Course Syllabus

Addendum to Aerospace Vehicles

Year: 2018/2019
Code: 9966001809
Coordinating professor: Fermín Navarro Medina
Degree program: Degree in Aerospace Engineering of aircrafts
School: Arquitectura, Ingeniería y Diseño
Languages: English

The mission of Universidad Europea de Madrid is to offer its students a holistic education, helping them become leaders and professionals capable of responding effectively to the needs of today's global world, adding value within their career fields, and contributing to social advancement through their entrepreneurial spirit and ethical integrity. We also strive to create and transfer knowledge through applied research, thus making our own contribution to progress and putting ourselves at the forefront of intellectual, scientific, and technological development.

Contents

1. Basic information on the course/module

ECTS	6
Credit type	Elective
Language	English
Delivery mode	Face to face
Trimester/Semester	First semester

2. Presentation of the course/module

Addendum to Aerospace Vehicles belongs to the module "Aerospace vehicles III", which contains two subjects:

- Design of satellites
- Addendum to Aerospace Vehicles

The design of satellites includes the study of many subsystems in parallel:

- Types
- Materials and structures
- Thermal control
- Mechanisms
- Attitude control
- Space propulsion
- Power subsystem
- Communication system (antennae)
- Tests

Previous topics are afford in the signature of "design of satellites", which dispose a limited number of sessions to further cover all subsystems. Therefore an additional signature (Addendum to Aerospace Vehicles) is available to include extra contents on topics abovementioned. Besides, an analysis of actual issues regarding aerospace technology is done, in order to focus on specific topics that are of interest in the period of the signature.

A main characteristic of design of satellites is the variety of subsystems needed to be studied to have a preliminary design, so a multidisciplinary approach is used to study specific subsystems of the spacecraft. Besides, complete subsystems of spacecraft are also complex what requires advance knowledge of space technology. Thus, extended contents of some subsystems initialized in the signature of “Design of satellites” are studied, and they are used to carry out short projects of design and manufacturing of those subsystems applied to cubesats or pocket cubesats (i.e. simplified power plants, structural platform, etc.).

3. Competencies and learning outcomes

Core competencies:

- CB2: That students can apply their knowledge to their work or vocation in a professional manner and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study.
- CB5: That students have developed those learning skills necessary to undertake further studies with a high degree of autonomy

Cross-curricular competencies:

- CT16: To communicate and convey information, ideas and skills in the student's field of specialization, either in writing or orally, both to skilled and unskilled audiences (communication skills).

Specific competencies:

- CE27: Ability to design satellites
- CE32: Ability to multidisciplinary work

Notes: UNIQUE LEVEL: Competence developed at one level. Level 1 (N1): awareness about the importance of competences and basic application of it to several situations. Level 2(N2): interiorization and skillful handling of competences. Level 3 (N3): Full interiorization and handling of competences at any needed situation.

Learning outcomes:

- LO20: To conduct studies by integrating the technologies and engineering procedures which are developed in the competencies of this modules
- LO21: From a series of requirements, and prior information, to conceptualize an engineering problem, proposes an approach to solve it, and obtain the better solution. All this related to the competencies of this moduleLO3: To transfer an engineering problem to the laboratory, and to use this resource as support to solve it.
- LO22: To transfer some parts of an engineering problem to the laboratory, and utilize this resource as support to resolve it
- LO31: To design any element of satellites

The table below shows the relation between the competencies developed during the course and the envisaged learning outcomes:

Competencies	Learning outcomes
CB2	LO20
CB2, CB5, CT16, CE27	LO21
CT16, CE32, CE27	LO22
CB5, CE27, CE32	LO31

The following table shows how the different types of activities are distributed and how many hours are assigned to each type:

Type of educational activity	Number of hours
Lecture-based class	20 h
Integration of team work	60 h
Self-study	50 h
Mentoring, academic monitoring and assessment	20 h
TOTAL	**150 h**

To develop the competencies and achieve the learning outcomes, you will have to complete the activities indicated in the table below:

Learning outcomes	Learning activity	Type of activity	Content
LO21: From a series of requirements, and prior information, to conceptualize an engineering problem, proposes an approach to solve it, and obtain the better solution. All this related to the competencies of this module LO31: To design any element of satellites	Activity 1	Mentoring, academic monitoring and assessment. Lectured-based class Self-study	UA1. Structural subsystem UA2. Thermal control subsystem UA3. Attitude control subsystem UA4. Power subsystem
	Activity 2	Self-study	
LO20: To conduct studies by integrating the technologies and engineering procedures which are developed in the competencies of this modules LO21: From a series of requirements, and prior information, to conceptualize an engineering problem, proposes an approach to solve it, and obtain the better solution. All this related to the competencies of this module LO22: To transfer some parts of an engineering problem to the laboratory, and utilize this resource as support to resolve it LO31: To design any element of satellites	Activity 3	Integration of team work	UA1. Structural subsystem UA2. Thermal control subsystem UA3. Attitude control subsystem UA4. Power subsystem
	Activity 4	Mentoring, academic monitoring and assessment.	

When you access the course on the *Virtual Campus,* you'll find a description of the activities you have to complete, as well as the deadline and assessment procedure for each one.

4. Monitoring and assessment

The following table shows the assessable activities, their respective assessment criteria, and the weight each activity carries towards the final course grade.

Assessable activity	Assessment criteria	Weight (%)
Activity 1	• Answer are complete and correct • Appropriate hypothesis has been considered. • The complete set of equations to solve the problem has been expound • Correct results are obtained according to the hypothesis considered. • The results are analyzed and conclusions are outlined.	30%
Activity 2	• Studies of state of the art are included • References are quoted • A solution for the study case is obtained. • Conclusions are drawn.	15%
Activity 3	• Studies of state of the art are included. • Appropriate hypothesis has been considered. • Correct results are obtained for several load cases, which are coherent with the hypothesis considered. • The results are analyzed and conclusions extracted. • Vehicle subsystem is manufactured and tested • Students cooperate to accomplish previous criteria.	45%
Activity 4	• Explanation is clear and concise • Presentation contents and slights format are correct • Presentation time is adjusting to required duration • Student can answer the questions of audience	10%

When you access the course on the *Campus Virtual*, you'll find a description of the activities you have to complete, as well as the deadline and assessment procedure for each one.

4.1. First exam period

To pass the course in the first exam period you should pass

1. Exams, tests and other test knowledge: 30% (individual, 5/10 minimum mark to be obtained)

2. Elaboration of articles, reports, specialized software: 15% (individual and groups)

3. Course integrating project (report and product): 45% (groups)

4. Transversal-disciplinary skills (project presentations included): 10% (individual)

A minimum mark of 5/10 is required in evaluation method 1.

A minimum mark of 5/10 is required in evaluation method 2, 3 and 4 globally.

A minimum of 50% attendance is required to pass the subject.

4.2. Second exam period

To pass the course in the second exam period you should pass

1. Exams, tests and other test knowledge: 30% (individual, 5/10 minimum mark to be obtained)

2. Elaboration of articles, reports, specialized software: 15% (individual and groups)

3. Course integrating project (report and product): 45% (groups)

4. Transversal-disciplinary skills (project presentations included): 10% (individual)

A minimum mark of 5/10 is required in evaluation method 1.

A minimum mark of 5/10 is required in evaluation method 2, 3 and 4 globally.

5. Bibliography

Here is the recommended bibliography:

- Pisacane V.L., Fundamentals of Space Systems (2nd Ed.), Oxford U.P. 2005
- Fortescue P., Stark J., Swinerd G. Spacecraft Systems Engineering (Third Edition). Wiley. England. 2003.
- Gilmore D. G. Spacecraft Thermal Control Handbook. Fundamental Technologies. (Second Edition). The Aerospace Press. California. 2002
- Prussing J.E. and Conway B.A., Orbital Mechanics (2nd Ed.), Oxford U.P. 2013
- Thomson W.T., Introduction to Space Dynamics, Dover 1961
- Wertz J.R. and Everett J.J. and Purschell J.J., Space Mission Engineering: the new SMAD, Space Technology Library 2011
- Larson W. J., Wertz J.R. Space Mission Analysis and Design (Third Edition). Space Technology Library. 1972

6. How to communicate with your professor

Whenever you have a question about the content or activities, don't forget to post it to your course forum so that your classmates can read it.

You might not be the only one with the same question!

If you have a question that you only want to ask your professor, you can send him/her a private message from the *Campus Virtual*. And if you need to discuss something in more detail, you can arrange an advisory session with your professor.

It's a good idea to check the course forum on a regular basis and read the messages posted by your classmates and professors, as this can be another way to learn.

7. Study recommendations

When you study at university, you need to plan and be consistent from the first week. It's very useful to exchange experiences and opinions with professors and other students, as this will help you develop core competencies such as flexibility, negotiating skills, teamwork, and, of course, critical thinking.

To help you, we recommend using a general method of study based on the following points:

- Study systematically and at a steady pace.
- Attend class and regularly check the course forum on the *Campus Virtual* so that you keep up to date with what's happening.
- Participate actively in the course by sharing your opinions, doubts and experiences relating to the topics covered and/or suggesting new topics of interest for discussion.
- Read the messages posted by your classmates and/or professors.

Active participation in physical and virtual classroom activities is of special interest and academic value. You can participate in many different ways: asking questions, giving your opinion, doing all the activities your professor suggests, taking part in collaborative activities, helping your classmates, etc. This way of working requires effort, but it will help you get better results as you develop your competencies.