

## 28612 - Structures I: Introduction to Structures

### Syllabus Information

**Academic Year:** 2019/20

**Subject:** 28612 - Structures I: Introduction to Structures

**Faculty / School:** 175 - Escuela Universitaria Politécnica de La Almunia

**Degree:** 422 - Bachelor's Degree in Building 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 Structures I, is part of the Building Engineering degree (Grado en Arquitectura Técnica) taught by EUPLA, framed within the group of specific subjct. It is a subject of the second course, 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 analysys.

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 recommended 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

The methodology followed in this course is oriented towards the achievement of the learning objectives. A wide range of teaching and learning tasks are implemented, such as theory sessions, practice sessions, laboratory sessions, tutorials, and autonomous work and study.

A strong interaction between the teacher and student is encouraged. 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, up to a certain degree, students can set their learning pace based on their own needs and availability, following the guidelines set by the teacher.

### 4.2.Learning tasks

This course is organized as follows:

- **Theory sessions:** The theoretical concepts of the course 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.
- **Tutorials:** Individual tutorials that can be online or face-to-face
- **Autonomous work and study**
  - 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.

### 4.3.Syllabus

This course will address the following 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

The course has 6 ECTS credits, which represents 150 hours of student work in the course during the four-month period. This

is, 10 hours per week for 15 weeks of class. This includes 4 hours of lectures a week and 6 hours of autonomous work and study and other activities.

Further information concerning the timetable, classroom, office hours, assessment dates (<http://www.eupla.unizar.es/asuntos-academicos/examenes>) and other details regarding this course will be provided on the first day of class or please refer to the Faculty of EUPLA website and Moodle.

#### **4.5. Bibliography and recommended resources**