

250473 - DISAVESTFO - Advanced Design of Concrete Structures

Coordinating unit:	250 - ETSECCPB - Barcelona School of Civil Engineering
Teaching unit:	751 - DECA - Department of Civil and Environmental Engineering
Academic year:	2015
Degree:	MASTER'S DEGREE IN CIVIL ENGINEERING (RESEARCH TRACK) (Syllabus 2007). (Teaching unit Optional) MASTER'S DEGREE IN CIVIL ENGINEERING (PROFESSIONAL TRACK) (Syllabus 2012). (Teaching unit Optional) MASTER'S DEGREE IN CIVIL ENGINEERING (PROFESSIONAL TRACK) (Syllabus 2012). (Teaching unit Optional) MASTER'S DEGREE IN CIVIL ENGINEERING (RESEARCH TRACK) (Syllabus 2009). (Teaching unit Optional) MASTER'S DEGREE IN STRUCTURAL AND CONSTRUCTION ENGINEERING (Syllabus 2009). (Teaching unit Optional) MASTER'S DEGREE IN STRUCTURAL AND CONSTRUCTION ENGINEERING (Syllabus 2015). (Teaching unit Optional)
ECTS credits:	5
Teaching languages:	Catalan, Spanish, English

Teaching staff

Coordinator:	JESÚS MIGUEL BAI RÁN GARCÍA
Others:	ANTONIO AGUADO DE CEA, JESÚS MIGUEL BAI RÁN GARCÍA, ALBERTO DE LA FUENTE ANTEQUERA, ANTONIO RICARDO MARI BERNAT, EVA OLLER IBARS

Opening hours

Timetable:	Prof. Jesús Bairán: Thursdays from 10.00h to 14.00h, or other hours by appointment. Office C1-201b Other professors of the course: by appointment.
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Degree competences to which the subject contributes

Specific:

8162. Knowledge of all kinds of structures and materials and the ability to design, execute and maintain structures and buildings for civil works.

8228. Knowledge of and competence in the application of advanced structural design and calculations for structural analysis, based on knowledge and understanding of forces and their application to civil engineering structures. The ability to assess structural integrity.

Teaching methodology

The course consists of 3 hours per week of classroom activity.

In the classroom activity, the teacher presents the basic concepts and topics of the subject, shows examples and solves exercises to consolidate the general and specific learning objectives.

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.

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Learning objectives of the subject

Specialization subject in which knowledge on specific competences is intensified.

Knowledge and skills at specialization level that permit the development and application of techniques and methodologies at advanced level.

Contents of specialization at master level related to research or innovation in the field of engineering.

The course Advanced design of concrete structures intend to supplement a basic course of reinforced and prestressed concrete structures and provide a structural specialist level of knowledge. One of the objectives is to strengthen the capacity of students to design by introducing concepts related to project and construction systems. A particular emphasis is given to the struts and ties model as a general method of design, especially suitable for areas of discontinuity. This method is applied to the study of structural elements with geometric or mechanical discontinuity, such as corbels, deep beams.

In the structural analysis, some aspects are studied such as the effects of prestressing in statically indeterminate structures as well as long term behaviour, nonlinear behaviour, construction effects, and the design of structures partially prestressed, taking into account the service and ultimate limit states.

Limit states not studied in a basic course, such as shear-friction, punching or fatigue are taught. Finally, a chapter is dedicated to earthquake design of concrete structures, dealing with ductility, confinement, structure of buildings, structural calculations and arrangements of reinforcement to ensure the proper behaviour of the resisting mechanisms.

Study load

Total learning time: 125h	Theory classes:	19h 30m	15.60%
	Practical classes:	9h 45m	7.80%
	Laboratory classes:	9h 45m	7.80%
	Guided activities:	6h	4.80%
	Self study:	80h	64.00%

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Content

Basis of design and structural reliability	Learning time: 7h 11m Theory classes: 2h Practical classes: 1h Self study : 4h 11m
Description: Semi-probabilistic methods. Accidental actions. Bases of reliability of structures. Practice	
Analysis of concrete structures	Learning time: 19h 12m Theory classes: 4h Practical classes: 4h Self study : 11h 12m
Description: Structural analysis of prestressed Structural analysis of prestressing. Exercise Nonlinear Analysis. Redistributions Nonlinear analysis. Redistributions. Exercise	
Limit states	Learning time: 19h 12m Theory classes: 6h Practical classes: 2h Self study : 11h 12m
Description: Ultimate limit state of instability Ultimate limit state instability. Exercise Partially prestressed Partial prestressing. Exercise Fatigue	

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<p>Method of struts and ties</p>	<p>Learning time: 12h Theory classes: 2h Practical classes: 1h Laboratory classes: 2h Self study : 7h</p>
<p>Description: Struts and ties Struts and ties. Exercise Laboratory scale test</p>	
<p>Structural Elements</p>	<p>Learning time: 19h 12m Theory classes: 7h Practical classes: 1h Self study : 11h 12m</p>
<p>Description: Corbels and deep beams Short corbels and beams of great depth. Exercise Anchors in prestressed elements Plates Shells</p>	
<p>Seismic design</p>	<p>Learning time: 7h 11m Theory classes: 2h Practical classes: 1h Self study : 4h 11m</p>
<p>Description: Seismic design Practice</p>	
<p>Course Work</p>	<p>Learning time: 9h 36m Laboratory classes: 4h Self study : 5h 36m</p>
<p>Description: Partial homework 1 Partial Homework 2</p>	

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Qualification system

The evaluation will be continued through a series of short practical works (P), one course work (T) and a final exam (E). Practical works (P) may be proposed to be carried out in the classroom or as homeworks. No more than 8 short works will be proposed. The mark P will consist on the average grade obtained in all proposed works.

The course work (T) consists of a design to be developed along the course as a case study where a significant number of the course contents are applied.

The final exam (E) will be held at the end of the course consisting on short conceptual problems, but require analysis and demonstrate ability to apply concepts.

The final mark (F) of the course will be a weighted score according to the following formula:

$$F = 0.4 P + 0.3 T + 0.3 E$$

To pass the course, a final mark (F) equal to or greater than 5 and noted on the exam (E) greater than 3.5 are necessary.

Regulations for carrying out activities

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:

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Miguel Sosa, P., Fernández Prada, M. A., Bonet Senach, J. L., Martí Vargas, J. R., Navarro Gregori, J., Castro Bugallo, M. C., Pallarés Rubio, L.. Proyecto de estructuras de hormigón mediante el método de bielas y tirantes. 2ª edición. Valencia: Ediciones VJ, 2009. ISBN 978-84-96937-82-6.

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