Universidad Zaragoza

**Academic Year/course: 2023/24**

# 29739 - Metal Structures

## Syllabus Information

**Academic year:** 2023/24
**Subject:** 29739 - Metal Structures
**Faculty / School:** 110 - Escuela de Ingeniería y Arquitectura
**Degree:** 434 - Bachelor's Degree in Mechanical Engineering
**ECTS:** 6.0
**Year:** 4
**Semester:** First semester
**Subject type:** Optional
**Module:**

## 1. General information

Objectives of the subject:

Design and testing of steel structures.

Discussion of Spanish and European regulations applicable to this type of structures.

Deepening in the conceptual aspects of the design of metallic structures.

Overview of the metallic structure and its applications in civil and industrial construction.

Special emphasis is placed on the following aspects:

Steel as a structural material

Actions on structures Load hypotheses Stress laws and stress envelopes

Dimensioning and testing of parts

Construction details

Application of regulations

After having studied the theoretical foundations of Structural Analysis, this subject applies them to the design of detail. This is the first subject that confronts the student with the detailed structural design of real constructive elements

It is essential to have taken the subjects Resistance of Materials, Mechanics of the Deformable Solid and Theory of Industrial Structures and Installations

## 2. Learning results

**Competencies**

Specific competencies:

C31: Ability to apply engineering graphics techniques, including CAD/CAM/CAE software.

C38: Ability to apply the fundamentals of elasticity and strength of materials to the behaviour of real solids.

C39: Ability to calculate and design structures and systems in the field of construction and urban planning.

Generic competencies:

C1: Ability to plan, design and develop engineering projects.

C4: Ability to solve problems and make decisions with initiative, creativity and critical thinking.

C5: Ability to communicate and transmit knowledge, skills and abilities in Spanish.

C6: Ability to use engineering techniques, skills and tools necessary for engineering practice.

C9: Ability to manage information, handling and application of technical specifications and legislation required for the practice of engineering.

C10: Ability to learn continuously and develop autonomous learning strategies.

2.2- **Learning Results**

Is capable of designing and calculating and projecting steel structures

Knows in detail the resistance mechanisms in steel structures under different types of stresses

Knows in detail the concepts related to structural safety

Is capable of defining unique construction details

Manages national and European regulations on steel structures, with full knowledge of their application limits

## 3. Syllabus

Building with steel

Structural steel design

Analysis of steel structures

Calculation bases

Section strength

Tensile stressed parts

Flexural buckling. Theoretical basis

Compressed parts

Bars under bending stress

Stress interaction

Screws and bolts

Welding

Calculation of joints

## 4. Academic activities

The subject consists of four well-determined teaching blocks consistent with a tutored work: Theoretical classes, where the fundamental concepts for the understanding and development of the subject as a whole are introduced.

Exercise classes, application of theoretical concepts with practical exercises related to the subject work Practical classes, developed with professional computer applications where the subject work is modelled Development of the subject work, practical example of an individualized industrial building in which all the concepts exposed in the previous parts are applied and that can serve as an embryo of the Degree Final Project

## 5. Assessment system

Continuous assessment

The evaluation will be carried out by means of a theoretical-practical exam and the oral defence of a work, with the following evaluation:

Examination: 30 %, being necessary to obtain a grade higher than 5 out of 10

Work: 70%

Practices: delivery of the modelling of the work (no value in the final grade)

The exam will consist of specific exercises on conceptual aspects of the subject.

The practical work will be carried out on a real case, which will be developed as the subject progresses, applying in each phase the knowledge acquired in theory classes.

There will be an oral defence of the work done, at the end of the term.

Global assessment

It will consist of a theoretical exam and the calculation of a building structure with the use of computer tools, presenting part of the work with supporting calculations and construction drawings, with the following evaluation:

Examination: 40 %, being necessary to obtain a grade higher than 5 out of 10

Calculation exercise: 60%