

Course guide

310613 - 310613 - Fundamentals of Civil Engineering

Last modified: 24/02/2025

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

Degree: BACHELOR'S DEGREE IN GEOINFORMATION AND GEOMATICS ENGINEERING (Syllabus 2016).
(Compulsory subject).

Academic year: 2024 **ECTS Credits:** 4.5 **Languages:** Catalan, Spanish

LECTURER

Coordinating lecturer: Josep A. Gili

Others: Rodrigo Miró Recasens
Altomare, Corrado

REQUIREMENTS

Several field trips are planned to visit some archetypical civil works, both in execution and in operation. We will also visit civil engineering laboratories. Hence, students must be covered by the school insurance. This is automatic for students under 28 years of age. Older students must opt for the optional insurance offered at the time of registration, or provide the school with proof of equivalent or higher insurance. Otherwise, they will not be able to go on the trips, and their learning, and chances of passing the course, will be severely limited.

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

1. (ENG) Comprendre i analitzar els problemes de implantació en el terreny de les infraestructures, construccions i edificacions projectades des de l'enginyeria en topografia, analitzar els mateixos i procedir a la seva implantació.
2. (ENG) Planificació, projecte, direcció, execució i gestió de processos i productes d'aplicació a l'obra civil i l'edificació, dins l'àmbit geomàtic.
3. Knowledge about construction methods; analysis of structures; design, execution and control of infrastructures in the work with interdisciplinary teams, knowledge of hydraulics.
4. Knowledge about security, health and labour risks inside the scope of this engineering and its application and development.

Transversal:

5. SUSTAINABILITY AND SOCIAL COMMITMENT - Level 2. Applying sustainability criteria and professional codes of conduct in the design and assessment of technological solutions.
6. TEAMWORK - Level 1. Working in a team and making positive contributions once the aims and group and individual responsibilities have been defined. Reaching joint decisions on the strategy to be followed.

TEACHING METHODOLOGY

Classes will be eminently practical, both in the classroom and in the field (trips). The 3 hours per week in common (students-teacher) will be used to share previously prepared contents (classroom) or to analyze the jobs and organisms visited. After each activity there will be activities to be carried out individually or in small groups.

The teaching intranet moodle (ATENEA) will be used as a repository of basic and complementary documentation for each activity, as well as for the delivery of the deliverables in which the directed activities will be specified.

All activities directed by the course are subject to assessment, including attendance (face-to-face or, when indicated, online) and active participation in the sessions by the students.

During the four-month period, the aim is to incorporate some generic competences, such as teamwork, critical spirit, search for new solutions, sustainability and social and environmental commitment.

LEARNING OBJECTIVES OF THE SUBJECT

At the end of the subject, the student must:

- Understand the main types of public works, their purpose, their parts and their basic nomenclature.
- Know the raw materials and machinery used in the construction of these civil engineering works.
- Identify differently the different actors involved in the public work (endusers, owners, builders, developers, administrations).
- Be able to distinguish the execution phases of a civil engineering project, from the initial idea to the exploitation and possible final deconstruction.
- Know how a job site is designed and managed, especially in relation to the monitoring and control during execution.

STUDY LOAD

Type	Hours	Percentage
Hours medium group	27,0	24.00
Hours large group	18,0	16.00
Self study	67,5	60.00

Total learning time: 112.5 h

CONTENTS

- Materials and elements necessary for construction

Description:

Presentation of the subject

Make known the materials, from their properties, to how can they be improved, in their case, until the application in construction.

Necessary auxiliar elements for the correct geometric definition and for its positioning.

The grounds and rocks. The materials used in construction. The auxiliar materials necessary for the application in construction.

Projection of related videos and round table.

This content will be carried out in the first three lective weeks.

Full-or-part-time: 6h

Theory classes: 3h

Self study : 3h

- The principles of geotechnics. The foundations. Concrete structures.

Description:

It will be based on the main knowledge of the ground mechanics and study of the soil, necessary for the definition of determined foundations that can transmit the charges of the structure. The different types of foundation, the elements that form a structure and its implantation in the space will also be defined. It will be done special emphasis on the bridges. Projection of related videos and round table.

This content will be made in the fourth, fifth and sixth week.

Full-or-part-time: 6h

Theory classes: 3h

Practical classes: 3h

- Constructive processes of linear works

Description:

The different phases in the construction of linear works will be discussed, highlighting roads, railroads and tunnels. The appropriate machinery will be studied in each case and how topographic and geodesic monitoring and control is carried out. Projection of related videos and round table.

This topic will be carried out in the seventh, eighth and ninth week of the course.

Full-or-part-time: 6h

Laboratory classes: 3h

Self study : 3h

- Constructive processes of maritime jobs.

Description:

It will be treated maritime and portuary works with a big surface and that also have specific conditions that affect the machinery to use and the constructive processes. Ground consolidation, maritime machinery and phases in the construction will be talked about. In each phase it will be talked about monitoring and topographic and geodesic control. Projection of related videos and round table.

This topic will be carried out in the tenth, eleventh and twelfth school week.

Full-or-part-time: 6h

Theory classes: 3h

Practical classes: 3h

- Introduction to hydraulics

Description:

It will be based on the basic concepts of piping and canal hydraulics, beginning by the geometric notions that will define the hydraulic section to the aspects of fluid dynamics like speed, the volume of water and flow.

The hydraulic infrastructures like pipes, canals and dams will be described.

Full-or-part-time: 6h

Theory classes: 3h

Guided activities: 3h

ACTIVITIES

- VISIT to Civil Engineering Lab-1

Description:

A Civil Engineering Laboratory will be visited, a visit linked to the content covered in the joint sessions.

Full-or-part-time: 6h

Guided activities: 3h

Practical classes: 3h

- VISIT to Civil Engineering Lab-2

Description:

A Civil Engineering Laboratory will be visited, a visit linked to the content covered in the joint sessions.

Full-or-part-time: 6h

Guided activities: 3h

Practical classes: 3h

- VISIT TO A PUBLIC CONSTRUCTION SITE-1

Description:

A work in execution linked to the contents explained and worked on will be visited.

Specific objectives:

See in situ some of the contents explained in class.

Full-or-part-time: 6h

Guided activities: 3h

Practical classes: 3h

- VISIT TO A PUBLIC CONSTRUCTION SITE-2

Full-or-part-time: 6h

Guided activities: 3h

Practical classes: 3h

- VISIT TO A PUBLIC CONSTRUCTION SITE-3

Full-or-part-time: 6h

Guided activities: 3h

Practical classes: 3h

- VISIT TO A PUBLIC CONSTRUCTION SITE-4

Full-or-part-time: 6h

Guided activities: 3h

Practical classes: 3h



- VISIT TO A PUBLIC CONSTRUCTION SITE-5

Full-or-part-time: 6h

Guided activities: 3h

Practical classes: 3h

- VISIT TO a public organism related to Civil Engineering-1

Description:

An organization related to Civil Engineering will be visited, a visit linked to the content covered in the joint sessions.

Full-or-part-time: 6h

Guided activities: 3h

Practical classes: 3h

- VISIT TO a public organism related to Civil Engineering-2

Full-or-part-time: 6h

Guided activities: 3h

Practical classes: 3h



GRADING SYSTEM

The course is passed by continuous learning and evaluation.

All the activities directed by the course are subject to assessment: before classes and trips, they will have to be prepared (search and study of previous documentation); during classes and trips, the active participation of the students will be assessed; the work or reports produced after the joint activity (directed activity, individual or in small groups) will be assessed. In parallel to the joint sessions, students will be asked to read chapters of books, watch videos, prepare "inter-parents" questionnaires, take ATENEA questionnaires, study basic vocabulary of Civil Engineering, trip exhibitions / free expositions, etc. Logically, attendance to each activity is controlled, which is also included in the grade.

The computation of the Final Grade is made by averaging all the evaluated items (activities, works, reports, questionnaires, interventions, etc.).

The first choice of the person in charge of the type of average is the geometric average. If for any general normative issue it is not possible to apply the geometric mean, the arithmetic mean will be applied (see note below).

The minimum grade (or in case of failure to complete the assignment) is 1 out of 10. It is possible that some activities receive a higher weight than others, by means of an exponent greater than unity within the root of the geometric mean. The ratio of the root of the geometric mean will logically be the sum of all the sub-radical exponents. This computation is intended to favor the regularity of the student's effort and participation throughout the whole four-month period and all the activities carried out in the course, from the beginning to the end.

Note on how, eventually, the arithmetic average would be made as such: The minimum grade (or in case of not having done the assignment) is 0 out of 10. It is possible that some activities receive a higher weight than others. The denominator of the average will be, logically, the sum of all the weights. This calculation has the intention of favoring the regularity of the effort and participation of the student throughout the whole four-month period and of all the activities carried out in the course, from the beginning to the end.

It follows from the above that, if the course is developed 'normally', it is not necessary to take partial or final exams to pass the course. Given the current pandemic circumstances, it cannot be ruled out (because it has already happened) that the 'normal' planned development will be affected by changes from face-to-face to online or by the impossibility of making the site visits that have been prepared. In this case, we would be forced to do a final exam, the grade would be combined with the grades of the 'normal' activities that have been maintained; we will always try to give maximum weight in the grade to the 'normal' activities.

Re-evaluation test: only students who have participated in a significant majority (> 80%) of the directed activities of the course, but who have not passed (failed final grade) will have the opportunity to take a re-evaluation test. This test will not necessarily be a written exam, but will try to evaluate a representative part of the main activities carried out during the term, therefore it will combine online questionnaires with oral, written and / or practical part. The maximum grade (transcript) for students who pass this re-evaluation test will be 5.0.

BIBLIOGRAPHY

Basic:

- Corral Manuel de Villena, Ignacio de. Topografía de obras. Barcelona: Edicions UPC, 2001. ISBN 8483015439.
- Mamlouk, Michael S. ; Zaniewski, John P. Materiales para ingeniería civil. Madrid [etc.]: Pearson Educación, 2009. ISBN 978-84-8322-510-3.
- Sarria Molina, Alberto. Introducción a la ingeniería civil. Santafé de Bogotá (Colombia): McGraw-Hill Interamericana, 1999. ISBN 9586009351.
- Tapia Gómez, Ana. Topografía subterránea. Barcelona: Edicions UPC, 1997. ISBN 8483012081.
- Mulder, Karel. Desarrollo sostenible para ingenieros [Recurs electrònic] . Barcelona : Edicions UPC, 2007. ISBN 9788498803433.

RESOURCES

Audiovisual material:

- Lèxic o Vocabulari Bàsic de la Construcció. <https://www.upc.edu/slt/ca/terminologia-upc/vocabularis/construccio.pdf>

Hyperlink:

- Diccionari Visual de la Construcció. https://territori.gencat.cat/ca/01_departament/documentacio/general/terminologia_tecnica/diccionari_visual_de_la_construccio/- Diccionari d'enginyeria civil. <https://www.termcat.cat/en/diccionaris-en-linia/240/en>