

19614 - MCS - Modern Control Systems

Coordinating unit:	300 - EETAC - Castelldefels School of Telecommunications and Aerospace Engineering		
Teaching unit:	707 - ESAII - Department of Automatic Control		
Academic year:	2018		
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.

Generical:

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

19614 - MCS - Modern Control Systems

Study load

Total learning time: 125h	Hours large group:	45h	36.00%
	Self study:	80h	64.00%

Content

Modern Control Systems	Learning time: 48h Theory classes: 45h Guided activities: 3h
<p>Description:</p> <ol style="list-style-type: none"> 1. Architecture of control systems: <ul style="list-style-type: none"> o Open and closed loop architectures. Control variables. Feedback. 2. Dynamic models and time response: <ul style="list-style-type: none"> 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: <ul style="list-style-type: none"> o The root-locus method. Design by frequency techniques. Bode and Nyquist plots. 4. State-space methods: <ul style="list-style-type: none"> o State-Space models, design of state-feedback controllers. Controllability. 5. Estimator design: <ul style="list-style-type: none"> o Estimation of control state variables. Observability. Kalman filters. 6. Optimal and robust control: <ul style="list-style-type: none"> o Quadratic cost functions. Linear-quadratic regulator (LQR). Linear-quadratic Gaussian control (LQG). Robust control. H-infinity methods. 7. Control of nonlinear systems: <ul style="list-style-type: none"> o Introduction to nonlinear dynamical systems. Typical nonlinearities. Linearization. The describing function method. 	

Qualification system

Defined in the course webpage at the EETAC website

19614 - MCS - Modern Control Systems

Bibliography

Basic:

Ogata, Katsuhiko. Modern control engineering. 4th ed. Englewood Cliffs, NJ: Prentice-Hall, cop. 2002. ISBN 0130609072.

Nise, Norman S. Control systems engineering. 6th ed., international student version. Hoboken: John Wiley & Sons, cop. 2011. ISBN 9780470646120.

Franklin, Gene F; Powell, J. David; Emami-Naeini, Abbas. Feedback control of dynamic systems. 7th ed. Upper Saddle River [etc.]: Pearson, cop. 2015. ISBN 9781292068909.

Nise, Norman S. Control systems engineering. 6th ed., international student version. Hoboken: John Wiley & Sons, cop. 2011. ISBN 9780470646120.

Franklin, Gene F; Powell, J. David; Emami-Naeini, Abbas. Feedback control of dynamic systems. 3rd ed. Reading, Mass. [etc.]: Addison-Wesley, cop. 1994. ISBN 0201527472.