Course guide
19614 - MCS - Modern Control Systems

Unit in charge: Castelldefels School of Telecommunications and Aerospace Engineering
Teaching unit: 707 - ESAII - Department of Automatic Control.
Degree: MASTER'S DEGREE IN AEROSPACE SCIENCE AND TECHNOLOGY (Syllabus 2015). (Optional subject).
MASTER'S DEGREE IN AEROSPACE SCIENCE AND TECHNOLOGY (Syllabus 2021). (Optional subject).

Academic year: 2022 ECTS Credits: 5.0 Languages: English

LECTURER

Coordinating lecturer: Defined in the course webpage at the EETAC website

Others: Defined in the course webpage at the EETAC website

PRIOR SKILLS

Linear algebra. Basic programming skills in MATLAB/Simulink

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
CE4 MAST. (ENG) CE4: Aplicar el método científico para el estudio de la fenomenología particular del ambiente aeroespacial.

General:
CG2 MAST. (ENG) CG2: Identificar y aplicar los análisis teóricos, experimentales y numéricos fundamentales de uso actual en ingeniería aeroespacial.

Transversal:
CT1b. ENTREPRENEURSHIP AND INNOVATION: Being aware of and understanding the mechanisms on which scientific research is based, as well as the mechanisms and instruments for transferring results among socio-economic agents involved in research, development and innovation processes.

Basic:
CB6. (ENG) CB6 - Poseer y comprender conocimientos que aporten una base u oportunidad de ser originales en el desarrollo y/o aplicación de ideas, a menudo en un contexto de investigación.

TEACHING METHODOLOGY

Autonomous work. Theory lessons. Laboratory sessions. Problem-based sessions.

LEARNING OBJECTIVES OF THE SUBJECT

- Understand the different constituent elements of a control system
- Characterisation of the dynamics of a system and its temporal response
- Basic skills in design of control systems
- Advanced techniques and applications in different fields
STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
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</thead>
<tbody>
<tr>
<td>Hours large group</td>
<td>45.0</td>
<td>36.00</td>
</tr>
<tr>
<td>Self study</td>
<td>80.0</td>
<td>64.00</td>
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</tbody>
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Total learning time: 125 h

CONTENTS

Modern Control Systems

Description:
1. Architecture of control systems:
   o Open and closed loop architectures. Control variables. Feedback.
2. Dynamic models and time response:
   o Modeling mechanical, electrical, electromechanical and fluid systems.
   o Analysis of the transient and stationary response. Laplace transform, z-transform. Transfer function.
3. Standard controller design methods:
4. State-space methods:
   o State-Space models, design of state-feedback controllers. Controllability.
5. Estimator design:
6. Optimal and robust and adaptive control:
7. Control of nonlinear systems:
   o Introduction to nonlinear dynamical and chaotic systems. Typical nonlinearities. Linearization. The describing function method. Particle filters
8. Intelligent control and machine learning:
   o Evolutionary and Genetic Algorithms. Fuzzy Logic. Neural Networks and Deep Learning

Full-or-part-time: 48h
Theory classes: 45h
Guided activities: 3h

GRADING SYSTEM

Defined in the course webpage at the EETAC website
BIBLIOGRAPHY

Basic: