

Course guide

2500229 - GEA0229 - Construction Procedures and Materials

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

Degree: BACHELOR'S DEGREE IN ENVIRONMENTAL ENGINEERING (Syllabus 2020). (Compulsory subject).

Academic year: 2023 **ECTS Credits:** 6.0 **Languages:** Spanish

LECTURER

Coordinating lecturer: MIREN ETXEBERRIA LARRAÑAGA

Others: MIREN ETXEBERRIA LARRAÑAGA, GONZALO RAMOS SCHNEIDER, MANUEL VALDES LOPEZ

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

- 14451. Apply the fundamental concepts of statistics and randomness of physical, social and economic phenomena, as well as uncertainty and decision-making techniques.
- 14457. Identify the fundamentals of structure theory, sustainable procedures for construction and dismantling of buildings and civil works; and describe the technology bases of the materials used in construction.
- 14460. Design and project treatment systems for purification and purification of water resources, and establish the basis for the management of waste generated, describe and assess desalination and reuse processes.
- 14461. Analyze, design, simulate and optimize processes and systems with environmental relevance, both natural and artificial, and their resolution techniques, as well as recognize techniques for analysis and evaluation of climate change.
- 14462. Design and project processes for the treatment of contaminated soils and aquifers.
- 14463. Prepare, implement, coordinate and evaluate urban and industrial solid waste management plans and resource recovery.
- 14464. Apply measures to prevent and control air quality, quantify noise pollution and its corrective measures and quantify odor emissions and corrective measures.

Generical:

- 14440. Identify, formulate and solve problems related to environmental engineering.
- 14441. Apply the functions of consulting, analysis, design, calculation, project, construction, maintenance, conservation and exploitation of any action in the territory in the field of environmental engineering.
- 14442. To use in any action in the territory proven methods and accredited technologies, in order to achieve the greatest efficiency respect for the environment and the protection of the safety and health of workers and users.
- 14443. Apply the necessary legislation during the professional practice of environmental engineering.
- 14444. Apply business management techniques and labor legislation.

TEACHING METHODOLOGY

The course consists of 2.3 hours per week of classroom activity (large size group) and 1.2 hours weekly with half the students (medium size group).

The 2.3 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 1.2 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.

The material can be in Spanish, Catalan and 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

Study of the environmental impact of the most common materials in the field of construction: energy consumption, CO2 emissions, waste; as well as their possibilities for recycling, reuse and recovery as waste.

Description of the construction procedures in environmental mitigation, prevention or recovery works: dredging of rivers, ports and coasts, mining rafts, decontamination, etc., based on the analysis of real cases. Environmental assessment of construction procedures through BREEAM, LEED, CEEQUAL and others.

1. Know the procedures to organize and plan an environmental mitigation, prevention or recovery work.
2. Know the characteristics of the machinery and materials that will be used in the execution of an environmental mitigation, prevention or recovery work.

Construction Procedures and Materials. Knowledge of construction procedures, materials, construction machinery and techniques for organizing, measuring, evaluating and planning environmental mitigation, prevention or recovery works. The course will be taught from a practical point of view based on analysis of real cases.

STUDY LOAD

Type	Hours	Percentage
Hours small group	15,0	10.00
Hours large group	30,0	20.00
Hours medium group	15,0	10.00
Self study	90,0	60.00

Total learning time: 150 h

CONTENTS

Materials

Description:

Sustainable building materials are those that do not deplete non-renewable (natural) resources and do not have an adverse impact on the environment when used. Although in practice it is very difficult to achieve these two objectives, the aim is to develop and use building materials aimed at sustainable development. For this, in each of the construction materials studied in the different topics, in addition to describing their physical-chemical and mechanical properties, the properties linked to sustainable development will be described. In the introduction, the average values of construction materials will be provided in terms of: - Consumption of raw materials in their production (minerals, water, etc.) - Incorporated energy, in Eq CO₂.

(consumption/production emissions, consumption/transport emissions, etc.) - Reuse and Recyclability - Durability
Concrete is the most used construction material in civil works. This topic analyzes the components of concrete (aggregates, cements, additives and water), the production process and placement. In addition, the fresh and hardened state properties of concrete and the durability of reinforced and prestressed concrete are studied. Special emphasis will be placed on the use of secondary materials (recycled aggregates and industrial by-products such as aggregates and supplementary cementitious materials) in new low-impact concretes and the analysis of the eco-efficiency of concrete. All aspects will be addressed theoretically and through problems. Laboratory practices will be carried out with which the manufacturing part, properties of the fresh and hardened state of conventional concrete and recycled concrete will be reinforced. Chapter 1. Introduction (components and regulations). Chapter 2 Cement and supplementary cementitious materials. Water. additives; Chapter 3. Aggregates (natural, recycled, etc.) (theory, problems and laboratory); Chapter 4. Design and manufacture of concrete. Fresh concrete. (theory, problems and laboratory); Chapter 4. Hardened concrete (theory, problems and laboratory); Chapter 6. Durability and eco-efficiency (theory, problems and laboratory).

Concrete

Concrete

In the construction industry, metals are used in an infinity of applications, whether as structures, facade cladding, anchors or enclosures. Metal is an essential element in contemporary buildings and civil works. The components that constitute the most used metals in construction (steel, iron, aluminum, copper and titanium) will be analyzed. Its manufacturing process (energy cost and emissions) and recyclability. In addition, the physical-mechanical properties and its durability. Chapter 1. Ferrous Alloys. Mechanical properties. Chapter 2. Microstructure (Theory). Heat treatment. Chapter 3. Non-ferrous alloys. Chapter 4. Applications of metallic materials in construction. Regulations and environmental analysis

metals

the ceramic industry is the oldest industry of humanity. Ceramic material is understood as the product of various raw materials, especially clays, which are manufactured in the form of powder or paste (to be able to shape them in a simple way) and which, when subjected to firing, undergo physical-chemical processes by which they acquire consistency. stoney In other words, more simply, they are non-metallic inorganic solid materials produced by heat treatment. Chapter 1. Introduction. Raw Materials. Fabrication process; Chapter 2. Physico-mechanical properties. Durability. Chapter 3. Applications. Regulations and environmental analysis.

Ceramic and Glass

Chapter 1. Properties of bituminous materials; Chapter 2. Bituminous mixtures, regulations and applications. Environmental analysis; Chapter 3. Insulating materials. Types, regulations and applications; chapter 4. Paints and varnishes: components, types and applications.

Bituminous materials, insulation and paints

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Full-or-part-time: 72h

Theory classes: 17h

Practical classes: 9h

Laboratory classes: 4h

Self study : 42h



Construction Procedures

Description:

Documents that form a project that will be the basis of the environmental work. Concepts of: work unit, unit price, measurement and budget

The project

The works contract. Organization of the Work: Work Management, Environmental Management, Main Contractor, Subcontractors

Environmental impact during construction. Types of impacts. Mitigation, prevention and recovery works

Environmental impact

Specific characteristics. Social considerations. collectors. Procedures

Urban works

Purification and treatment plants. Pipelines. Emissaries.

Dredged. Beach regenerations. contaminated sludge. Machinery

Maritime works

Procedures. Machinery. Environmental aspects

Earth movements

Full-or-part-time: 72h

Theory classes: 16h

Practical classes: 8h

Laboratory classes: 6h

Self study : 42h

GRADING SYSTEM

The grade for the subject is obtained from the continuous assessment grades and those corresponding to the laboratory and/or computer room. 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 qualification of teachings in the laboratory is the average of the activities of this type. The evaluation tests consist of a part with questions about concepts associated with the learning objectives of the subject in terms of knowledge or understanding, and a set of application exercises. The grade for the materials part is obtained with 10% of activities, 15% of laboratory practices and 75% of face-to-face exams (30% first exam and 45% second exam). The grade for the procedures part is obtained from the exams (40% first exam and 60% second exam). The final grade is the arithmetic mean of the material and procedure grades.

EXAMINATION RULES.

Criteria for qualification and admission to the re-evaluation: Students suspended from the ordinary evaluation who have appeared regularly in the evaluation tests of the suspended subject will have the option to take a re-evaluation test in the period set in the academic calendar. Students who have already passed or students classified as not present will not be able to take the reevaluation test of a subject. The maximum grade in the case of taking the reassessment exam will be five (5.0). The non-attendance of a student called to the re-evaluation test, held in the fixed period, cannot give rise to the completion of another test with a later date. Extraordinary assessments will be carried out for those students who, due to accredited force majeure, have not been able to take any of the continuous assessment tests. These tests must be authorized by the corresponding head of studies, at the request of the teacher responsible for the subject, and will be carried out within the corresponding teaching period.

BIBLIOGRAPHY

Basic:

- Martínez Montes, G.; Pellicer Armiñana, E. Organización y gestión de proyectos y obras. Madrid: McGraw-Hill, 2007. ISBN 9788448156411.

- Mamlouk, M. S.; Zaniwski, J. P. Materiales para ingeniería civil. 2a. Madrid: Pearson, 2009. ISBN 9788483225103.