

## 29717 - Strength of Materials

### Syllabus Information

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**Academic year:** 2023/24

**Subject:** 29717 - Strength of Materials

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

**Degree:** 330 - Complementos de formación Máster/Doctorado  
434 - Bachelor's Degree in Mechanical Engineering

**ECTS:** 6.0

**Year:** 434 - Bachelor's Degree in Mechanical Engineering: 2

330 - Complementos de formación Máster/Doctorado: XX

**Semester:** Second semester

**Subject type:** 434 - Compulsory

330 - ENG/Complementos de Formación

**Module:**

### 1. General information

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

The subject covers both the fundamentals of Strength of Materials and its more applied aspects. The realization of practical sessions allows to check the validity of the basic hypotheses and the different simplifications proposed in the theoretical exposition of the different concepts developed. Along the same line are the problem classes, which allow the application of the theory and the continuation in the understanding and assimilation of the concepts covered throughout the subject.

### 2. Learning results

The learning results obtained in the subject enable the student to deal with problems related to structural mechanics that arise in the field of Mechanical Engineering: design and testing of industrial and building structures, strength analysis of all types of machines and installations, vehicle design, etc.

1. Understand the concepts of stress and deformation and know how to relate them by means of the behavioral equations, to solve problems of simple three-dimensional elastic solids.
2. Know how to calculate and represent stress diagrams in bars and simple structures. Know how to solve problems of torsion in axes and simple three-dimensional structures.
3. Know how to solve composite bending problems in beams and simple structures.
4. Understand the concepts of exhaustion by plasticization and breakage and know how to correctly apply the most common plasticization criteria.
5. Understand the phenomenon of bar buckling and know how to solve isolated bar buckling problems.
6. Know how to distinguish between isostatic and hyperstatic problems and know different strategies for solving the latter.

### 3. Syllabus

Unit 1. Introduction to deformable solids and strength of materials.

Unit 2. Structural strength analysis.

Unit 3. Bars subjected to tension and compression.

Unit 4. Bars subjected to bending.

Unit 5. Bars subjected to torsion.

Unit 6. Buckling.

Unit 7. Introduction to the analysis of bar structures.

### 4. Academic activities

Theory and problems. Theory constitutes the central teaching nucleus. Although the technique followed in the explanation of theoretical concepts is fundamentally expository, we try to accompany it with explanatory examples that reinforce its comprehension. In addition, the resolution of problems that allow the student to apply the theoretical concepts to the resolution of engineering practice problems is proposed.

Computational simulation practices. The aim is to familiarize students with another of the basic tools, such as calculation and numerical simulation.

Subject work. Project-based learning.

Tutoring. Reinforcement of contents explained in class.

## 5. Assessment system

### Continuous assessment

- 1) Subject work (15% of the final grade).
- 2) Practices (15% of the final grade). Their assessment will be based on questionnaires after the completion of the practice.
- 3) Exam (70% of the final grade). On the date of the official exam of the first call, there will be an exam that will evaluate the complete content of the subject. A minimum score of 4.5 out of 10 will be required for this exam. For to pass the subject this total grade must be equal or higher than 5 points out of 10.

### Global assessment

In the second call the only method available is global assessment.

- 1) Exam (85% of the final grade) On the date of the official exam of the first call, there will be an exam that will evaluate the complete content of the subject. A minimum score of 5 out of 10 will be required for this exam.
- 2) Practice exam (15% of the final grade). If the student has satisfactorily completed the practices in the regulated sessions ,they may be exempted from taking this practice exam, maintaining the grade corresponding to the continuous assessment. For to pass the subject this total grade must be equal or higher than 5 points out of 10.