

Course file

Study cycle	BACHELOR IN CIVIL ENGINEERING		
Course	DESIGN OF STRUCTURES	Mandatory	<input checked="" type="checkbox"/>
		Optional	<input type="checkbox"/>
Course scientific area	CIVIL ENGINEERING	Category	E

Course category: B - Basic; C - Core Engineering; E - Specialization; P - Complementary.

Year: 3rd	Semester: 6th	ECTS: 5,5	Total: 149
Contact time	T:	TP: 67,5	PL: S: OT:

T - Lectures; TP - Theory and practice; PL - Lab Work; S - Seminar; OT - Tutorial Guidance.

Course Director	Title	Position
António Carlos T. Sousa Gorgulho	Especialista	Professor Adjunto

Learning objectives (knowledge, skills and competences to be developed by students)

(max. 1000 characters)

- Design and implementation of the project of stability of a metal structure, calculating and detailing of structural elements and their connections.

and

- Design and implementation of the project of stability of a reinforced concrete building , calculating and detailing of structural elements

Syllabus

(max. 1000 characters)

I- INTRODUCTION TO THE DESIGN OF STRUCTURES

1. Phases and constituent parts of a structural project

2 . Bases for the design of structures

2.1. Lifetime of the project

2.2. Limit States design : Latest and Use

2.3. Classification and representation of actions

2.4. Partial factor method . Combinations of actions

3 . Actions on structures

3.1. General measures : own weights , impulses of land , overloads

3.2. Wind action

3.3. Temperature action

3.4. Seismic action

4 . Structural systems of buildings in reinforced concrete

4.1. General aspects of design

4.2. Structural design in seismic areas

5 . Steel Structures

5.1. Solutions in metal frame

5.2. Modeling and structural analysis

5.3. Security check

5.4. Buckling ULS: columns, beams

II - PROJECT WORKS

1. Design of the structural solution

2 . Pre - sizing

3 . Definition of actions

4 . Modeling

5 . Structural elements design

6 . Detailing

Demonstration of the consistency between the syllabus and the course objectives

(max. 1000 characters)

The competence to be acquired by students in conceiving a metal frame or concrete to perform certain construction and later in its structural design, including the calculation and detailing of the various

constituent elements will be provided not only through the practical implementation of each of these types of projects throughout the semester, but also by exposure in the early half, of all matters referred to, in syllabus presented, and that constitute the key to dealing with the students to develop the projects.

Teaching methodology (evaluation included)

(max. 1000 characters)

Matters deemed necessary and complementing the concepts already supplied by other courses in the area of structures including STR, RM1 and RM2 and BE1 and BE2, will be transmitted to students in the early classes so that they are able to receive the statements of project work in the area of metal structures and in the area of reinforced concrete structures and begin their work. Projects will be developed simultaneously with themselves for each type of project sessions.

Working groups among students, seeking to be made so that students develop the skills needed in the preparation of the projects involved in collective sessions with the respective teacher and in eventually additional tutorial sessions promoted by this. The final evaluation will focus on the projects will be implemented and delivered at a joint session of the group with their teachers.

Demonstration of the consistency between teaching methodology and the course learning objectives

(max. 3000 characters)

The ability of students to develop skills within the project of metal structures and concrete structures in terms of design and verification of safety and in terms of detail with representatives of sections and connections in metallic case and representation of sections in the case of concrete reinforcement , is, as previously mentioned, the main goal of the course.

To allow students to develop these skills are essential in addition to the initial theoretical sessions in which all fundamental and regulatory aspects of the project will be addressed, the theoretical and practical sessions where groups of students together with the teacher develop a first phase of the work design , pre - design and modeling of the structure and subsequently the design with verification of safety and detailing of structures projecting.

Any doubts in the development of the work are also discussed and clarified in the also conducted tutorials sessions .

Ensuring the achievement of these objectives by the students is ensured the accuracy and type of assessment of knowledge where students practiced despite the delivery of project work through the group will only succeed in demonstrating individually in approved evaluation session with the teacher , ability to answer any

questions relating to the project delivered.

Main Bibliography

(max. 1000 characters)

- NP EN1990 2009: “Bases para o projecto de estruturas”, IPQ, Lisboa
- NP EN1991-1-1 2009: “Acções em estruturas – Parte 1-1: Acções gerais : pesos volúmicos, pesos próprios, sobrecargas em edifícios”, IPQ, Lisboa.
- NP EN1991-1-4 2010: “Acções em estruturas – Parte 1-4: Acções gerais : Acções do vento ”, IPQ, Lisboa.
- NP EN1991-1-5 2009: “Acções em estruturas – Parte 1-5: Acções gerais : Acções térmicas”, IPQ, Lisboa.
- NP EN1992-1-1 2010: “Projecto de estruturas de betão - Parte 1-1:Regras gerais e regras para edifícios”, IPQ, Lisboa.
- NP EN1993-1-1 2010: “Projecto de estruturas de aço - Parte 1-1:Regras gerais e regras para edifícios”, IPQ, Lisboa.
- NP EN1998-1 2010: “Projecto de estruturas para resistência aos sismos - Parte 1:Regras gerais, acções sísmicas e regras para edifícios”, IPQ, Lisboa.
- Simões, A., 2005: "Manual de Dimensionamento de Estruturas Metálicas"
- Appleton, J., 2013: "Estruturas de Betão", vol. 1 e 2, Edições Orion.