Course guide
250471 - PONTS - Bridges

Last modified: 22/05/2025

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

Degree: MASTER'S DEGREE IN GEOTECHNICAL AND EARTHQUAKE ENGINEERING (Syllabus 2009). (Optional subject).
MASTER'S DEGREE IN CIVIL ENGINEERING (PROFESSIONAL TRACK) (Syllabus 2012). (Optional subject).
MASTER'S DEGREE IN GEOTECHNICAL ENGINEERING (Syllabus 2015). (Optional subject).
MASTER'S DEGREE IN STRUCTURAL AND CONSTRUCTION ENGINEERING (Syllabus 2015). (Optional subject).

Academic year: 2025 **ECTS Credits:** 5.0 **Languages:** Spanish, English

LECTURER

Coordinating lecturer: JUAN RAMON CASAS RIUS

Others: JUAN RAMON CASAS RIUS, MAGÍ DOMINGO TARANCÓN, GONZALO RAMOS SCHNEIDER, JOSE TURMO CODERQUE

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.

Transversal:
8559. ENTREPRENEURSHIP AND INNOVATION: Being aware of and understanding the mechanisms on which scientific research is based, as well as the mechanisms and instruments for transferring results among socio-economic agents involved in research, development and innovation processes.
8560. SUSTAINABILITY AND SOCIAL COMMITMENT: Being aware of and understanding the complexity of the economic and social phenomena typical of a welfare society, and being able to relate social welfare to globalisation and sustainability and to use technique, technology, economics and sustainability in a balanced and compatible manner.

8561. TEAMWORK: Being able to work in an interdisciplinary team, whether as a member or as a leader, with the aim of contributing to projects pragmatically and responsibly and making commitments in view of the resources that are available.

TEACHING METHODOLOGY

There are 2 groups, one in spanish (Q2) and one in english (Q1)
The subject is lectured in presential sessions of 3 hours once per week. 5 practical works should be solved as assignements.

The students can address their questions in english, catalan or spanish.

Practical works and exams can be answered in english, catalan or spanish

In the lectures, it is used audiovisual material that is available to the student in the virtual campus ATENEA: contents, assignments, bibliography. This material can be either in english, catalan or spanish.

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

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.

- Learn to design and build bridges of small and medium spans constructed by any method
- Started in the design and construction of long span bridges

STUDY LOAD

Type	Hours	Percentage
Hours medium group	9,8	7.83
Hours large group	25,5	20.38
Self study	80,0	63.95
Hours small group	9,8	7.83

Total learning time: 125.1 h

CONTENTS

Generals Themes

Description:
Presentation of the Course. Specific language of Bridge Engineering. Historical approach
Actions on the bridges. Equipment of the superstructure
Structural Behavior of Beam Bridges, Portal Bridges and Arch Bridges
Structural behavior of cable-stayed bridges

Full-or-part-time: 24h
Theory classes: 10h
Self study : 14h

Structural behaviour and Design criteria for deck cross sections

Description:
Design of precast prestressed beam decks
Design of slabs decks
Design of box beam girder decks

Full-or-part-time: 16h 48m
Theory classes: 7h
Self study : 9h 48m

Bridge Bearings, Piers and Abutments

Description:
Design of Piers and Abutments
Bearing devices for bridges

Full-or-part-time: 12h
Theory classes: 5h
Self study : 7h

Bridge Deck Structural Analysis by the Grillage method

Description:
Structural analysis by plane grillage method of beam bridge decks, slab decks and box beam decks

Full-or-part-time: 14h 23m
Practical classes: 6h
Self study : 8h 23m

Evaluations

Full-or-part-time: 21h 36m
Laboratory classes: 9h
Self study : 12h 36m

Design and Construction of segmental prestressed concrete bridges

Description:
Design and Construction of bridge decks "in situ" and with pecast beams
Design and construction of segmental bridges span by sapan
Design and construction of bride decks by incremental launching
Design and Construction of Bridges by the Cantilever method

Full-or-part-time: 19h 12m
Theory classes: 8h
Self study : 11h 12m

GRADING SYSTEM

-Performing a preliminary design of a bridge is graded according to a format of five assignments, P1 to P5, conducted in groups of two no Erasmus students or 2 students + 1 Erasmus student

-These Practical Works will be delivered in the dates indicated in ATENEA. (Continuous assessment). Failure to timely delivery of a practice will qualify with 50% of the mark obtained.

- The mark obtained in each delivery (3 deliveries) will be considered as a mark of continuous assessment

- These three assessment are worth the following:

- Groups of two students not Erasmus: 30% of the final grade

- Groups of two students + 1 Erasmus student: 40% of the final grade

- The last assessment will be at week number 13 of course, it will last three hours and will have a value of 70% or 60% of the final grade respectively

- According to academic guidelines, there will only be an extraordinary assessment for students who can support, in a documented way, their inability to attend, to one or more partial assessments. Only the missing assessment can be re-graded.

Although in the Masters course is not foreseen in the UPC regulations the scheduling a re-evaluation of the subjects, the Chair will conduct a reevaluation to all students who have not passed the subject under the continuous assessment and under the following conditions:
- Valuation of Practical Work: 0.00 points
- Maximum Note: 5.00

EXAMINATION RULES.

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

BIBLIOGRAPHY

Basic:
- Aparicio, Angel C.; Casas, Juan Ramon. Apuntes de la asignatura "Puentes".
- Leonhardt, F. Ponts : l'esthétique des ponts = Puentes : estética y diseño. Laussanne: Presses Polytechniques Romandes, 1986. ISBN 2880740991.
- Arenas, J.J.; Aparicio, A.C. Estribos de puente de tramo recto : concepción, diseño, cálculo. Santander: Departamento de Tecnología de las Estructuras, Universidad de Santander, 1984.
- Arenas, J.J.; Aparicio, A.C. Aparatos de apoyo para puentes y estructuras. Santander: Universidad. E.T.S. de Ingenieros de Caminos, Canales y Puertos. Cátedra de Puentes, 198. ISBN 8460022439.
- Calgaro, J.-A. Projet et construction des ponts. 3e éd. Paris: Presses de L'Ecole Nationale des Ponts et Chaussées, 2000. ISBN 9782859783273.
- Menn, C. Prestressed Concrete Bridges. Brasel: Birkhaüser Verlag, 1990. ISBN 0817624147.
- . E.CHambly. Bridge deck behaviour. 2nd ed. New York: Chapman and Hall, 1991. ISBN 0419172602.
- Manterola, J. Puentes: apuntes para su diseño, cálculo y construcción. Madrid: Colegio de Ingenieros de Caminos,, 2006. ISBN 9788438003237.
- Fernández, L. Tierra sobre el agua : visión histórica universal de los puentes. Madrid: Colegio de Ingenieros de Caminos, Canales y Puertos, 2004. ISBN 8438002714.