Control engineering I

Academic Year: (2022 / 2023) **Review date: 09-05-2022**

Department assigned to the subject: Department of Systems Engineering and Automation

Coordinating teacher: ESCALERA HUESO, ARTURO DE LA

Type: Electives ECTS Credits : 6.0

Year : 4 Semester :

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

0- Introduction

1- Transformations.
- 1.1 Basic concepts
- 1.2 Fourier Transform
- 1.3 Laplace Transform.

2- Modelling of systems
- 2.1 Mathematical models
- 2.2 Linealization.
- 2.3 Transference function.
- 2.4 Diagram Blocks.
- 2.5 Mason

3- Temporary analysis of systems
- 3.1 The concept ofTemporal analysis
- 3.2 Response to the step signal
- 3.3 Equivalent systems
- 3.4 Routh-Hurwitz's Method
- 3.5 Influence of poles and zero.
- 3.6 Response to standard signals.
- 3.7 Systems of first and second order.
- 3.8 Root Locus.

4- Introduction to control systems
- 4.1 Architectures of control.
- 4.2 Precision.
- 4.3 Sensitivity to disturbances.
- 4.4 Temporary design of regulators PID.
- 4.5 Empirical adjustment of regulators PID.

5 - Frequential analysis of systems
5.1 Diagram of Bode.
5.2 Nyquist Diagram.
5.3 Frequential design 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 Modern Control Engineering, Pearson-Prentice Hall, 2002

ADDITIONAL BIBLIOGRAPHY

- Farid Golnaraghi, Benjamin C. Kuo Automatic Control Systems, John Wiley & Sons, 2009

BASIC ELECTRONIC RESOURCES

- 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