Last update: 12-04-2019

340033 - FOAU-F4O07 - Fundamentals of Automatic Control

Coordinating unit: 340 - EPSEVG - Vilanova i la Geltrú School of Engineering

Teaching unit: 707 - ESAII - Department of Automatic Control

Academic year: 2019

Degree: BACHELOR'S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN INDUSTRIAL DESIGN AND PRODUCT DEVELOPMENT ENGINEERING (Syllabus 2009). (Teaching unit Optional)

ECTS credits: 6 Teaching languages: Catalan, Spanish, English

Teaching staff

Coordinator: FRANCISCO JAVIER RUIZ VEGAS

Others: FRANCISCO JAVIER RUIZ VEGAS
CRISTÓBAL RAYA GINER
XAVIER LLANAS PARRA
ALBERT SAMÀ MONSONÍS
RAMON GUZMAN SOLA
ANDREU CATALA MALLOFRE
LUIS MIGUEL MUÑOZ MORGADO

Opening hours

Timetable: See schedule consultation in ATENEA.

Prior skills

Prerequisites: basic Calculus and Algebra course, with complex numbers and a basic cours on Physics.

Degree competences to which the subject contributes

Specific:

3. CE12. Knowledge of fundamental automatism and control methods.

Transversal:

1. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 1. Planning oral communication, answering questions properly and writing straightforward texts that are spelt correctly and are grammatically coherent.
2. TEAMWORK - Level 1. Working in a team and making positive contributions once the aims and group and individual responsibilities have been defined. Reaching joint decisions on the strategy to be followed.

Teaching methodology

theoretical classes, practical classes and laboratory

Learning objectives of the subject

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1. To understand the concept of linear dynamic system invariant in time and its representation through its transfer function.
2. To be able to model some mechanical and electrical systems using the formalism of the transfer functions.
3. To determine the characteristics that may hold the responses to first and second order systems where standard inputs (impulse, step or ramp) are applied.
4. To understand the advantages of closed loop system.
5. To be able to represent by Bode and Nyquist diagrams frequency responses of first and second order systems, as well as higher order systems.
6. To know how to interpret frequency diagrams.
7. To learn to select in some cases the best controller to reach the given specifications relating to stability, steady-state error and characteristics of the stationary response.
8. To Be able to simulate the behavior of linear systems using MATLAB and Simulink.

Study load

Total learning time: 150h	Hours large group:	22h 30m	15.00%
	Hours medium group:	0h	0.00%
	Hours small group:	37h 30m	25.00%
	Guided activities:	0h	0.00%
	Self study:	90h	60.00%

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Content

Unit 0: Automation and Robotics fundamentals	Learning time: 22h Theory classes: 2h Practical classes: 2h Laboratory classes: 12h Guided activities: 3h Self study : 3h
Unit 1: Transfer Functions	Learning time: 17h Theory classes: 2h Practical classes: 2h Laboratory classes: 1h Self study : 12h
Unit 2: Physical systems modeling	Learning time: 17h Theory classes: 2h Practical classes: 2h Laboratory classes: 1h Self study : 12h
Unit 3: Time response analysis	Learning time: 17h Theory classes: 2h Practical classes: 2h Laboratory classes: 1h Self study : 12h
Unit 4: Properties of feedback systems	Learning time: 17h Theory classes: 2h Practical classes: 2h Laboratory classes: 1h Self study : 12h

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Unit 5: Frequency response analysis	Learning time: 20h Theory classes: 2h Practical classes: 2h Laboratory classes: 4h Self study : 12h
Unit 6: Stability analysis using frequency response	Learning time: 20h Theory classes: 2h Practical classes: 2h Laboratory classes: 4h Self study : 12h
Unit 7: Control systems dessign	Learning time: 20h Theory classes: 2h Practical classes: 2h Laboratory classes: 4h Self study : 12h

Qualification system

partial exams: E1 and E2
Laboratory controls: P1 and P2
oral presentation: O

final grade:
max(0.65·T+0.25·P+0.1·O , 0.7·T+0.3·P), where:
T=max(E2, (E1+E2)/2) and P=(0.5·P1+0.5·P2)

Re-assesment is possible if final grade>=3

In this case,
final grade=min(5, max(0.65·TR+0.25·P+0.1·O, 0.7·TR+0.3·P)) , where:
TR=max(R, (E1+R)/2)

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Bibliography

Basic:

Villà Millaruelo, Ricard. Dinàmica de sistemes. Barcelona: Serveis Gràfics Copisteria Imatge, 2012.

Ogata, Katsuhiko. Ingeniería de control moderna. Madrid [etc.]: Pearson Educación, 2010. ISBN 9788483226605.

Kuo, Benjamin C.. Sistemas de control automático. México: Prentice Hall Hispanoamericana, 1996. ISBN 9688807230.