

Centre	University College of Engineering of Vitoria-Gasteiz
Name of subject	26007 – Control by Computer
Qualification	Degree in Industrial Electronic Engineering and Automatics
Type	Compulsory
Credits	6 ECTS
Year	4
Term(s)	2nd
Department	Systems and Automation Engineering
Language	English and Spanish

Outcomes / Objectives

Control theory. Feedback. Controller design. System dynamics.

Syllabus

The computer as a control element. Introduction. Diagram of control by computer. Advantages and inconveniences of using the computer as a control system. Discrete sequences and systems. Z-Transform. Properties of sequences. Representation of discrete systems through difference equations. Laplace transform of a sequence. Z-transform. Solution of difference equations using the Z-Transform. Block diagrams of sampled systems. Signal sampling and reconstruction. Introduction. Signal sampling. Signal reconstruction. Zero-order holders. Z-plane analysis of discrete-time control systems. Correspondence between the S-plane and the Z-plane. Stability analysis. Modified Routh criterion. Transient response analysis. Steady state response analysis. Design of discrete-time control systems using conventional methods. Design based on the root locus method. Design based on the frequency response method. Analytical design methods. Discretisation of continuous PID controllers. Design of discrete-time state-space control systems. State-space representation of a discrete-time system. Solution of discrete-time state equations. Discretisation of continuous-time state equations. State feedback pole placement. State observer design. Controller-observer design.

Methodology

Teaching Method

Face-to-Face Teaching Hours

Lectures	Seminars	Classroom practice	Lab. practice	Computer sessions	Clinical practice	Workshops	Industrial workshops	Field practice
36		6	18					

Student Hours of Non Face-To-Face Activities

Lectures	Seminars	Classroom practice	Lab. practice	Computer sessions	Clinical practice	Workshops	Industrial workshops	Field practice
63		9	18					

Assessment System

General criteria

Clarification regarding assessment

Bibliography

Basic Bibliography

- Barambones, O., Sistemas Digitales de Control. Servicio Editorial de UPV/EHU, 2004.
- Ogata, K., Sistemas de control en tiempo discreto, 3ª Ed. Prentice Hall. 1996.

In-depth Bibliography

- Phillips, C.L. and Nagle, H.T., Sistemas de Control Digital. Análisis y Diseño. Gustavo Gili 1993.
- Kuo, B., Sistemas de control digital, 2ª Ed. CECM, 1997.
- K.J. Astrom and B. Wittenmark, Computer Controlled Systems, Prentice Hall. 1992- Franklin, G. F., Powel, J.D. and Workman M.L., Digital control of Dynamic Systems, 2nd Ed. Addison Wesley. 1992.
- Phillips, C.L. and Nagle, H.T., Digital control systems. Analysis and Design. Prentice Hall 1995.

Magazines

- Automática (Elsevier) International Journal of Control Control System Magazine (IEEE)

Websites

- http://ib.cnea.gov.ar/~control2/Links/Tutorial_Matlab_esp/index.html in its original version (in English): <http://www.engin.umich.edu/group/ctm/>