

Course guide

330530 - ASC - Analysis of Systems and Control

Last modified: 04/05/2023

Unit in charge: Manresa School of Engineering
Teaching unit: 750 - EMIT - Department of Mining, Industrial and ICT Engineering.

Degree: BACHELOR'S DEGREE IN AUTOMOTIVE ENGINEERING (Syllabus 2017). (Compulsory subject).

Academic year: 2023 **ECTS Credits:** 6.0 **Languages:** Catalan, Spanish, English

LECTURER

Coordinating lecturer: Josep Font Teixidó

Others:

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

CE13. Knowledge and application of production and manufacturing systems.
CE21. Knowledge of automatic regulation, control techniques and its application to industrial automation.
CE22. Ability to design control systems and industrial automation.

Transversal:

1. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 3. Communicating clearly and efficiently in oral and written presentations. Adapting to audiences and communication aims by using suitable strategies and means.
2. TEAMWORK - Level 3. Managing and making work groups effective. Resolving possible conflicts, valuing working with others, assessing the effectiveness of a team and presenting the final results.
3. EFFECTIVE USE OF INFORMATION RESOURCES - Level 3. Planning and using the information necessary for an academic assignment (a final thesis, for example) based on a critical appraisal of the information resources used.
4. SELF-DIRECTED LEARNING - Level 3. Applying the knowledge gained in completing a task according to its relevance and importance. Deciding how to carry out a task, the amount of time to be devoted to it and the most suitable information sources.
5. THIRD LANGUAGE. Learning a third language, preferably English, to a degree of oral and written fluency that fits in with the future needs of the graduates of each course.

TEACHING METHODOLOGY

Expository classes
Problem solving and case study
Carrying out small-scale projects
Evaluation Activities

LEARNING OBJECTIVES OF THE SUBJECT

1. Ability to design basic control systems.
2. Knowledge of the principles and techniques that allow analyzing the stability of the feedback systems.
3. Ability to model and simulate dynamic systems of continuous time.
4. Ability to program control systems taking into account the conditions of the environment.
5. Ability to perform individual and team work and will be able to carry out the search for information to achieve this objective.
6. Knowledge of general purpose program tools and ability to apply them to the analysis and design of control systems.



STUDY LOAD

Type	Hours	Percentage
Hours large group	30,0	20.00
Hours small group	30,0	20.00
Self study	90,0	60.00

Total learning time: 150 h

CONTENTS

1. Introduction to electronic control systems

Description:

Physical systems, sensors and actuators
Open loop control
Closed loop control

Full-or-part-time: 10h

Theory classes: 4h
Self study : 6h

2. Continuous models of physical systems

Description:

Continuous models of electrical, mechanical, hydraulic, thermal systems
Models with Differential Equations
Models in the State Space
Laplace transform analysis

Full-or-part-time: 40h

Theory classes: 16h
Self study : 24h

3. Analysis of the temporal and frequency response of invariant systems

Description:

Temporal response
Frequency response
Matlab and Simulink as modeling and simulation tools

Full-or-part-time: 30h

Theory classes: 12h
Self study : 18h



4. Stability analysis

Description:

Stability in linear systems
Compensation techniques
Matlab and Simulink as modeling and simulation tools

Full-or-part-time: 20h

Theory classes: 8h
Self study : 12h

5. Analog controllers

Description:

Analog PID controller
State feedback controller

Full-or-part-time: 30h

Theory classes: 12h
Self study : 18h

6. Discrete controllers

Description:

Discretization of an analog controller
Discrete PID controller

Full-or-part-time: 20h

Theory classes: 8h
Self study : 12h

ACTIVITIES

1. Exams

Description:

Written activity in which the knowledge acquired up to the moment of the test is evaluated
During the course there will be three partial tests of individual control
Once the course is finished, a final comprehensive test of the knowledge acquired can be taken

Specific objectives:

At the end of the Electronic Control Systems course, the student will have synthesized and consolidated the concepts and techniques worked so far.

Material:

Test statements
Documents for the entire course
Software

Delivery:

Test exercises, which will contribute 30% to the first quarter, 30% to the second quarter and 40% to the third quarter
The globalizing test will be worth 100% of the final grade if the subject has not been passed by partial

Full-or-part-time: 6h

Theory classes: 6h



2. Contents

Description:

The study of the contents is the individual or collective activity that leads to understanding and assuming the knowledge, vocabulary and techniques that are part of the contents of the subject

Material:

Main reference of the subject
Published teaching material

Full-or-part-time: 45h

Self study: 45h

3. Expositive class

Description:

They are face-to-face classes specifically dedicated to understanding the contents of the subject, especially those of a rather theoretical nature

Material:

Recommended basic bibliography
Collection of subject problems

Full-or-part-time: 26h

Theory classes: 26h

4. Solving problems and analysis of reduced scope projects

Description:

Resultados de traducción

They are face-to-face classes specifically dedicated to solving problems and studying small projects

Material:

Recommended basic bibliography
Collection of subject problems

Full-or-part-time: 28h

Theory classes: 28h

5. Solving exercises

Description:

They are face-to-face classes specifically dedicated to solving problems and studying small projects

Material:

Recommended basic bibliography
Collection of subject problems
Published teaching material

Full-or-part-time: 45h

Self study: 45h



GRADING SYSTEM

The final grade for the course will be obtained as follows:

100% Exams (A1)

Exercises of the tests, which will contribute 30% to the first quarter, 30% to the second quarter and 40% to the third quarter.

The globalizing test will be worth 100% of the final grade if the subject is not passed by partial exams.

EXAMINATION RULES.

The activities will be carried out following the uses and customs of academic work and, in particular, the following guidelines will be respected:

1. Those activities that are explicitly declared as individual, whether in person or not, will be carried out without any collaboration from other people.
2. The dates, formats and other delivery conditions that are set will be mandatory.
3. If any of the activities of the subject are not carried out, it will be considered a grade with zero.

BIBLIOGRAPHY

Basic:

- Bolzern, Paolo; Scattolini, Riccardo; Schiavoni, Nicola. Fundamentos de control automático. 3ª ed. Madrid: McGraw-Hill, cop. 2008. ISBN 9788448166403.

- Ogata, Katsuhiko. Modern control engineering [on line]. 5th ed. Boston [etc.]: Pearson, cop. 2010 [Consultation: 02/06/2022]. Available on:

https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=1259. ISBN 9780137133376.

RESOURCES

Other resources:

Own notes