

Course guide

250711 - 250711 - Advanced Bridge Engineering

Last modified: 28/03/2024

Unit in charge:	Barcelona School of Civil Engineering	
Teaching unit:	751 - DECA - Department of Civil and Environmental Engineering.	
Degree:	MASTER'S DEGREE IN STRUCTURAL AND CONSTRUCTION ENGINEERING (Syllabus 2015). (Optional subject).	
Academic year: 2023	ECTS Credits: 5.0	Languages: Spanish

LECTURER

Coordinating lecturer:	JOSE TURMO CODERQUE
Others:	JUAN RAMON CASAS RIUS, GONZALO RAMOS SCHNEIDER, JOSE TURMO CODERQUE

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

- 13364. To conceive and design civil and building structures that are safe, durable, functional and integrated into its surroundings.
- 13365. Designing and building using traditional materials (reinforced concrete, prestressed concrete, structural steel, masonry, wood) and new materials (composites, stainless steel, aluminum, shape memory alloys?).
- 13366. To evaluate, maintain, repair and strengthen existing structures, including the historic and artistic heritage.
- 13369. 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.

Generical:

- 13360. To conceive, design, analyze and manage structures or structural elements of civil engineering or building, encouraging innovation and the advance of knowledge.
- 13361. To develop, improve and use conventional materials and new construction techniques to ensure the safety requirements, functionality, durability and sustainability.
- 13362. To define construction processes and methods of organization and management of projects and works.

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.

LEARNING OBJECTIVES OF THE SUBJECT

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.

STUDY LOAD

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

Total learning time: 125.1 h

CONTENTS

Seismic design of bridges

Description:

Bridge prestressing technology

Full-or-part-time: 14h 23m

Theory classes: 6h

Self study : 8h 23m

Creep stress redistribution

Description:

Creep stress redistribution

Full-or-part-time: 7h 11m

Theory classes: 3h

Self study : 4h 11m

Bridge decks built by the cantilevering method

Description:

Bridges built by cantilever construction method

Full-or-part-time: 14h 23m

Theory classes: 6h

Self study : 8h 23m

Design and Construction of Arch Bridges

Description:

Design and construction of Arch Bridges

Full-or-part-time: 14h 23m

Theory classes: 6h

Self study : 8h 23m

Design and construction of cable-stayed Bridges

Description:

Design and Construction of Cable-Stayed Bridges

Full-or-part-time: 14h 23m

Theory classes: 6h

Self study : 8h 23m

Railway bridges

Description:

Railway bridges

Full-or-part-time: 14h 23m

Theory classes: 6h

Self study : 8h 23m

Prestressing technology for bridges

Description:

Seismic design of bridges

Full-or-part-time: 14h 23m

Theory classes: 6h

Self study : 8h 23m

Virtual visit to the site

Description:

Virtual visit to site

Full-or-part-time: 14h 23m

Laboratory classes: 6h

Self study : 8h 23m

GRADING SYSTEM

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.



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:

- 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.

Complementary:

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