Control Engineering

Academic Year: (2023 / 2024) **Review date: 10/04/2023 15:55:58**

Department assigned to the subject: Systems Engineering and Automation Department

Coordinating teacher: ARMINGOL MORENO, JOSE MARIA

Type: Compulsory ECTS Credits : 6.0

Year : 3 Semester : 1

LEARNING OUTCOMES

CB1. Students have demonstrated possession and understanding of knowledge in an area of study that builds on the foundation of general secondary education, and is usually at a level that, while relying on advanced textbooks, also includes some aspects that involve knowledge from the cutting edge of their field of study.
CB2. Students are able to apply their knowledge to their work or vocation in a professional manner and possess the competences usually demonstrated through the development and defence of arguments and problem solving within their field of study.
COCIN1. Ability to draft, sign and develop projects in the area of industrial engineering for construction, renovation, repair, preservation, demolition, manufacture, installation, assembly or operation of: structures, mechanical equipment, energy installations, electrical and electronic installations, industrial plants and installations and automation and manufacturing processes.
COCIN4. Ability to resolve problems with initiative, decision-making, creativity, and critical reasoning skills and to communicate and transmit knowledge, skills and abilities in the Industrial Engineering field.
COCIN5. Knowledge to perform measurements, calculations, assessments, appraisals, surveys, studies, reports, work plans and other similar jobs.
CEP1. Capacity to design a system, component or process in the area of electrical engineering in compliance with required specifications.
CEP2. Knowledge and ability to apply computational and experimental tools for analysis and quantification of electrical engineering problems.
CER6. Knowledge of the fundamentals of automation and control methods.
ECRT8. Knowledge of the fundamentals of automatic regulation and application to industrial automation.

By the end of this content area, students will be able to have:
RA1.3. Coherent knowledge of the branch of electrical engineering including some at the forefront of their branch in control engineering.
RA2.3. The ability to select and apply relevant analytic and modelling methods in control engineering.
RA3.1. The ability to apply their knowledge and understanding to develop and realise designs to meet defined and specified requirements.
RA4.3. Workshop skills on control engineering.
RA5.2. The ability to combine theory and practice to solve electrical engineering problems.
RA5.3. An understanding of applicable techniques and methods in control engineering, and of their limitations.

OBJECTIVES

By the end of this content area, students will be able to have:
1. a systematic understanding of the key aspects and concepts of their branch of engineering in control engineering;
2. coherent knowledge of their branch of engineering including some at the forefront of the branch in control engineering;
3. the ability to apply their knowledge and understanding of control engineering to identify, formulate and solve engineering problems using established methods;
4. the ability to apply their knowledge and understanding to develop and realise designs to meet defined and specified requirements;

5. an understanding of design methodologies, and an ability to use them.
6. workshop and laboratory skills.
7. the ability to select and use appropriate equipment, tools and methods;
8. the ability to combine theory and practice to solve control engineering problems;
9. an understanding of applicable techniques and methods in control engineering, and of their limitations.

DESCRIPTION OF CONTENTS: PROGRAMME

1. Laplace Transform.
2. Modelling of systems:
   2.1 Linealization.
   2.2 Diagram Blocks.
   2.3 Transfer function.
3. Temporal analysis of systems:
   3.1 Influence of poles and zero.
   3.2 Response to standard signals.
   3.3 Systems of first and second order.
4. Frequential analysis of systems:
   4.1 Diagram of Bode.
   4.2 Design of filters.
5. Introduction to control systems:
   5.1 Architectures of control.
   5.2 Precision.
   5.3 Sensitivity to disturbances.
6. Temporary analysis of feedback systems:
   6.1 Root Locus.
7. Frequential analysis of feedback systems:
   7.1 Nyquist Diagram.
8. PID Controllers:
   8.1 Temporary design of regulators PID.
   8.2 Frequential design of regulators PID.
   8.3 Empirical adjustment of regulators PID.

LEARNING ACTIVITIES AND METHODOLOGY

- Skillful classes, classes of resolution of doubts in reduced groups, individual presentations of the students, individual tutorials and personal work of the student; oriented to the theoretical knowledge acquisition (3 credits ECTS). - Practices of laboratory and individual classes of problems in reduced groups, individual tutorials and personal work of the student; oriented to the acquisition of practical abilities related to the program of the subject (3 credits ECTS).

ASSESSMENT SYSTEM

% end-of-term-examination/test:	50
% of continuous assessment (assigments, laboratory, practicals…):	50

- Continuous evaluation (deliverables problems) 10%
- Compulsory Practices 10%
- 2 Midterms 15% and 15%
- Final exam 50%
- You will need to get at least a 4 on the final exam to pass the course.

BASIC BIBLIOGRAPHY

- Jacqueline Wilkie & Michael A. Johnson & Reza Katebi Control Engineering: An Introductory Course, Palgrave Macmillan, 2002

- K. Ogata Ingeniería de Control Moderna, Pearson, 2010

ADDITIONAL BIBLIOGRAPHY

- Charles L. Phillips Signals, Systems, and Transforms, Prentice Hall, 2008

- Jesu¿s Fraile Mora, Pedro Garci¿a Gutie¿rrez, Jesu¿s Fraile Ardanuy Ingeniería de control, Ibergarceta Publicaciones, 2018

- R. C. Dorf Sistemas de Control Moderno, Prentice Hall, 2008

BASIC ELECTRONIC RESOURCES

- . Introducción a los sistemas de control: http://http://lcr.uns.edu.ar/fcr/images/Introduccion%20a%20Los%20Sistemas%20de%20Control.pdf

- Eric Cheever . Linear Physical Systems Analysis: http://lpsa.swarthmore.edu/index.html

- Michigan U. and Carnegie Mellon . Control Tutorial for Matlab: http://ctms.engin.umich.edu/CTMS/index.php?aux=Home