Universidad Zaragoza

Academic Year/course: 2023/24

28816 - Elasticity and Resistance of Materials

Syllabus Information

Academic year: 2023/24
Subject: 28816 - Elasticity and Resistance of Materials
Faculty / School: 175 - Escuela Universitaria Politécnica de La Almunia
Degree: 424 - Bachelor's Degree in Mechatronic Engineering
ECTS: 6.0
Year: 2
Semester: Second semester
Subject type: Compulsory
Module:

1. General information

The purpose of this subject is for students to acquire the competences of the module common to the industrial branch industrial branch **"Knowledge and use of the principles of material resistance**" (According to order CIN/351/2009).

These approaches and objectives are aligned with the Sustainable Development Goals (SDGs) of the United Nations Agenda 2030 (https://www.un.org/sustainabledevelopment/es/) so that the acquisition of the learning results of the subject will contribute to some extent to the achievement of the SDGs:

Goal 4: Ensure inclusive, equitable and quality education and promote learning opportunities.

Goal 9: Build resilient infrastructure, promote sustainable industrialization and foster innovation.

The subject "Elasticity and Strength of Materials" is mandatory and belongs to the *Mechanics Module* within the Mechatronics Engineering Degree. In the current *study plan* it has a teaching load of 6 ECTS and is taught in the second semester of the second year.

2. Learning results

- **Design or analyze**, using computer tools; the behavior of parts, subassemblies or systems, against established stresses or performance requirements.
- **Calculate and design** structural elements subjected to loads.

3. Syllabus

Topic1. Introduction to the Resistance of Materials

- Types of Structures, Links and Loads.
- Equilibrium and GDH of a Structure.
- Definition and types of Internal Forces.
- Calculation and Representation of Stress Diagrams.

Topic 2: Design of Rigid Node Structures.

- Plasticization Criteria: Von-Mises stress.
- Normal Stress Distribution in a section (Axial and Flector).
- Tangential stress distribution in a section (shear and torsional).
- Bending and torsion problems in structures.

Topic 3: Design of Articulated Node Structures.

- Method of knots for structural design.
- PTV method for calculating displacements.
- Bending phenomenon.

Topic 4. Calculation of displacements in structures.

- Principle of Virtual Works (Rotations and Displacements).
- Flexibility Method for the Design of Hyperstatic Structures.

Topic 5. Mechanics of Deformable Solids: Stress-Strain

- Mechanics of the Deformable Solid.
- Behavioral relationship.

4. Academic activities

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

At the beginning of the subject, students will choose one of the following two evaluation methodologies:

- A **Continuous Assessment System**, which will be carried out throughout the entire learning process. Characterized by the obligation to take and pass the practical tests, partial exams and academic work proposed in the course, within the deadlines established for this purpose. In this case, the student does not have to take a final exam.
- An **overall assessment test**, reflecting the achievement of the learning results, at end of the teaching period. Characterized by not taking or not passing the tests practices, partial exams or academic work proposed in the subject. In this case, the student must take a final exam.

Continuous assessment system: Explanation

Concept	Percentage	Assessment Criteria
A: Written Tests. Three compulsory written tests will be carried out 1st SP on topics 1 and 2 2nd SP on item 3 3rd SP on topics 4 and 5	50%	Minimum grade for each test≥ 3.0 Minimum grade for Block (A) ≥ 4.0
B: Continuous Assessment Exercises. A total of 5 continuous assessment exercises will be carried out (one for each of the following subject) on a mandatory basis	30%	Minimum grade for each exercise≥ 3.0 Minimum grade for Block (B) ≥ 4.0
C: Simulation Practices. Three compulsory practice sessions will be conducted 1st Practice on topic 2 2nd Practice on topic 3 3rd Practice on topic 4	20%	Minimum grade for each practical ≥ 3.0
Average grade of the subject = 50%A+30%B+20%C ≥ 5.0		

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

In case of failure to pass with the previous system, there will be two additional exams available two additional calls (Ordinary and Extraordinary) performing a Global AssessmentTest, 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 subjectcontributing 100% to the final grade of the subject.