

Course guide

250346 - TECESTR - Structural Technology

Last modified: 16/11/2022

Unit in charge: Barcelona School of Civil Engineering
Teaching unit: 751 - DECA - Department of Civil and Environmental Engineering.

Degree: BACHELOR'S DEGREE IN GEOLOGICAL ENGINEERING (Syllabus 2010). (Compulsory subject).

Academic year: 2022 **ECTS Credits:** 6.0 **Languages:** Spanish

LECTURER

Coordinating lecturer: ALBERTO DE LA FUENTE ANTEQUERA

Others: ALBERTO DE LA FUENTE ANTEQUERA, SERGIO GALLEGU URBANO

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

4060. Knowledge of the strength of materials and structures theory

Generical:

3103. Students will learn to identify, formulate and solve a range of engineering problems. They will be expected to show initiative in interpreting and solving specific civil engineering problems and to demonstrate creativity and decision-making skills. Finally, students will develop creative and systematic strategies for analysing and solving problems.

3108. Students will learn to identify and model complex systems and to identify the most suitable methods and tools for defining and solving the associated equations. They will acquire the knowledge and skills to perform qualitative analyses and approximations, estimate the uncertainty of results, formulate hypotheses and define experimental methods through which to validate them, establish compromises, identify principal components and prioritise their work. More generally, students will develop their capacity for critical thought.

3109. Students will learn to plan, design, manage and maintain systems suitable for use in civil engineering. They will develop a systematic approach to the complete life-cycle of a civil engineering infrastructure, system or service, which includes drafting and finalising project plans, identifying the basic materials and technologies required, making decisions, managing the different project activities, performing measurements, calculations and assessments, ensuring compliance with specifications, regulations and compulsory standards, evaluating the social and environmental impact of the processes and techniques used, and conducting economic analyses of human and material resources.

3114. Students will learn to identify market requirements and opportunities and to compile information from which to determine the ideal specifications of a new product, process or service. They will acquire the skills to prepare a basic business plan, define a new product, process or service, and plan and implement the different phases in the design process.

Transversal:

587. ENTREPRENEURSHIP AND INNOVATION - Level 3. Using knowledge and strategic skills to set up and manage projects. Applying systemic solutions to complex problems. Devising and managing innovation in organizations.

590. SUSTAINABILITY AND SOCIAL COMMITMENT - Level 3. Taking social, economic and environmental factors into account in the application of solutions. Undertaking projects that tie in with human development and sustainability.

593. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 3. Communicating clearly and efficiently in oral and written presentations. Adapting to audiences and communication aims by using suitable strategies and means.

584. THIRD LANGUAGE. Learning a third language, preferably English, to a degree of oral and written fluency that fits in with the future needs of the graduates of each course.

TEACHING METHODOLOGY

The course consists of 2.1 hours per week of classroom activity (large size group) and 1 hour weekly with half the students (medium size group).

The 2.1 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 1 hour 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.

Although most of the sessions will be given in the language indicated, sessions supported by other occasional guest experts may be held in other languages.

LEARNING OBJECTIVES OF THE SUBJECT

Students will acquire a general technical understanding of structural concrete and metallic structures and learn to design, construct and maintain these types of structures.

Upon completion of the course, students will be able to: 1. Define the individual and combined actions required in the design of concrete and metallic structures, and interpret and verify the resistance of individual sections to different forms and combinations of stress;

2. Design reinforcement structures, taking into account the types of reinforcement required and the appropriate lengths of overlap and anchoring components;

3. Design standard concrete and metallic structures and interpret or verify the response of concrete and metallic elements to instability phenomena.

Stress-resistance mechanisms in structural concrete; Planning and construction of specific structures: Materials and durability strategy; Criteria for selecting suitable structure types; Design criteria, detailed verification and organisation of isostatic and hyperstatic linear components of structural concrete, reinforcement strategies and construction feasibility; Behaviour of common structures such as forging, beams, girders, pillars, foundations and their individual sections; Steel production for the manufacturing of sheets and profiles for construction industry; Common structure types in metallic constructions; Stress-deformation response of metal structures to sectional, axial, bending, shear and torsional strain; Strain interactions; Response of individual elements to instability phenomena; Behaviour of screwed and soldered joints in metal structures

STUDY LOAD

Type	Hours	Percentage
Self study	84,0	56.00
Hours medium group	16,0	10.67
Hours small group	8,0	5.33
Hours large group	36,0	24.00
Guided activities	6,0	4.00

Total learning time: 150 h



CONTENTS

Introduction

Description:

Technology Concept Structures
Actions
Safety
Concepts of structural stability
Exercise of actions

Full-or-part-time: 33h 36m

Theory classes: 10h
Practical classes: 2h
Laboratory classes: 2h
Self study : 19h 36m

Structural Design

Description:

Materials
Limit states. Durability
Failure versus normal stress
Ultimate limite of shear
Cracking
Deformability
The steel material
Bases of calculus. Failure criteria
Bent structures
Compressed elements. Interaction
Buckling

Full-or-part-time: 67h 12m

Theory classes: 26h
Laboratory classes: 2h
Self study : 39h 12m

Structural elements

Description:

Beams and columns
Piles and pile caps
Foundation structures
Frames
Walls
Tubbing and Sheet piles
Screens

Full-or-part-time: 43h 12m

Practical classes: 14h
Laboratory classes: 4h
Self study : 25h 12m

GRADING SYSTEM

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.

Criteria for re-evaluation qualification and eligibility: Students that failed the ordinary evaluation and have regularly attended all evaluation tests will have the opportunity of carrying out a re-evaluation test during the period specified in the academic calendar. Students who have already passed the test or were qualified as non-attending will not be admitted to the re-evaluation test. The maximum mark for the re-evaluation exam will be five over ten (5.0). The non-attendance of a student to the re-evaluation test, in the date specified will not grant access to further re-evaluation tests. Students unable to attend any of the continuous assessment tests due to certifiable force majeure will be ensured extraordinary evaluation periods.

These tests must be authorized by the corresponding Head of Studies, at the request of the professor responsible for the course, and will be carried out within the corresponding academic period.

EXAMINATION RULES.

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

BIBLIOGRAPHY

Basic:

- Jiménez Montoya, P. [et al.]. Hormigón armado [on line]. 15a ed. Barcelona: Gustavo Gili, 2009 [Consultation: 08/03/2021]. Available on: <https://ebookcentral.proquest.com/lib/upcatalunya-ebooks/detail.action?docID=3209549>. ISBN 9788425223075.
- Comisión Permanente del Hormigón. Instrucción de hormigón estructural: EHE: con comentarios de los miembros de la Comisión Permanente del Hormigón [on line]. 5a ed. rev. Madrid: Ministerio de Fomento, 1999 [Consultation: 11/03/2021]. Available on: http://www.fomento.gob.es/MFOM/LANG_CASTELLANO/ORGANOS_COLEGIADOS/MASORGANOS/CPH/instrucciones/EHE_es/. ISBN 8449803969.
- Espanya. Comisión Permanente de Estructuras de Acero. EAE: instrucción de acero estructural: con comentarios de los miembros de la Comisión Permanente de Estructuras de Acero [on line]. Madrid: Ministerio de Fomento, Secretaría General Técnica, 2011 [Consultation: 08/02/2021]. Available on: https://www.mitma.es/recursos_mfom/1903100.pdf. ISBN 9788449809040.
- Arcelor. Prontuario-Catalogo de perfiles [on line]. Arcelor, 2010 [Consultation: 02/05/2020]. Available on: https://constructalia.arcelormittal.com/es/productos/perfiles_estructurales.
- Dirección General de Carreteras. Guía de cimentaciones en obras de carretera. 2a ed. rev. Madrid: Ministerio de Fomento, 2004. ISBN 8449807131.

Complementary:

- Calavera, J. Proyecto y cálculo de estructuras de hormigón: en masa, armado y pretensado : de acuerdo con la nueva instrucción EHE-08: de acuerdo con el EUROCÓDIGO EC-2. 2a ed. Madrid: INTEMAC, 2008. ISBN 8488764249.
- Marí, A.R.; Molins, C.; Bairán, J.; Oller, E. Formigó armat i pretensat: exercicis curts de bases de càlcul i estats límits, adaptat a la instrucció EHE-08 [on line]. 2a ed. Barcelona: Edicions UPC, 2009 [Consultation: 25/02/2021]. Available on: <http://hdl.handle.net/2099.3/36837>. ISBN 9788498803907.
- Marí, A.R.; Aguado, A.; Agulló, L.; Martínez, F.; Cobo, D. Hormigón armado y pretensado: ejercicios: adaptado a la instrucción EHE [on line]. Barcelona: Edicions UPC, 1999 [Consultation: 08/03/2021]. Available on: <http://hdl.handle.net/2099.3/36182>. ISBN 8483013029.
- Park, R.; Paulay, T. Estructuras de concreto reforzado. México D.F.: Limusa, 1979. ISBN 9681801008.
- Páez, A. Hormigón armado. Barcelona: Reverté, 1986. ISBN 8429120564.