-locus method. Design specification. P, PI, PD and PID regulators.

9th subject: Control System analysis by frequency domain performance techniques. Polar plot representation, Bode diagrams, Nichols Chart.Stability. Nyquist criterion

10th subject: Control System analysis by frequency domain performance techniques. Phase advanced compensation. Phase delay compensation.

11th State variable system analysis: State diagrams. Characteristic vector and values. Transition state matrix. Controllability and Observability

Bibliography

Recommended bibliography

Control Systems, Katsuhiko Ogata.

Automatic Control Systems, Benjamin Kuo.

Sistemas de Control, Hostetter