

1. BASIC INFORMATION

Course	Materials Resistance and Elasticity
Degree program	Degree in Aerospace Engineering of aircrafts
School	Arquitectura, Ingeniería y Diseño
Year	Second
ECTS	6
Credit type	Compulsory
Language(s)	English
Delivery mode	Face to face
Semester	Second
Academic year	2019-20
Coordinating professor	

2. PRESENTATION

This course belongs to the “Materials and production I” module:

- Materials science 6 ECTS (second year)
- Materials elasticity and resistance 6 ECTS (second year)
- Aerospace production and projects 6 ECTS (third year)

The course topics are strictly linked to several subjects of the Aerospace Engineering Career: in the process of conceiving, designing, building, certifying, delivering and maintaining aero structures, the resistance of materials under load conditions is crucial to understand aero structure components and parts behavior.

The Engineering market is requiring an ever-growing emphasis on Concurrent Engineering, especially between Design, Stress Analysis and Manufacturing, reducing interaction with fellow departments and increasing their efficiency, resulting in shortening the timescale to certification.

Best Aerospace companies currently fund their success requiring their engineers a balanced mix of Knowledge, Experience and Concurrent Work in within and between departments.

This course allows the future engineers to enhance their Knowledge by a continuous class interaction.

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.

Cross-curricular competencies:

- CT13 (N2): Ability to use tools to search for library resources or information (information retrieval).
- CT15 (N2): Compile and interpret data to make judgments that include relevant social, scientist, and ethical issues, taking fundamental rights respect into consideration, as well as the democratic principles, gender equality, solidarity, environment protection, universal accessibility and design for all, and culture of peace (consultancy).
- CT20 (N2): Take decisions, in advance, on what is need to be done, who should do it, and how it should be done.

Specific competencies:

- CE7: Understanding of the behavior of structures under stress in service conditions and limit situations.
- CE11: Understanding of technological performance, optimization techniques of materials and material properties change by treatments.
- CE18: Appropriate knowledge applied to engineering of: basics of fluid mechanics; basic principles of flight control and automation; main characteristics and physical and mechanical properties of materials.

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 module.

- LO22: To transfer some parts of an engineering problem to the laboratory, and utilize this resource as support to resolve it.

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

Competencies	Learning outcomes
CT13(N2), CT15(N2), CE7, CE11, CE18	LO20
CB2, CT13(N2), CT20(N2), CE7, CE11, CE18	LO21
CT13(N2), CT20(N2), CE7, CE11	LO22

4. CONTENT

- Introduction to the mechanics of continuous media
- Introduction to elasticity
- Material resistance (bending, tension, torsion, deformation)
- Calculation of structures

5. TEACHING-LEARNING METHODOLOGIES

1. Survey of objectives and interests
2. Master class
3. Laboratory practices
4. Group research or group problem solving
5. Field experiences, conferences, visits to companies and institutions

6. LEARNING ACTIVITIES

Listed below are the types of learning activities and the number of hours the student will spend on each one:

Campus-based mode:

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

7. ASSESSMENT

Listed below are the assessment systems used and the weight each one carries towards the final course grade:

Assessment criteria	Weight (%)
1. Exam, test and other type of assessment.	30%-35%
2. Reports, articles and informs.	15%-30%
3. Alternative system of assessment.	15%-30%
4. Conferences, company-tour visit and experiences in situ	10%-10%
6. Transversal skills (rubric)	10%-15%

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

7.1. First exam period

To pass the course in the first exam period, you must obtain a final course grade of at least 5 out of 10 (weighted average). Minimums needed to pass:

The failed assignments, homework or lab reports during academic year can be submitted on extraordinary session. To pass the course, each assignment shall have, at least, five points out of ten and it is mandatory to pass all assignments, activities and exams. If the student fails or does not submit some activities these activities will not be considered for the average of the final grade.

In the case, when the student do not reached the minimum required to pass any evaluable activity. The final grade will be:

- The mean average when the mean value is less than or equal to 4
- 4 if the value of the mean average is greater than 4

The grade will be considered as NP (Not Presented) when the student has not delivered any evaluable activity of which they are part of the weighted average.

7.2. Second exam period

To pass the course in the first exam period, you must obtain a final course grade of at least 5 out of 10 (weighted average). Minimums needed to pass:

The failed assignments, homework or lab reports during academic year can be submitted on extraordinary session. To pass the course, each assignment shall have, at least, five points out of ten and it is mandatory to pass all assignments, activities and exams. If the student fails or does not submit some activities these activities will not be considered for the average of the final grade.

In the case, when the student do not reached the minimum required to pass any evaluable activity. The final grade will be:

- The mean average when the mean value is less than or equal to 4
- 4 if the value of the mean average is greater than 4

The grade will be considered as NP (Not Presented) when the student has not delivered any evaluable activity of which they are part of the weighted average.

8. BIBLIOGRAPHY

Here is the recommended bibliography:

- Aircraft structures for engineering students; Megson T.H.G., Butterworth-Heinemann, 2007.
- Introduction to Composite Materials; Tsai, S.W., and Hahn, H.T., Technomic Publishing Co., Westport, CT, 1980.
- Airframe Structural Design; Michael Chun-Yung Niu; Practical Design Information and Data on Aircraft Structures. Conmilit, 2006.
- Elements of spacecraft design (2002). Charles D. Brown. AIAA Education Series.
- Resistencia de Materiales; Luis Ortiz Berrocal; McGraw-Hill, 2010.
- Strength of Materials, 3e Vol. I: Elementary Theory and Problems Paperback. S. Timoshenko. December 1, 2004
- Strength of Materials, Part 1 and Part 2 3rd Edition. S. Timoshenko.

9. DIVERSITY MANAGEMENT UNIT

Students with specific learning support needs:

Curricular adaptations and adjustments for students with specific learning support needs, in order to guarantee equal opportunities, will be overseen by the Diversity Management Unit (UAD: Unidad de Atención a la Diversidad).

It is compulsory for this Unit to issue a curricular adaptation/adjustment report, and therefore students with specific learning support needs should contact the Unit at unidad.diversidad@universidadeuropea.es at the beginning of each semester.

INSTITUTIONAL ASSESSMENT OF LEARNING OUTCOMES PLAN Covid-19 TEMPLATE TO ADAPT TEACHING AND EVALUATION ACTIVITIES

Course/Module: Materials Resistance and Elasticity
Degree Program: Degree in Aerospace Engineering of aircrafts
Year: 2º
Group (s): M2Z
Professor: Anwarul Haque
Coordinating professor Alicia Páez

Teaching Activity described in the syllabus	Adapated activity in distance learning
Survey of objectives and interests	Survey of objectives and interests online
Master class	Master class online
Laboratory practices	Laboratory practices online
Group research or group problem solving	Group research or group problem solving online
Field experiences, conferences, visits to companies and institutions	Virtual field experiences, conferences, visits to companies and institutions

Evaluation Activity that was planned in the Syllabus for face to face instruction		NEW virtual evaluation activity (adapted)	
Description of original face to face evaluation activity	Laboratory experiments	Description of new activity	Laboratory experiments online. Instead of the face-to-face laboratory practice, the operation of the equipment will be explained and the students will analyze realistic test data
Content to be assessed	Introduction to the mechanics of continuous media Introduction to elasticity Material resistance (bending, tension, torsion, deformation) Calculation of structures		
Learning Outcomes to be assessed <i>(Please check Syllabus of the course/module)</i>	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.		
Duration	January-May	Approximate duration	January-May
Weight in evaluation	20%	Weight in evaluation	20%
Please note:			

Evaluation Activity that was planned in the Syllabus for face to face instruction		NEW virtual evaluation activity (adapted)	
Description of original face to face evaluation activity	Midterm exams and final exam	Description of new activity	Midterm exams final exam online
Content to be assessed	Introduction to the mechanics of continuous media Introduction to elasticity Material resistance (bending, tension, torsion, deformation) Calculation of structures		
Learning Outcomes to be assessed <i>(Please check Syllabus of the course/module)</i>	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.		
Duration	January-May	Approximate duration	January-May
Weight in evaluation	20 + 25%	Weight in evaluation	20 + 25%
Please note:	Exams will be done through blackboard		

Evaluation Activity that was planned in the Syllabus for face to face instruction		NEW virtual evaluation activity (adapted)	
Description of original face to face evaluation activity	Problem solving, assignments	Description of new activity	Problem solving, assignments online
Content to be assessed	Introduction to the mechanics of continuous media Introduction to elasticity Material resistance (bending, tension, torsion, deformation) Calculation of structures		
Learning Outcomes to be assessed (Please check Syllabus of the course/module)	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.		
Duration	January-May	Approximate duration	January-May
Weight in evaluation	15 + 20%	Weight in evaluation	15 + 20%
Please note:	Activities will be done through blackboard		