Last update: 24-10-2018

19399 - SM - Science in Microgravity

Coordinating unit: 300 - EETAC - Castelldefels School of Telecommunications and Aerospace Engineering

Teaching unit: 748 - FIS - Department of Physics

Academic year: 2018

Degree: MASTER'S DEGREE IN AEROSPACE SCIENCE AND TECHNOLOGY (Syllabus 2015). (Teaching unit Optional)
MASTER'S DEGREE IN AEROSPACE SCIENCE AND TECHNOLOGY (Syllabus 2009). (Teaching unit Optional)

ECTS credits: 5 Teaching languages: English

Teaching staff

Coordinator: Defined in the course webpage at the EETAC website.

Prior skills

Students should have a basic knowledge on fluid dynamics and materials science.

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.
CB7. (ENG) CB7 - Que los estudiantes sepan aplicar los conocimientos adquiridos y su capacidad de resolución de problemas en entornos nuevos o poco conocidos dentro de contextos más amplios (o multidisciplinares) relacionados con su área de estudio.
CB8. (ENG) CB8 - Que los estudiantes sean capaces de integrar conocimientos y enfrentarse a la complejidad de formular juicios a partir de una información que, siendo incompleta o limitada, incluya reflexiones sobre las responsabilidades sociales y éticas vinculadas a la aplicación de sus conocimientos y juicios.
CB9. (ENG) CB9 - Que los estudiantes sepan comunicar sus conclusiones y los conocimientos y razones últimas que las sustentan a públicos especializados y no especializados de un modo claro y sin ambigüedades.
CB10. (ENG) CB10 - Que los estudiantes posean las habilidades de aprendizaje que les permitan continuar estudiando de un modo que habrá de ser en gran medida autodirigido o autónomo.

Specific:

CE2 MAST. (ENG) CE2: Utilizar las herramientas, dispositivos, y sistemas que permiten realizar el acondicionamiento tanto analógico como digital de señal.
CE4 MAST. (ENG) CE4: Aplicar el método científico para el estudio de la fenomenología particular del ambiente aeroespacial.

Generical:

CG1 MAST. (ENG) CG1: Identificar y conocer las principales actividades de I+D+i en el campo aeroespacial que se llevan a cabo actualmente a nivel internacional en el ámbito académico, la industria y las mayores agencias espaciales.
CG2 MAST. (ENG) CG2: Identificar y aplicar los análisis teóricos, experimentales y numéricos fundamentales de uso actual en ingeniería aeroespacial.
CG4 MAST. (ENG) CG4: Participar en un proyecto de I+D+i del ámbito aeroespacial aportando una visión y conocimientos novedosos asociados con las técnicas de uso más puntero en el campo.

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.
CT3. TEAMWORK: Being able to work in an interdisciplinary team, whether as a member or as a leader, with the aim

of contributing to projects pragmatically and responsibly and making commitments in view of the resources that are available.
CT4. EFFECTIVE USE OF INFORMATION RESOURCES: Managing the acquisition, structuring, analysis and display of data and information in the chosen area of specialisation and critically assessing the results obtained.
CT5. FOREIGN LANGUAGE: Achieving a level of spoken and written proficiency in a foreign language, preferably English, that meets the needs of the profession and the labour market.

Teaching methodology

Lectures.
Paper discussions.
Individual and team work.
Tutorials.

Learning objectives of the subject

To acquire understanding on the current research carried out in microgravity platforms and its interest for the design of space systems.
To offer a view on the available microgravity platforms and the ways to access them.
To provide a broad introduction to research topics in microgravity conditions.
To provide the necessary tools to define and develope a research project to carry out in a microgravity environment.

Study load

Total learning time: 125h	Hours large group:	45h	36.00%
	Hours medium group:	0h	0.00%
	Hours small group:	0h	0.00%
	Guided activities:	0h	0.00%
	Self study:	80h	64.00%

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Content

1. Research in a microgravity environment.

Learning time: 70h

Theory classes: 25h
Guided activities: 5h
Self study : 40h

Description:
Microgravity: What it is and what it is not.
Microgravity facilities and ways to access them.
Basic research and industrial applications.
Fundamental concepts, mathematical models and analysis in the microgravity environment.
Research in fluid physics under microgravity:
- Dynamics and stability.
- Interfacial phenomena.
- Multiphase flows.

A microgravity research lab.

Related activities:
Lectures.
Discussion of research papers.
Individual work.

2. Design of a scientific payload for a microgravity platform.

Learning time: 55h

Theory classes: 5h
Guided activities: 10h
Self study : 40h

Description:
Introduction of project topics.
Project definition and development.

Related activities:
Lectures.
Discussion of research papers.
Team work.

Qualification system

Defined in the course webpage at the EETAC website.

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Bibliography

Others resources:

M. Lappa, Fluids, Materials & Microgravity, Elsevier, 2004.
K. Gabriel, Microgravity two-phase flow and heat transfer, Space Technology Library, 2007.
Research papers.
www.esa.int/education
www.nasa.gov/multimedia/nasatv