1. BASIC DATA

Subject	Structural Dimensioning
Grade	Grado en Fundamentos de la Arquitectura
School/ Faculty	Architecture, Engineering and Design School
Course	Third
ECTS	6 ECTS
Character	Basic
Language	English
Mode	Attendance
Quarter/Semester	Second Semester
Curso académico	2025/2026
Coordinator	José Agulló de Rueda

2. PRESENTATION

This course is the third in the subject of Structures and deals with the sizing of sections of structural elements of reinforced concrete, steel, wood and factory.

From the point of view of knowledge, the course begins with a review of the basic concepts of Regulations or Calculation Bases: loads, materials and safety coefficients.

Then the course goes through three parts differentiated by the material, but whose objective is the same: sizing structures to strength and rigidity, review the structural types for that material and know the construction criteria and structural detail with a brief introduction to its calculation.

This will cover reinforced concrete, steel, timber and masonry structures. The main types of structural floor will also be studied. In reinforced concrete, we will look at the reinforcement and curtailment of sections of beams and columns. In steel, the sizing of any type of simple or composite profile and the design and approximate calculation of its joints; bolted or welded. In timber, you will learn how to size sections and, in a basic way, the design and calculation of their joints. In masonry, you will learn to design with structural criteria and to understand basic concepts of stability and resistance. Regarding structural floor, you will learn how to size and reinforce concrete, uni and bidirectional slabs; and how to size usual steel and timber slabs.

From the practical point of view, Exercises and Works will be carried out with two different objectives. On the one hand so that the student understands and practices the mathematical concepts so necessary in this subject and on the other hand so that he understands the processes of work in the design, analysis, dimensioning and documenting of the structures of construction.

3. COMPETENCES AND LEARNING OUTCOMES

Basic Competences:

- CB1: That students have demonstrated that they possess and understand knowledge in their area of study which starts from the foundation of general secondary education, and is usually found at a level which, while supported by advanced textbooks, also includes some aspects involving knowledge from the forefront of their field of study.
- CB2: That students know how to apply their knowledge to their work or vocation in a professional manner and possess the skills that are usually demonstrated through the elaboration and defense of arguments and the resolution of problems within their area of study.
- CB3: That students have the ability to gather and interpret relevant data (usually within their area of study) to make judgments that include reflection on relevant social, scientific or ethical issues.
- CB4: That students are able to convey information, ideas, problems and solutions to both specialized and non-specialized audiences.
- CB5: That students have developed those learning skills necessary to understand subsequent studies with a high degree of autonomy.

General Competences:

- CG4: Understand the structural, construction and engineering design issues associated with building projects, as well as building resolution techniques.
- CG5: To know the physical problems, the different technologies and the function of the buildings, in order to provide them with internal conditions of comfort and protection from climatic factors.
- CG6: Know the industries, organizations, regulations and procedures to translate projects into buildings and to integrate plans into planning.

Transversal Competences:

- CT1: Responsibility: Aptitude or capacity to face the responsibility that raises awareness of the role that the profession of architect has in society, in particular by developing projects that take into account social and environmental factors.
- CT2: Self-confidence.
- CT4: Communicative skills in native language (either orally or in writing) and in the English language, according to the ideology of the European University of Madrid, any concept or specification specific to the development of the regulated profession of Architect. This will include learning the specific vocabulary of the degree. This aptitude includes the ability to manage information.
- CT5: Interpersonal understanding.
- CT6: Flexibility.
- CT7: Teamwork: Ability to work in teams of architects, or interdisciplinary teams (with shared responsibilities in many cases), managing and planning work groups, necessary in the scheme of skills and work that defines a project of a certain scope in which various disciplines converge. This capacity includes interpersonal relationship skills and team leadership skills.
- CT9: Planning and time management: Ability to plan work on the need to meet delivery deadlines and respect the limits imposed by budgetary factors and construction implementing regulations.
- CT10: Innovation and creativity: Creativity, imagination and aesthetic sensitivity aimed at design, satisfying both aesthetic and technical requirements. This competence includes critical reasoning and historical culture.

Specific competences:

- CE13: Aptitude to apply the technical and constructive norms.
- CE17: Ability to conceive, calculate, design, integrate into buildings and urban complexes and execute building structures.
- CE24: Adequate knowledge of the mechanics of solids, continuous media and soil, as well as the plastic, elastic and resistance qualities of heavy-duty materials.

Learning outcomes:

- RA1: Suitability for pre-sizing, design, calculation and testing of structures.

- RA2: Ability to dimension reinforced concrete sections, steel sections, and wood sections.
- RA3: Ability to understand the operation of pre-stressed concrete sections and composite sections.
- RA4: Ability to understand the operation of masonry structures.
- RA5: Ability to communicate and graphically represent solutions and structural details.
- RA6: To know and to handle properly the English terminology proper of the professional environment. Be able to use professional computer programs in English.

The table below shows the relationship between the competencies developed in the subject and the desired learning outcomes:

Competences	Learning outcomes
CB1, CB2 CG4 CT1	RA1: Suitability for pre-sizing, design, calculation and testing of structures.
CB1, CB2 CG4 CE13, CE24	RA2: Ability to dimension reinforced concrete sections, steel sections, and wood sections.
CB1, CB2 CG4 CE13, CE24	RA3: Ability to understand the operation of pre-stressed concrete sections and composite sections.
CB1, CB2 CE13, CE24	RA4: Ability to understand the operation of masonry structures.
CB3 CG5, CG6 CT2	RA5: Ability to communicate and graphically represent solutions and structural details.
CB4, CB5 CT4, CT5, CT6, CT7, CT9, CT10 CE17	RA6: To know and to handle properly the English terminology proper of the professional environment. Be able to use professional computer programs in English.

4. CONTENTS

The subject is organised into THREE Learning Units (LU), which in turn are divided into topics.

LU1- Steel Structures

Topic S0: Steel, material, general aspects.

Topic S1: Bearing and shear design. Deflection

Topic S2: Compression sizing. Buckling

Topic S3: Design and sizing of joints.

LU2- Timber and masonry structures

Topic T1: Timber, material and general aspects. Bearing, shear and axial sizing. Buckling.

Topic T2: Design and sizing of joints.

Topic T3: Design and sizing of masonry walls.

UA3- Reinforced concrete structures

Topic C0: Concrete, material, general aspects.

Topic C1: Bending reinforcement.

Topic C2: Shear reinforcement.

Topic C3: Concrete beams. Curtailment

Topic C4: Centred and skewed compression reinforcement.

UA4- Structural floors

Topic F0: Structural floor, types and constructive approach

Topic F1: Concrete structural floors, uni and bidirectional.

Topic F2: Steel and timber structural floor.

5. TEACHING-LEARNING METHODOLOGIES

The following are the types of teaching-learning methodologies that will be applied:

- Master class.
- Case study method.
- Cooperative learning.
- Problem-based learning.
- Project-based learning.

6. LEARNING ACTIVITIES

Listed below are the types of learning activities, the number of hours the student will spend on each one and the course policy about the use of artificial intelligence (IA):

Type of training activity	Number of hours	Use of IA
Master Sessions	12 h	Allowed
Directed work, practical exercises and problem solving	64 h	Allowed
Exhibition of the works	4 h	Allowed
Group work	10h	Allowed
Self-employed	40 h	Allowed
Tutoring, academic monitoring and evaluation	20 h	Allowed
Laboratory Practices	-	-

Professional internships	0	-
TOTAL	**150 h**	-

7. EVALUATION

The table below indicates the evaluable activities, the evaluation criteria for each of them, as well as their weight in the total grade of the subject.

ASESSMENT	**100%**	
1. EXAMS (minimun average 4'0)	**50%**	Extraordinary call:
CONCRETE EXAM	25%	Extraordinary Exam
STEEL, TIMBER AND MASONRY EXAM	25%	
2. EXERCISES (minimun average 4'0)	**50%**	
CLASS PARTICIPATION (Solving home exercises)	20%	<< Included in Extraordinary exam
LABORATORY WORKS	10%	<< Included in Final Work
FINAL WORK	20%	Complete or do for Extraordinary call

In Virtual Campus, when you access the subject, you will be able to consult in detail the activities you must carry out, as well as the delivery dates and evaluation procedures for each of them.

7.1. Ordinary call

In order to pass the course in ordinary convocation, you must obtain a grade greater than or equal to **5.0 out of 10.0** in the final grade (weighted average) of the course. In addition, there should be **an average of 4.0 on both parts**: theory and practice.

7.2. Extraordinary call

As in the ordinary call, in order to pass the course in ordinary convocation, you must obtain a grade greater than or equal to **5.0 out of 10.0** in the final grade (weighted average) of the course. In addition, there should be **an average of 4.0 on both parts**: theory and practice.

A written test must be taken and the activities that have not been passed must be handed in in an ordinary call. The exam is one and complete, and replaces the marks of the exams (independently for each) and course participation (complete) of the course which are lower. The submission of the completed or re-delivered Coursework replaces the grade for the Coursework and Labs whichever is lower.

8. AGENDA

A daily schedule is available on the Virtual Campus and may be modified for logistical reasons. Any modification will be notified to the student in due time and form.

9. BIBLIOGRAPHY

The recommended bibliography is given below:

LOADS:

- **CTE DB SE-AE: Seguridad Estructural: Acciones en la edificación**. Código Técnico. Ministerio de la vivienda.
- **Eurocódigo l. Parte 2. Acciones en estructuras**. UNE ENV 199112. AENOR.
- NSCE-02. Norma de construcción sismorresistente. Ministerio de Fomento. Octubre 2002.

REINFORCED CONCRETE STRUCTURES, PRESTRESSED AND SLABS:

CODES

- **Código Estructural**. Ministerio de Transportes, Movilidad y Agenda Urbana. 2021.
- **Norma UNE-EA'V 1992/1/1: Eurocódigo 2: Proyecto de estructuras de Hormigón**. Parte 1-1: Reglas generales y reglas para edificación. AENOR, 1 993.

BOOKS

- P. JIMENEZ MONTOYA, A. GARCÍA MESEGUER, F. MORÁN CABRE. **Hormigón armado**. Ed. Gustavo Gili. 2001.
- J. CALAVERA. **Proyecto y cálculo de estructuras de hormigón** (Tomos 1 y 11). 2000.
- J. CALAVERA. **Manual de detalles constructivos en obras de hormigón armado**.
- H. CORRES. J.L. MARTINEZ, PEREZ, J.C. LÓPEZ AGOI. **Prontuario informático del hormigón estructural** 3.0. IECA. 2001
- FLORENTINO REGALADO. **Los forjados reticulares: diseño. análisis, construcción y patología**. CYPE Ingenieros. 2003.
- FLORENTINO REGALADO. **Los forjados de los edificios: pasado. presente y futuro**. CYPE Ingenieros.
- FLORENTNO REGALADO. **Los pilares: criterios para su proyecto, cálculo y reparación**. CYPE Ingenieros. 2002.
- FLORENTINO REGALADO. **Cortante y punzonamiento: teoría y práctica**. CYPE 2002.
- FLORENTINO REGALADO. **Biblioteca de detalles constructivos metálicos, de hormigón y Mixtos** (con biblioteca de detalles en AutoCAD). CYPE Ingenieros.
- VARIOS AUTORES. Números gordos en el proyecto de estructuras. Ed.CINTRA. 2001.
- J. CALAVERA. **Cálculo, construcción patología de forjados de edificación**.
- MANUEL AIDEPLA. **Proyecto y ejecución de elementos resistentes con Alveoplaca**.

STEEL AND COMPOSITE STRUCTURES

CODES

- **CTE DB SE-A: Seguridad Estructural: Acero**. Código Técnico. Ministerio de la vivienda.
- **Código Estructural**. Ministerio de Transportes, Movilidad y Agenda Urbana. 2021.
- **Norma UNE-ENV 1993/1/1: Eurocódigo 3: Proyecto de estructuras metálicas**. Parte 1-1: Reglas generales y reglas para edificación. AENOR, 1996.
- **Norma UNE-ENV 1994/1/1: Eurocódigo 4: Proyecto de estructuras mixtas**. Parte 1-1: Reglas generales y reglas para edificación. AENOR, 1995.

BOOKS

- F. HART, W. HENN, H. SONTAG. **Atlas de la construcción metálica**. Editorial GG.
- R. ARGUELLES ÁLVAREZ. R. ARGUELLES BUSTILLO. F. ARRIAGA Y J.R. ATIENZA. **Estructuras de acero**. cálculo, Norma Básica y Eurocódigo. 1999.
- RAMÓN ARGUELLES. **La estructura metálica hoy**. Librería Técnica Bellisco.
- RAMIRO RODRIGUEZ BORLADO. **Manual de estructuras metálicas de edificios urbanos**. CEDEX. 1997
- RAMIRO RODRÍGUEZ BORLADO. **Prontuario de estructuras metálicas**. CEDEX. 1999
- **Guía de diseño para edificios con estructura de acero**. Instituto Técnico de la Estructura de Acero OTEA). 1997
- **Manual de cálculo de estructuras metálicas**. Prontuario ENSIDESA
- J. MONFORT LLEONART. **Estructuras Mixtas para Edificación**. U.P.V. 2002
- JESUS ORTIZ, JOSE HERNANDO, JAIME CERVERA. **Uniones Atornilladas frontales**. Serie: Práctica en el proyecto de estructuras de acero en edificación. UPM. APTA.

TIMBER STRUCTURES

CODES

- **CTE DB SE-M: Seguridad Estructural: Madera**. Código Técnico. Ministerio de la vivienda.
- **Norma UNE-ENV 1995/1/1: Eurocódigo 5: Proyecto de estructuras de madera**. Parte 1-1: Reglas generales y reglas para edificación. AENOR, 2002.

BOOKS

- RAMON ARGUELLES y FRANSCISCO ARRIAGA. **Estructuras de madera. Diseño y cálculo**. AITIM, 2000.
- VARIOS AUTORES. **Madera aserrada estructural**. AITIM 2003.
- FRANCISCO ARRIAGA. **Diseño y Cálculo de Uniones en Estructuras de Madera**. Maderia,2011.

10. UNITY OF ATTENTION TO DIVERSITY

Students with specific educational support needs:

Curricular adaptations or adjustments for students with specific educational support needs, in order to guarantee equal opportunities, will be guided by the Diversity Unit (UAD).

A report on curricular adaptations/adjustments must be issued by the Diversity Unit. Students with specific educational support needs should contact unidad.diversidad@universidadeuropea.es at the beginning of each semester.

11. ONLINE SURVEYS

Your opinion matters!

The Universidad Europea encourages you to participate in several surveys which help identify the strengths and areas we need to improve regarding professors, degree programs and the teaching-learning process.

The surveys will be made available in the “surveys” section in virtual campus or via e-mail.

Your assessment is necessary for us to improve.

Thank you very much for your participation.