Universidad Zaragoza

**Academic Year/course: 2024/25**

# 29741 - Concrete Structures

## Syllabus Information

**Academic year:** 2024/25
**Subject:** 29741 - Concrete Structures
**Faculty / School:** 110 - Escuela de Ingeniería y Arquitectura
**Degree:** 434 - Bachelor's Degree in Mechanical Engineering
**ECTS:** 6.0
**Year:** 4
**Semester:** Second semester
**Subject type:** Optional
**Module:**

## 1. General information

**Approaches and objectives:**

* Design and testing of concrete structures.

* In-depth study of the conceptual aspects of the design of reinforced concrete structures.

* Overview of the applications of reinforced concrete structures in civil and industrial construction.

**Context and meaning of the subject in the degree:**

It is an elective subject that is part of the curriculum of the Bachelor of Architecture. It is assigned six credits and is taught in the second semester of the fourth year.

It is a natural continuation of the courses Structures 1, Structures 2 and Structures 3, in which the conceptual foundations on which it is based have been established . Based on their knowledge, this course provides the student with the concepts and technological tools necessary for the analysis of reinforced concrete structures, as well as their regulations.

## 2. Learning results

1.- Ability to determine the type of concrete required for each application and to dose it.

2.- Ability to design and calculate reinforced concrete structures.

3.- Detailed knowledge of the resistance mechanisms in a reinforced concrete structure under different types of stresses.

4.- Detailed knowledge of the concepts related to structural safety.

5.- Ability to calculate reinforced concrete construction elements.

6.- Fluency in the handling of national and European regulations on reinforced concrete structures, with full knowledge of their application limits.

The learning outcomes of this subject are fundamental for the final materialization of architectural projects.

An architect's competence is the ability to conceive the most appropriate structural solution for each project and need, taking into account that with the study of this subject the following competences should be acquired: * Combine generalist and specialized knowledge of architecture to generate innovative and competitive proposals in the professional activity.

* Solve problems and make decisions with initiative, creativity and critical thinking.

* Communicate and transmit knowledge, skills and abilities related to reinforced concrete.

* Analyze and assess the social and environmental impact of solutions, acting with ethics, professional responsibility and social commitment.

* Manage information, handle and apply technical specifications and legislation in force, necessary for the architecture practice.

* Continuous learning and development of autonomous learning strategies.

* Apply information and communication technologies.

* Coordinate activities.

* Writing reports or documents.

* Ability to apply technical and constructive standards.

* Ability to conceive, calculate, design and integrate buildings and urban complexes, executing appropriate foundation solutions.

## 3. Syllabus

0.- Calculation bases. Ultimate limit states (U.L.S.) and serviceability limit states (S.L.S.).

1.- Introduction to reinforced concrete.

2.- Concrete constituents.

3.- Dosage of reinforced concrete.

4.- Properties of reinforced concrete.

5.- The method of connecting rods and tie rods.

6.- General reinforcement arrangements and reinforcement details.

7.- Calculation in exhaustion under normal stresses.

8.- Buckling in reinforced concrete elements.

9.- E.L.U. of exhaustion against shear.

10.- E.L.U. of torsion.

11.- E.L.U. of shallow stresses in joints between concretes.

12.- E.L.U. punching.

13.- E.L.S. cracking.

14.- E.L.S. of deformation.

15.- Foundations and walls.

## 4. Academic activities

* The official academic calendar reflects class periods and exam dates.

* Lectures, problems and practical classes are given according to the calendar and schedules established by EINA.

* Activities must be submitted by the deadline announced by the teacher on the first day of class.

* At the end of each topic, the student will present the solved practical exercises individually.

* The assignment must be submitted prior to the date announced by the professor on the first day of class.

* The professor will inform the first day of class of his tutoring schedule.

## 5. Assessment system

**1. Continuous assessment**

A theoretical exam and a practical exam at the end of the subject, the realization of practices and a work of the subject, developed along the subject, with the following assessment.

* Theoretical examination: 20%, being necessary to obtain a grade equal or higher than 5 out of 10 to pass the course.

* Practical examination: 30%, being necessary to obtain a grade equal or higher than 5 out of 10 to pass the subject.

* Practices and subject work: 50%, being necessary to obtain a grade equal or higher than 5 out of 10 to pass the subject.

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

The practical exam will consist of the resolution of one or more practical problems by applying the theoretical knowledge acquired, and the handling of current regulations.

The scripts and/or practice sheets must be handed in on the due date, and the practice(s) that are not handed in will be considered as failed.

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

The professor may ask certain students, with a pre-set date and time, to make an oral defense of their course work.

**2. Global assessment**

The student who does not pass the continuous assessment or does not wish to do it, will opt for the global assessment, which will consist of a theoretical and a practical exam, with the following assessment:

* Theoretical examination: 40%, being necessary to obtain a grade equal or higher than 5 out of 10 to pass the subject.

* Practical examination: 60%, being necessary to obtain a grade equal or higher than 5 out of 10 to pass the subject.

This test will take place during the examination period established by the center, in the academic calendar.

## 6. Sustainable Development Goals

4 - Quality Education
8 - Decent Work and Economic Growth
9 - Industry, Innovation and Infrastructure