Centre	**University College of Engineering of Vitoria-Gasteiz**
Name of subject	**25991 – Automatic Regulation**
Qualification	**Degree in Industrial Electronic Engineering and Automatics**
Type	**Compulsory**
Credits	**6 ECTS**
Year	**3**
Term(s)	**1st**
Department	**Systems and Automation Engineering**
Language	**Spanish**

Outcomes / Objectives

Automatic regulation systems. Servo systems. Industrial automation

Syllabus

Introduction and Fundamentals. System concept. Open look system. Closed loop system. Classification. External and internal descriptions of a dynamical system. Systems modelling. Differential equations and transfer functions. Impulse response model. Block diagram. Internal model. System state. Time domain analysis. Test signals. Response based on the poles and zeros of the transfer function. First order systems. Second order systems. Response based on the internal model. Calculation of the response using the state model. System modes. Feedback systems. Intuitive concept of feedback and its properties. Components of a feedback system. Effects of feedback. Sensitivity concept. Sensitivity to parameter variations. Response to external disturbances. Controllability, observability and stability. Controllability and observability in the internal model. Stability concept. Absolute and relative stability. Characteristic equation. Routh-Hurwitz criterion. Steady state of feedback systems. Steady state response analysis. Steady state error. Static error coefficients. Classification of control systems. Process control structures. Rate feedback. Proportional action. Integral action. Derivative action. Control structures. Analysis in frequency domain. Relationship between transfer function and frequency response. Pole representation. Bode plot. Minimum phase systems. Specifications in the frequency domain. Stability in the frequency domain. Argument principle. Nyquist criterion. Gain and phase margin. Relationship with the time domain. Classical design methods. Design specifications and methodology. Relationship between time response and frequency response. Types of controllers. PID controllers. Root locus design. PID tuning methods. Modern design methods. State feedback control. Pole assignment method.

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

- "Ingeniería de Control Moderna", 4ª Edición, Katsuhiko Ogata, Pearson.Prentice Hall (2003)
- "Sistemas de Control Moderno", 10ª Edición, Richard C. Dorf, Pearson.Prentice Hall (2005)

In-depth Bibliography

- "Sistemas de Control Automático", 7ª Edición, Benjamin C. Kuo, Pearson.Prentice Hall (2005)
- "Sistemas de Control en Ingeniería", Paul H. Lewis, Chang Yang, Prentice Hall (1999)

Magazines

- Automática (Elsevier) Control System Magazine (IEEE)

Websites

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