Universidad Zaragoza

Academic Year/course: 2024/25

29920 - Strength of Materials

Syllabus Information

Academic year: 2024/25
Subject: 29920 - Strength of Materials
Faculty / School: 110 - Escuela de Ingeniería y Arquitectura
Degree: 435 - Bachelor's Degree in Chemical Engineering
ECTS: 6.0
Year: 3
Semester: First semester
Subject type: Compulsory
Module:

1. General information

The subject of Strength of Materials is part of the block of subjects of the Industrial Branch of the Plan of studies of the Degree of Engineering. The subject presents the conceptual bases of the Strength of Materials and is the only training course in the degree program related to the mechanics of continuous media and the theory of structures. Given its finalist character of training in Structural Mechanics, the program is generalist and tries to cover the aspects that future graduates in chemical engineering may encounter (related to this training in Structural Mechanics) in the performance of their duties. Therefore, the student will be provided with the solid bases and the necessary rigor trying to show the application of the concepts developed in the course to problems related to the field of Chemical Engineering.

2. Learning results

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

3. Syllabus

The content of the subject is as follows:

- Concepts of deformable solid, stress and deformation. Linear elastic behavior equations: Brief introduction to the theory of linear elasticity.
- Bar typology: Introduction to the structural typology of bars, as well as to the calculation of the stresses to which is subjected.
- Tension and compression of bars: Calculation of stresses, deformations and displacement of bars subjected to axial tensile and compressive stresses. Differential formulation and elastic energy stored. Axial forces on surfaces of revolution (such as tanks, pipes, etc.)will also be analyzed.
- Uniform torsion of bars: Calculation of stresses, strains and twists in thin-walled tubes or bars of circular cross-section subjected to uniform torsion. Differential formulation and stored elastic energy.
- Composite bending of bars: Calculation of stresses, strains and spins of bars subjected to composite bending. Differential formulation and stored elastic energy.
- Bar failure criteria: Brittle and ductile fracture, buckling, plasticization criteria.
- Solving isostatic and hyperstatic problems of bars: Solving isostatic and hyperstatic problems in bars subjected to any type of stress. Hyperstatic problem solving by the flexibility method.

4. Academic activities

- **Theoretical classes**.
- **Practical problem solving classes**.
- **Computer practices**.
- **Tutoring**.

5. Assessment system

A **continuous** assessment of the subject is proposed, consisting of the following sections:

Examination (Weighting: 70%) (Minimum grade to average with the rest of the tests: 4.5 points)

- Final test in which the complete content of the course will be assessed.
- It will consist of a theoretical part and a practical part (exercises).
- It will have an estimated duration of three hours.

Partial assessment test (Weighting: 10 %) (Minimum grade to average with the rest of the tests: 4.0 points)

- Towards the middle of the subject there will be a written test to assessment the concepts presented up to that point .
- It will have an estimated duration of one hour.

Internships (Weighting: 20%) (Minimum grade to average with the rest of the tests: 4.5 points)

- Computer practice sessions will be conducted in groups of less than twenty students.
- Assessment questionnaires will be conducted on the previous work to be carried out in the practical sessions

and a posteriori questionnaires on the activity carried out in the same. It may require obtaining some previous theoretical result related to the content of the practice.

The student who does not pass the continuous assessment or does not wish to take it, will opt for a **global assessment**. In second call it is mandatory to take the global assessment. Their characteristics are described below: *Examination (Weighting: 80 %) (Minimum grade to average 4.5 points)*

- Final test (estimated duration 3 hours) in which the complete content of the course will be assessed.

Practice text (Weighting: 20 %) (Minimum grade for averaging 4.5 points)

- It will have an estimated duration of two hours.
- If the student has satisfactorily completed the internship in the regulated sessions, they will be exempted from taking this test in the global evaluation test, the grade obtained during the term will be used to mediate with the test.

6. Sustainable Development Goals

9 - Industry, Innovation and Infrastructure