

## 30021 - Strength of Materials

### Syllabus Information

**Academic year:** 2024/25

**Subject:** 30021 - Strength of Materials

**Faculty / School:** 110 - Escuela de Ingeniería y Arquitectura

**Degree:** 436 - Bachelor's Degree in Industrial Engineering Technology

**ECTS:** 6.0

**Year:** 3

**Semester:** Second semester

**Subject type:** Compulsory

**Module:**

### 1. General information

The objective of the subject is to enable the student to analyze and design the simplest and also the simplest deformable solid and design the simplest and most common deformable solid, the the bar element, which appears in most of the building structures as well as in innumerable machine elements.

The realization of practical sessions allows to check the validity of the basic hypotheses and the different simplifications of the different theoretical concepts developed and, on the other hand, the classes of problems and practical cases allow to demonstrate the application of these concepts. These activities proposed during the development of the course not only seek this assimilation of concepts, but also the enhancement of reasoning, synthesis, resolution and subsequent analysis of the results of different problems.

### 2. Learning results

The student, in order to pass this subject, will have to demonstrate that:

Understand the concepts of stress and deformation and know how to relate them by means of the behavioral equations, to solve simple three-dimensional elastic solid problems.

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 composite bending problems in beams and simple structures.

To understand the concepts of plasticization depletion and rupture, and to be able to correctly apply the most common plasticization criteria.

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 .

Identify the social, environmental, economic and industrial implications of strength of materials problems.

### 3. Syllabus

Motivation the motivation and objectives of this strength of materials course are as follows

#### **Block I: Element Bar**

1. Introduction to Strength of Materials.
2. Bar element. Effort concept
3. Axially stressed bars
4. Bars subjected to bending.
5. Bars subjected to torsion.

#### **Block II: Bar Structures**

1. Introduction Structural typologies.
2. Flexibility and Rigidity methods.
3. Finite elements applied to bars.
4. Structural failure criteria (creep and buckling).

### 4. Academic activities

Theoretical classes The content of the program is developed and examples of application are presented. For the definition of technical terms, both Spanish and English are used simultaneously.

Problem classes (T2). Resolution, delivery, and defense of practical cases related to theoretical classes.

Simulation and laboratory practices: The practical sessions are intended to familiarize students with computational simulation through different applications.

Tutoring. Resolution of doubts in a personalized way or in small groups.

## 5. Assessment system

There are two assessment modalities to pass the subject: **gradual** and **global**.

The following tests are proposed for a gradual assessment:

Practical cases (20 %)

- Mandatory attendance to problem-solving sessions. Submission and defense of proposed activities.
- Practical cases related to the subject content that involve the analytical and numerical resolution of bar structures will be proposed. The evaluation will be based on regular submissions and defenses, with attendance at the sessions being mandatory.
- A grade equal to or higher than 4 will allow averaging with the rest of the activities.

Practices (15 %)

- It will be carried out in five sessions of 3 hours of individual computer practice.
- Its assessment will be based on questionnaires filled out by the students in the ADD.
- A grade equal to or higher than 4 will allow averaging with the rest of the activities.

Examination (65 %)

- Final exam during the period set by the School. You must obtain a grade equal to or higher than 4.0 to mediate with the rest of the activities.

For an overall evaluation of the course, the following is proposed:

Final exam. It will consist of a theory/problem part (85%) and a practical part (15%), having to reach a minimum score of 5 in each part.

## 6. Sustainable Development Goals

9 - Industry, Innovation and Infrastructure

11 - Sustainable Cities and Communities