

Advanced Bridge Engineering (250711)

General Information

School	ETSECCPB
Departments	Departament d'Enginyeria Civil i Ambiental (DECA)
Credits	5.0 ECTS
Programs	MÀSTER UNIVERSITARI EN ENGINYERIA ESTRUCTURAL I DE LA CONSTRUCCIÓ (pla 2015)
Course	2024/25

Main teaching language at each group

- Group 10ES2 Spanish (Q2)

Faculty

Responsible Faculty: Jose Turmo Coderque
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Objectives of Education

Subject to introduce students to the conception and design of special or long span bridges

Capability to design, calculate and build long span bridges: arches, cable stayed bridges, progressive cantilever bridges

Structural behavior of bridges built by the progressive cantilever technique. Longitudinal and cross section design. Type of piers. Methods of provisional stability. Construction methods: cast in situ, precast segments. Forces during construction and in service. Layout and design of prestressing. Structural behaviour of arch bridges. Longitudinal and cross section design. Long-term effects. Construction methods of arch bridges. Structural behavior of cable-stayed bridges. Longitudinal and cross section design. Types of towers and decks. Design criteria. Typology and design of towers. Construction methods: on falsework, by cantilever construction.

Competencies

Especific

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

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.

To define construction processes and methods of organization and management of projects and works.

Total hours of student work

		Hours	Percentage
Supervised Learning	Large group	25.5 h	56.67 %
	Medium group	9.75 h	21.67 %
	Laboratory classes	9.75 h	21.67 %
	Guided Activities	0.0 h	0.00 %
Self Study		80.0 h	

Contents

Seismic design of bridges

Bridge prestressing technology

Creep stress redistribution

Creep stress redistribution

Bridge decks built by the cantelivering method

Bridges built by cantilever construction method

Design and Construction of Arch Bridges

Design and construction of Arch Bridges

Design and construction of cable-stayed Bridges

Design and Construction of Cable-Stayed Bridges

Railway bridges

Railway bridges

Prestressing technology for bridges

Seismic design of bridges

Virtual visit to the site

Virtual visit to site

Teaching Methodology

The communication of the teachers will be mostly in Spanish. The subject consists of 3 hours a week of face-to-face classes in a classroom. Different workshops and the realization of several practical works are proposed. It is intended that the student develop their ability to work in multidisciplinary, multicultural and international environments. Student queries may be answered in Spanish, Catalan or English. The practical work and the exams can be answered in Spanish or Catalan. Support material is used through the virtual campus: content, statement of work and bibliography. The material can be in Spanish, Catalan and English. Workshops and interventions by speakers other than the teachers of the subject are planned for the course. These may be developed in Spanish or Catalan and exceptionally in English.

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.

Grading Rules

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

The course grade is obtained from the continuous assessment grades. Continuous assessment consists of doing different activities, both individual and group, of an additive and formative nature, carried out during the course (inside the classroom and outside of it). The evaluation tests consist of carrying out some practical work, in groups, which have a value of 60% of the final grade and an individual exam that has a value of 40%. The realization and delivery in time and form of the practical works is an essential condition to pass the subject.

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.

Office Hours

Request

Bibliography

Basic

- Menn, C. [Prestressed concrete bridges](#). Basel [Switzerland] ; Boston: Birkhäuser Verlag, 1990. ISBN 3764324147.
- Naaman, A.E. [Prestressed concrete analysis and design: fundamentals](#). 2nd ed. Michigan: Techno Press 3000, 2004. ISBN 0967493919.
- High-Speed Railway Bridges: Conceptual Design Guide. ISBN 978-3-433-03313-5.

Complementary

- Gimsing, N.J.; Georgakis, C.T. [Cable supported bridges : concept and design](#). 3er ed. Chichester [etc.]: John Wiley & sons, cop. 2012. ISBN 9780470666289.