Universidad Zaragoza

**Year : 2019/20**

# 28714 - Structure Theory

## Syllabus Information

**Academic Year:** 2019/20
**Subject:** 28714 - Structure Theory
**Faculty / School:** 175 -

**Degree:** 423 - Bachelor's Degree in Civil Engineering

**ECTS:** 6.0
**Year:** 2
**Semester:** First semester
**Subject Type:** Compulsory
**Module:** ---

# 1.General information

## 1.1.Aims of the course

The subject has the following aims and scopes:

- At the end of this subject, the student will understand the physical phenomenon of solids deformation, as well as the resistant schemes related with each structural typology.
- The student will understand the two principles that all deformable solid must fulfill:
  - a) The  equilibrium between external and internal forces
  - b) The compatibility of solid deflections with the external and internal constraints / restraints, forces and other strain effects.

The student will be able to solve structural systems by using the two aboved meantioned principles.

## 1.2.Context and importance of this course in the degree

The subject of Theory of Structures, is part of the Civil Engineering degree (Grado en Ingeniería Civil) taught by EUPLA. It is It is a subject of the second course, placed in the first semester and compulsory (OB), it has 6 ECTS.

This subject is one of the student's first contacts with structural analysis field, which is very important to the future of the students. This subject has two main parts, a first one focus on the strength of materials and a second one on structures analsys.

Although this is one of the first students' contact with the structural analysis, the sizing of steel members is already cover in the subject.

The students who take this course they need to have a good level of maths, physics, mechanic concepts, learned in previous degree courses.

## 1.3.Recommendations to take this course

It is recommeded that students have passed the previous bacherlor's degree subjects of Mathematics, Physics and Mechanics of the first academic course. The student, before starting this subject, should be able to:

- Understand how to work with polynomials and trigonometric functions.
- Solve a linear system with different numbers of variables.
- Solve a polynomial equation of "n" degrees.
- Know how to work with vectors and matrixes.
- Derive and integrate polynomial functions and trigonometric funtions
- Change of physical units.
- Knowledge of vector algebra
- Apply the equations of the statics to obtain one or more unknown forces.
- Calculate statically determined articulated trusses.
- Calculate internal forces of simply supported beams.

# 2.Learning goals

## 2.1.Competences

## 2.2.Learning goals

## 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

Presentation general methodology

The learning process designed for this subject is based on the following:

Strong interaction between the teacher/student. This interaction is brought into being through a division of work and responsibilities between the students and the teacher. Nevertheless, it must be taken into account that, to a certain degree, students can set their learning pace based on their own needs and availability, following the guidelines set by the teacher.

The current subject  is conceived as a stand-alone combination of contents, yet organized into three fundamental and complementary forms, which are: the theoretical concepts of each teaching unit, the solving of problems or resolution of questions and laboratory work, at the same time supported by other activities

The organization of teaching will be carried out using the following steps:

- **Theory Sessions**: Theoretical activities carried out mainly through exposition by the teacher, where the theoretical supports of the subject are displayed, highlighting the fundamental, structuring them in topics and or sections, interrelating them.
- **Practice Sessions**: The teacher resolves practical problems or cases for demonstrative purposes. This type of teaching complements the theory shown in the lectures with practical aspects.
- **Individual Tutorials**: Those carried out giving individual, personalized attention with a teacher from the department. Said tutorials may be in person or online.

## 4.2.Learning tasks

**Programmed learning activities**

The programme offered to the student to help them achieve their target results is made up of the following activities...

Involves the active participation of the student, in a way that the results achieved in the learning process are developed, not taking away from those already set out, the activities are the following:

**Face-to-face generic activities:**

- Theory Classes: The theoretical concepts of the subject are explained and illustrative examples are developed as support to the theory when necessary.
- Practical Classes: Problems and practical cases are carried out, complementary to the theoretical concepts studied.

**Generic non-class activities:**

- Study and understanding of the theory taught in the lectures.
- Understanding and assimilation of the problems and practical cases solved in the practical classes.
- Preparation of seminars, solutions to proposed problems, etc.
- Preparation of the written tests for continuous assessment and final exams.

The subject has 6 ECTS credits, which represents 150 hours of student work in the subject during the four-month period, this is, 10 hours per week for 15 weeks of class.

**Activity / Weekly  school hours**

Lectures / 4 h

Other Activities & Autonomous work and study / 6 h

## 4.3.Syllabus

**Set of topics**

Topic 1: Introduction. Fundamental concepts

Topic 2: Statically Determinate Structures: calculation of forces and reactions

Topic 3: Mechanical properties of the materials

Topic 4: Tension-only and compression-only structures. Bar and cable systems (Only axial forces structures).

Topic 5: Pure Bending

Topic 6: Combined Bending and Axial Forces

Topic 7: Simple Bending & Shear Force

Topic 8: Torsional Moment

Topic 9: Beams deflection calculation (displacement and angle of rotation)

Topic 10: Energy Methods

Topic 11: Introduction to Statically Indeterminate Structures resolution

Topic 12: Statically Indeterminate Structures: Analysis by Force Method

Topic 13: Statically Indeterminate Structures: Analysis by Displacement Method

Topic 14: Buckling Analysis

Topic 15: Articulated Structures

## 4.4.Course planning and calendar

**Calendar of meetings attend them and presentation of works**

The dates of both final examinations will be the published on the official university website

http://www.eupla.unizar.es/asuntos-academicos/examenes

The dates of the midterm exams and course planning will be communicated through Moodle (university learning management system).

## 4.5.Bibliography and recommended resources

http://biblos.unizar.es/br/br_citas.php?codigo=28714&year=2019