

# Fundamentals of Structural Design (250700)

## General information

<b>School:</b>	ETSECCPB
<b>Departments:</b>	751 - Departament d'Enginyeria Civil i Ambiental
<b>Credits:</b>	6.0 ECTS
<b>Programs:</b>	1140 - MÀSTER UNIVERSITARI EN ENGINYERIA ESTRUCTURAL I DE LA CONSTRUCCIÓ (pla 2015)
<b>Course:</b>	2015/2016
<b>Course language:</b>	Castellano

## Faculty

Responsible faculty: Angel Carlos Aparicio Bengoechea

Teachers: Angel Carlos Aparicio Bengoechea, Jesús Miguel Bairán García, Juan Ramon Casas Rius, Rolando Antonio Chacón Flores, Alberto De La Fuente Antequera, Antonio Ricardo Mari Bernat, Enrique Mirambell Arrizabalaga, Eva Maria Oller Ibars, Esther Real Saladrigas

## Generic objectives

Subject to initiate the student in the design and calculation of concrete and steel according to European standards

Initial knowledge of the process of design of concrete and steel structures according to European Standards

Introduction of structural safety concepts and tools for their calculation. Limit states . Actions and combinations. Behavior of structural materials. Structural analysis of prestressing : prestress loads and forces, calculation of prestressing losses. Structural Concrete: service and ultimate limit states. Steel structures: bolted joints , welded joints , section class concept , and service limit states last

## Skills

### *Specific skills*

To conceive and design civil and building structures that are safe, durable, functional and integrated into its surroundings.

Designing and building using traditional materials (reinforced concrete, prestressed concrete, structural steel, masonry, wood) and new materials (composites, stainless steel, aluminum, shape memory alloys?).

To evaluate, maintain, repair and strengthen existing structures, including the historic and artistic heritage.

To apply methods and advanced design software and structural calculations, based on knowledge and understanding of forces and their application to the structural types of civil engineering.

**Generic skills of subject**

To conceive, design, analyze and manage structures or structural elements of civil engineering or building, encouraging innovation and the advance of knowledge.

To develop, improve and use conventional materials and new construction techniques to ensure the safety requirements, functionality, durability and sustainability.

**ECTS credits: total hours of student work**

		Dedication	
		Hours	Percent
Supervised Learning	Theory	45.00	100.0%
	Assignments	0.00	0.0%
	Laboratory	0.00	0.0%
	Supervised activities	0.00	0.0%
Self-Learning		105.00	

**Contents**

**Definition of Limits States and introduction to structural safety**

*Dedication*

10.0h. Theory

*Description*

Actions on structures and Introduction to Structural Safety

**Technology of prestressing**

*Dedication*

10.0h. Theory

*Description*

Tecnology and Structural Analysis of Prestressing

**Structural Response of Concrete according Eurocod EC-2**

*Dedication*

11.0h. Theory

*Description*

Introduction to the european conception of Structural Concrete according to

## **Structural Response of Steel Structures According Eurocod EC3**

### ***Dedication***

14.0h. Theory

### ***Description***

Introduction to european conception of Steel Structures

### **Activities**

### **Grading rules (\*)**

***(\*) The evaluation calendar and grading rules will be approved before the start of the course.***

The mark of the course is obtained from the ratings of continuous assessment and their corresponding laboratories and/or classroom computers.

Continuous assessment consist in several activities, both individually and in group, of additive and training characteristics, carried out during the year (both in and out of the classroom).

The teachings of the laboratory grade is the average in such activities.

The evaluation tests consist of a part with questions about concepts associated with the learning objectives of the course with regard to knowledge or understanding, and a part with a set of application exercises.

### **Test rules**

Failure to perform a laboratory or continuous assessment activity in the scheduled period will result in a mark of zero in that activity.

### **Teaching methodology**

The course consists of 2,3 hours per week of classroom activity (large size group) and 0,3 hours weekly with half the students (medium size group).

The 2,3 hours in the large size groups are devoted to theoretical lectures, in which the teacher presents the basic concepts and topics of the subject, shows examples and solves exercises.

The 0,3 hours in the medium size groups is devoted to solving practical problems with greater interaction with the students. The objective of these practical exercises is to consolidate the general and specific learning objectives.

The rest of weekly hours devoted to laboratory practice.

Support material in the form of a detailed teaching plan is provided using the virtual campus ATENEA: content, program of learning and assessment activities conducted and literature.

### **Office hours**

It will be published at the beginning of the course according the mentoring hours for each teacher

### **Basic bibliography**

- Comisión Permanente del Hormigón. **Instrucción de Hormigón Estructural EHE-08.** . Ministerio de Foment. Madrid. 2008.
- Comité Europeen de Normalisation. . **Eurocode 2: Design of Concrete Structures. EN-1992.** Comité Europeen de Normalisation. 2004.
- Jimenez Montoya P, García Meseguer A, Morán F, Arroyo JC. **Hormigón armado.** Gustavo Gili. . Barcelona. 2010.
- Marí A, Molins C, Bairán JM, Oller E. **Formigó armat i pretensat. Exercicis curts de bases de càlcul i estats límit adaptat a la Instrucció EHE-08.** Edicions UPC. Barcelona. 2009..
- Calavera, J. **Proyecto y cálculo de estructuras de hormigón en masa, armado y pretensado, de acuerdo con la EHE-08 y EC2.** Intemac. Madrid. 2008..
- Comisión Permanente de Estructuras de Acero. Mirambell, E. et al. **Instrucción EAE de Estructuras de Acero.** Ministerio de Fomento. Secretaría General Técnica.. Madrid. 2011.
- Luís Simoes da Silva, Rui Simoes, Helena Gervasi. **Design of steel structures.** ECCS-European Convention for Constructional Steelwork.. 2010. ISBN 978-92-9147-098-3.