Universidad Zaragoza

Academic Year/course: 2024/25

25881 - Strength of Materials

Syllabus Information

Academic year: 2024/25
Subject: 25881 - Strength of Materials
Faculty / School: 110 - Escuela de Ingeniería y Arquitectura
Degree: 558 - Bachelor's Degree in Industrial Design and Product Development Engineering
ECTS: 6.0
Year: 3
Semester: First semester
Subject type: Compulsory
Module:

1. General information

The objectives of this subject are that the student will be able to select the most adequate structural design to meet the requirements derived from the design; that they will be able to analyze how stresses are distributed in a deformable solid (mainly in bars) and to know how to determine whether a bar or bar structure is capable of fulfilling its resistant function under a given load state.

The fundamentals of strength of materials and its most applied aspects are provided. Reasoning is enhanced, synthesis, resolution and subsequent analysis of the results of the different problems.

2. Learning results

- To understand the concept of a deformable solid and to know how to differentiate it from a rigid solid.
- Know what the structural bar typology is and how to recognize it in your designs.
- Know how to calculate and represent stress diagrams in bars and simple bar structures.
- Know how to solve problems of uniform torsion 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 know how to correctly apply the plasticization criteria.
- To understand the phenomenon of bar buckling and to know how to solve isolated bar buckling problems.
- To know how to distinguish between isostatic and hyperstatic problems and to know different strategies for solving the latter.
- Know how to determine if the design is feasible from the point of view of mechanical resistance, knowing how to identify the critical element and how to proceed in its redesign

3. Syllabus

Unit 1. Introduction to Strength of Materials. Concepts of Deformable Solid, stress and deformation.

Unit 2. Axial force in bars

Unit 3. Stress diagrams.

Unit 4. Uniform torsion in circular section bars.

Unit 5. Composite bending of bars.

Unit 6. Introduction to buckling

Unit 7. Bolted joints.

4. Academic activities

Lectures. Presentation of contents by the teaching staff or by the students themselves, to all the students of the subject. 30 hours.

Problem solving and case studies. Practical exercises with all the students of the course. 15 hours.

Laboratory practices. Carrying out of practical exercises by computer, in small groups of students. 12 hours.

Carrying out practical application or research work. 15 hours.

Personalized teacher-student tutoring. 2 hours.

Study and personal work. 70 hours.

Assessment tests. 6 hours.

5. Assessment system

To pass, the final grade must be equal to or higher than 5 points out of 10. If the minimum exam grades are not met, neither papers nor practicals will be weighted. Two possibilities:

I) Continuous (only 1st call):

- Tutorial work (15% of the grade): with due dates

- Internships (15%): six computer practices. Questionnaires to be completed during the sessions.

- Exam (70%). On the date of first call. Theory and problems. If the stress diagram grade is lower than 50%, the final grade for the course cannot exceed 5. Minimum grade of 4.5 points out of 10 in this exam.

II) Overall assessment

- Exam (85%): Theory and problems. Minimum grade of 50% in stress diagrams, otherwise the final grade no may be higher than 5. Minimum grade of 5 points out of 10 in this exam.

- Practice exam (15%): exercises similar to those performed in the sessions

If the student has completed the practice sessions, they may keep their grade and not take the exam.

6. Sustainable Development Goals

9 - Industry, Innovation and Infrastructure