19614 - MCS - Modern Control Systems

Coordinating unit: 300 - EETAC - Castelldelfels School of Telecommunications and Aerospace Engineering
Teaching unit: 707 - ESAII - Department of Automatic Control
Academic year: 2019
Degree: MASTER'S DEGREE IN AEROSPACE SCIENCE AND TECHNOLOGY (Syllabus 2015). (Teaching unit Optional)
ECTS credits: 5
Teaching languages: English

Teaching staff
Coordinator: 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

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.

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.

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
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**Study load**

<table>
<thead>
<tr>
<th>Total learning time: 125h</th>
<th>Hours large group: 45h</th>
<th>36.00%</th>
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<td>Self study: 80h</td>
<td>64.00%</td>
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**Content**

**Modern Control Systems**

**Learning time: 48h**
- Theory classes: 45h
- Guided activities: 3h

**Description:**

1. Architecture of control systems:
   - Open and closed loop architectures. Control variables. Feedback.

2. Dynamic models and time response:
   - Modeling mechanical, electrical, electromechanical and fluid systems.

3. Standard controller design methods:

4. State-space methods:
   - State-Space models, design of state-feedback controllers. Controllability.

5. Estimator design:

6. Optimal and robust and adaptive control:

7. Control of nonlinear systems:
   - Introduction to nonlinear dynamical and chaotic systems. Typical nonlinearities. Linearization. The describing function method. Particle filters

8. Intelligent control and machine learning:
   - Evolutionary and Genetic Algorithms. Fuzzy Logic. Neural Networks and Deep Learning

**Qualification system**

Defined in the course webpage at the EETAC website
Bibliography

Basic:


