

Bridges (250471)

General information

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| School: | ETSECCPB |
| Departments: | Departament d'Enginyeria Civil i Ambiental (DECA) |
| Credits: | 5.0 ECTS |
| Programs: | MÀSTER UNIVERSITARI EN ENGINYERIA DE CAMINS, CANALS I PORTS, pla 2012 - (codi pla 872), MÀSTER UNIVERSITARI EN ENGINYERIA DE CAMINS, CANALS I PORTS, pla 2012 - (codi pla 1161), MÀSTER UNIVERSITARI EN ENGINYERIA DEL TERRENY, pla 2015 - (codi pla 1141), MÀSTER UNIVERSITARI EN ENGINYERIA ESTRUCTURAL I DE LA CONSTRUCCIÓ, pla 2015 - (codi pla 1140) |
| Course: | 2015/2016 |
| Course language: | Castellano |

Faculty

Responsible faculty: Angel Carlos Aparicio Bengoechea

Teachers: Angel Carlos Aparicio Bengoechea, Juan Ramon Casas Rius, Gonzalo Ramos Schneider

Generic objectives

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

Skills

Specific skills

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

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.

Generic skills of subject

INNOVATION, EMPLOYABILITY, DEVELOPMENT AND RESEARCH: The ability to develop one's creative and innovative tendencies with the ultimate aim of serving the development and progress of society. The ability to work on a research topic. Employability in managerial posts in all types of companies and public authorities, coupled with initiative and decision-making abilities. The ability to develop one's creative and innovative tendencies with the ultimate aim of serving the development and progress of society. The ability to work on a research topic. Employability in managerial posts in all types of companies and public authorities, coupled with initiative and decision-making abilities.

SUSTAINABILITY AND THE ENVIRONMENT: The capacity for engineering development in the framework of globalisation, sustainability and environmental protection. The ability to analyse the entire life cycle of an engineering project.

KNOWLEDGE DEVELOPMENT: The ability to develop new analytical methods and processes at all levels: conception, design and development. The ability to propose and develop specifications, regulations and rules in engineering following safety and efficiency criteria and using sustainable resources.

ECTS credits: total hours of student work

| | | Dedication | |
|----------------------------|------------------------------|------------|---------|
| | | Hours | Percent |
| Supervised Learning | Theory | 30.00 | 66.7% |
| | Assignments | 3.00 | 6.7% |
| | Laboratory | 6.00 | 13.3% |
| | Supervised activities | 6.00 | 13.3% |
| Self-Learning | | 80.00 | |

Contents

Generals Themes

Dedication

10.0h. Theory

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

Structural behaviour and Design criteria for deck cross sections

Dedication

7.0h. Theory

Description

Design of precast prestressed beam decks

Design of slabs decks

Design of box beam girder decks

Bridge Bearings, Piers and Abutments

Dedication

5.0h. Theory

Description

Design of Piers and Abutments

Bearing devices for bridges

Bridge Deck Structural Analysis by the Grillage method

Dedication

3.0h. Assignments

Description

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

Evaluations

Dedication

6.0h. Laboratory

Design and Construction of segmental prestressed concrete bridges

Dedication

8.0h. Theory

Description

Design and Construction of bridge decks "in situ" and with precast beams

Design and construction of segmental bridges span by span

Design and construction of bridge decks by incremental launching

Design and Construction of Bridges by the Cantilever method

Activities

Completing the previous design of a bridge in a format of five practical works, P1 to P5.

Dedication

6.0 h. Supervised activities

Description

P1. - Design of the bridge deck

P2. - Structural analysis of the deck due to live loads by the grillage analysis method

P3. - Analysis of the local transverse bending

P4. - Design of piers and abutments

P5. - Design of bearing devices

Note: many cases will be defined and each group will choose one of them to carry out the work

Grading rules (*)

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

- Continuous assesment consists in carrying out a practical work (40%) and a final exam (60%)
- The practical work consists in en preliminary design of a bridge according to a draft format of five partial works, P1 to P5, conducted in groups of two students
- Each partial practical work must be delivered on the dates indicated in ATENEA. Failure to timely delivery will be graded with 50% of the marks obtained at delivery.
- The grade obtained in each delivery (3 deliveries) will be affected by a multiplier, a value between 0 and 1, which is obtained through a write examination conducted the day of delivery of the practice. The review will assess the degree of authorship of each group member.
- These three evaluations are worth 40% of the total mark
- The final evaluation will be at week 13, is single, will last three hours and its value is 60% of the final mark
- According to academic guidelines, special evaluation exists only for those students who can support, in a documented way , they had been unable to attend to one or more partial evaluations. They can only recover the missing evaluation

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.

Teaching methodology

The course consists of 1,8 hours per week of classroom activity (large size group) and 0,8 hours weekly with half the students (medium size group).

The 1,8 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 0,8 hours 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.

Office hours

The tutorial hours will be published at the beginning of the course

Basic bibliography

- Ángel C. Aparicio y Juan Ramon Casas. **Apuntes de la asignatura "Puentes"**.
- F.Leonhardt. **"Ponts/Puentes"**.. Presses Polytechniques Romandes. . Lausanne, (1986).. (1986)..
- Arenas, J.J.; Aparicio, A.C. **Estribos de puente de tramo recto : concepción, diseño, cálculo**. Departamento de Tecnología de las Estructuras, Universidad de Santander. Santander. 1984.
- J. Arenas. A.C. Aparicio. **"Aparatos de apoyo para puentes y estructuras"**.. Publicaciones de la Universidad de Santander. . Santander. 1981.
- Calgaro y Virlogeux. **Projet et Construction des ponts" (2 tomos)**. Presses de L'Ecole Nationales des Ponts et Chaussées.
- C.Menn. **"Prestressed Concrete Bridges"**.. Birkhäuser. Birkhäuser, - Basilea, (1990)..
- E. Hambly. **"Bridge Deck Behaviour"**.. Ed: E & FN SPON (Chapman and Hall).- London. 1991.
- Manterola, Javier. **"Puentes: apuntes para su diseño, cálculo y construcción"**. Colegio de Ingenieros de Caminos, . Madrid 2006.
- Leonardo Fernández Troyano. **"Tierra sobre agua"**. Colegio I.C.C.P. Madrid, 1999. Madrid, 1999.