

Academic Year: (2019 / 2020)

Review date: 19-03-2019

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

Coordinating teacher: GARRIDO BULLON, LUIS SANTIAGO

Type: Electives ECTS Credits : 6.0

Year : 4 Semester : 2

STUDENTS ARE EXPECTED TO HAVE COMPLETED

Control Engineering I, Control Engineering II

COMPETENCES AND SKILLS THAT WILL BE ACQUIRED AND LEARNING RESULTS.

The main objective of this course is to acquaint students with the techniques of modeling and control of non-linear systems. In the previous subjects of control engineering, the students have learned control techniques related to continuous and discrete-time linear systems. In this subject, this knowledge is expanded by studying techniques related to non-linear systems control.

DESCRIPTION OF CONTENTS: PROGRAMME

Unit 1. Identification of systems.

- 1.1. Parametric and nonparametric models.
- 1.2. Identification methods: transfer function, state space, impulse response, frequency response.
- 1.3. Least squares method.

Unit 2. Modeling of non-linear systems.

- 2.1. Types and effects.
- 2.2. Describing Function analysis. Limit cycle.
- 2.3. Phase plane analysis.

Unit 3. Stability.

- 3.1. Lyapunov Criterion.

Unit 4. Non-linear Systems Control:

- 4.1. Systems with delay. Smith Predictor.
- 4.2. Linearization by state feedback.
- 4.3. Application of Lie Algebra.

Unit 5. Optimal Control. Hamiltonian Formulation.

- 5.1. General problem (discrete-time)
- 5.2. Linear Quadratic Regulator (LQR) in discrete-time.
- 5.3. General problem (continuous-time)
- 5.4. Linear Quadratic Regulator (LQR) in continuous-time.

LEARNING ACTIVITIES AND METHODOLOGY

- Lectures, classes to resolve doubts in small groups, tutorials and personal work, oriented to the acquisition of knowledge.

- Laboratory practices and kinds of problems in small groups, individual tutorials and personal work, oriented to the acquisition of practical skills related to the program of the course.

ASSESSMENT SYSTEM

There will be two partial exams. The average score of the partial exams will be the 90% of the final score (45% each). The student has to pass both partial exams in order to pass the subject. If the student fails a partial exam, the corresponding part can be repeated in a recovery exam.

There will be three mandatory lab sessions of two hours each one. The average score of the lab sessions will be the 10% of the final score.

If the student does not go through the continuous evaluation process, the mark of the final exam will be the 60% of the final score.

% end-of-term-examination:	0
% of continuous assessment (assignments, laboratory, practicals...):	100

BASIC BIBLIOGRAPHY

- L. Ljung System Identification, Prentice-Hall.
- Slotine Applied NonLinear Control, Prentice-Hall.