

## 30123 - Resistance of Materials

### Syllabus Information

**Academic year:** 2023/24

**Subject:** 30123 - Resistance of Materials

**Faculty / School:** 175 - Escuela Universitaria Politécnica de La Almunia  
179 - Centro Universitario de la Defensa - Zaragoza

**Degree:** 425 - Bachelor's Degree in Industrial Organisational Engineering  
563 - Bachelor's Degree in Industrial Organisational Engineering

**ECTS:** 6.0

**Year:** 3

**Semester:** Second semester

**Subject type:** Compulsory

**Module:**

### 1. General information

The main objective of this subject is to enable the student to establish criteria that will allow him/her to determine the material, shape and dimensions necessary to design any structural element in a specific project during their future professional career.

These approaches and objectives are aligned with the Sustainable Development Goals **SDG-4** and **SDG-9** of the United Nations Agenda 2030 (<https://www.un.org/sustainabledevelopment/es/>), so that the acquisition of the learning results of the subject provides training and knowledge, skills and competencies to contribute to some extent to their achievement.

### 2. Learning results

1. Understand the concepts of stress and deformation and know how to relate them by means of behavioural equations, to solve problems of simple three-dimensional elastic solids.
2. Know how to calculate and represent stress diagrams in bars and simple structures.
3. Know how to solve torsion problems in axes and simple three-dimensional structures.
4. Know how to solve composite bending problems in beams and simple structures.
5. Understand the phenomenon of bar buckling and know how to solve isolated bar buckling problems.
6. Can distinguish between isostatic and hyperstatic problems and know different strategies for solving the latter.
7. Know and has used at least one computer program for structural analysis.

### 3. Syllabus

#### DEFENSE PROFILE

Topic 1: Introduction to Strength of Materials

Topic 2: Axial stress

Topic 3: Flexion

Topic 4: Torsion

Topic 5: Buckling

#### COMPANY PROFILE

Topic 1: Introduction to Strength of Materials

Topic 2: Design of Rigid Nodal Structures

Topic 3: Design of Articulated Node Structures

Topic 4: Displacement Calculation and Resolution of Hyperstatic Structures

Topic 5: Mechanics of Deformable Solids: Stress-Strain

### 4. Academic activities

#### DEFENSE PROFILE

- Theory classes and examples (2h/week): sessions to develop the content of the subject.
- Problem-solving classes [12.5 hours]: solving problems of different complexity.
- Evaluation tests [4.5 hours]: continuous assessment exams on the different topics of the subject the subject.

Total = 42 hours

- Personal study and work; practices; tutorials

**COMPANY PROFILE**

In order to carry out the time distribution, we use as a measure the teaching week, in which the students must dedicate a total of **10 hours/week** to the study of the subject.

- Theory classes and examples (2h/week): sessions to develop the content of the subject.
- Problem-solving classes [1h/week]: solving problems of varying complexity.
- Practical classes with software [1h/week]: solution with structural analysis software.
- Tutored activities (2h/week)
- Study and preparation of evaluation tests [2 hours/week]
- Resolution of continuous assessment exercises [2 hours/week]

**5. Assessment system**

**DEFENSE PROFILE**

**FIRST CALL**

Continuous assessment:

1. **Continuous Evaluation Tests ( 80% final grade):** assessment of contents and knowledge of the subject.

1. PEC1 on topics 1 and 2 (30%)
2. PEC2 on topic 3 (30%)
3. PEC3 on topics 4 and 5 (20%)

2. Practice (20% final grade): completion of two group assignments.

1. Practice 1 (5%): tensile test
2. Practice 2 (15%): beam dimensioning in bending with the MEFI program

Global test:

Students who do not pass the course by continuous assessment or who would like to improve their grade will have the right to take the Global Test set in the academic calendar (1st call), prevailing, in any case, the best of the grades obtained. The global test will cover the contents of the entire subject taught, including the practical, and will consist of the resolution of problems and theoretical-practical questions to measure the final result of learning.

**SECOND CALL**

Global test:

Students who do not pass the subject in the first exam may sit for a Global Test set in the academic calendar for the second exam. It will be equivalent to the global test of the first call.

**ASSESSMENT CRITERIA**

They are established based on the learning results of the subject.

In order to pass the subject through continuous assessment, the weighted average of the PECs must be greater or equal to 4 out of 10 and the weighted average of the practicals must also be greater or equal to 4 out of 10.

In all cases, in order to pass the course, a grade greater than or equal to 5 must be obtained.

**INSTRUMENTS vs. LEARNING RESULTS (RA)**

Instruments Assessment	Weighting	RA-1	RA-2	RA-3	RA-4	RA-5	RA-6	RA-7
Tests of assessment	80%	X	X	X	X	X	X	
Practical classes:	20%	X	X					X

**COMPANY PROFILE**

**Continuous assessment system:**

Concept	Percentage	Assessment Criteria
<b>A: Written Tests.</b>		
There will be three compulsory written tests.	50%	Minimum grade for each test ≥ 3.0 Minimum grade for Block (A) ≥ 4.0
1st SP on topics 1 and 2		
2nd SP on topic 3		

3rd SP on topics 4 and 5

**B: Continuous Assessment Exercises.**

A total of 5 continuous assessment exercises will be carried out (one for each topic) on a mandatory basis

30%

Minimum grade for each exercise  $\geq 3.0$

Minimum grade for Block (B)  $\geq 4.0$

**C: Simulation Practices.**

Three practice sessions will be conducted on a mandatory basis.

20%

Minimum grade for each practical  $\geq 3.0$

Minimum Block Grade (C)  $\geq 4.0$

1st Practice on topic 2

2nd Practice on topic 3

3rd Practice on topic 4

**Average grade of the subject =  $50\%A + 30\%B + 20\%C \geq 5.0$**

A minimum grade of 5.0 must be obtained in order to pass the subject and all prerequisites must be fulfilled. Students who have passed the subject through this dynamic, may opt in the ordinary call to raise the grade (presenting to the full subject)

In case of not passing with the previous system, there will be two additional calls (Ordinary and Extraordinary) with a Global Assessment Test, which reflects the achievement of the learning results. This test will be a single test with theory and exercises representative of the entire syllabus of the subject contributing 100% to the final grade of the subject.