29920 - Strength of Materials

Syllabus Information

Academic Year: 2020/21
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

1.1.Aims of the course

1.2.Context and importance of this course in the degree

1.3.Recommendations to take this course

2.Learning goals

2.1.Competences

2.2.Learning goals

The student, in order to pass the course, will have to demonstrate the following results:

1. The student is able to understand the concepts of stress and strain and its relationships
2. The student knows how to calculate shear and moment diagrams
3. The student is able to solve torsion and bending problems
4. The student is aware of the buckling phenomenon
5. The student is able to aplly the knowledge of strength of materials on engineering applications and design problems using a computer program

2.3.Importance of learning goals

3.Assessment (1st and 2nd call)

3.1.Assessment tasks (description of tasks, marking system and assessment criteria)

4.Methodology, learning tasks, syllabus and resources

4.1.Methodological overview

Teaching methodology

Teaching for this course will consist primarily of lectures where the fundamental theory will be presented, followed by examples to illustrate how the theory can be applied to solve practical engineering mechanics problems. Students will learn how to use computer programs to apply the knowledge of strength of materials, that have been described in the lectures, on engineering applications and design problems. They will be required to perform calculations using the results of the programs to demonstrate their understanding of the underlying theory. Students will develop their understanding of the course content through the reading of the textbook, practice problem solving through tutorial questions and attendance at lectures where problem-solving strategies are presented and discussed.

4.2.Learning tasks

The distribution of the learning activities during the semester of the course is:

- Lectures (1.8 ECTS): 45 hours.
- Computer sessions (0.6 ECTS): 15 hours
- Guided assignments (0.6 ECTS): 15 hours.
- Autonomous work (2.80 ECTS): 70 hours.
- Evaluation (0.2 ECTS): 5 hours.
- Tutorials

Lectures: the professor will explain the theoretical contents of the course and solve illustrative applied problems. These problems and exercises can be found in the problem set provided at the beginning of the semester. Lectures run for 3 weekly hours. Although it is not a mandatory activity, regular attendance is highly recommended.

Computer Lab sessions: sessions will take place every 2 weeks. Students will work together in groups actively doing tasks such as practical demonstrations, measurements, calculations or simulations.

Guided assignments: students will complete assignments, problems and exercises related to concepts seen in laboratory sessions and lectures.

Autonomous work: students are expected to spend about 70 hours to study theory, solve problems, and prepare lab sessions.

Tutorials: the professor's office hours will be posted on Moodle and the degree website to assist students with questions and doubts. It is beneficial for the student to come with clear and specific questions.

4.3.Syllabus

The course will address the following topics:

1. Theory of Elasticity

    A short introduction to the theory of linear elasticity .

2. Beam types

    Axial, shear and bending loads.

3. Axial loading of prismatic sections

    Stress and strain calculation of prismatic sections under axial loading. Elastic energy. Differential equation. Axial loading in 2D structures (tanks, pipes, etc.)

4. Uniform torsion of prismatic sections

    Stress and strain calculation of circular and thin-walled hollow shafts. Elastic energy. Differential equation. The angle of twist.

5. Bending of prismatic sections

    Axial, shear and bending diagrams. Stress and strain calculation of prismatic sections. Elastic energy. Differential equation. Beam deflection.

6. Failure theories

    Brittle and ductile failure. Yield criteria. Buckling in columns: Euler's formula and extension of Euler's formula

7. Structural analysis: basic concepts

4.4.Course planning and calendar

For further details concerning the timetable, classroom and further information regarding this course, please refer to the "Escuela de Ingeniería y Arquitectura " website (https://eina.unizar.es/)

4.5.Bibliography and recommended resources

http://biblos.unizar.es/br/br_citas.php?codigo=29920&year=2019