Control Engineering I

Academic Year: (2022 / 2023) **Review date: 03-05-2022**

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

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

- 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.

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

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, John M. Parr, Eve Ann Riskin Signals, Systems, and Transforms, 2008, Prentice Hall
- 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