

Course guide

2500233 - GEA0233 - Sustainable Construction

Last modified: 01/10/2023

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). (Optional subject).

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

LECTURER

Coordinating lecturer: NIKOLA TOSIC

Others: NIKOLA TOSIC

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

14455. Identify the concepts and technical aspects linked to the conduit systems, both in pressure and in free sheet and apply them to the water supply transport networks; pumping systems; unit networks; separative networks; Avenues prevention systems in urban areas and analysis of tools for the recovery of altered river and coastal spaces.

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.

14459. Describe the components and modes of transport and the impact of their externalities on the environment; identify the principles of environmental management of transport systems and sustainable planning of the territory; and introduce the tools for the management and operation of transport systems.

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 subject consists of 4 hours a week of face-to-face classes.

30 hours are dedicated to theoretical classes, in which the teaching staff exposes the basic concepts and materials of the subject and presents examples. 30 hours are dedicated to the analysis of literature and the study of practical cases with greater interaction with students and the evaluation of independent or group work. Practical exercises are carried out in order to consolidate the general and specific learning objectives.

Support material is used in the format of a detailed teaching plan through the ATENEA virtual campus: contents, programming of evaluation activities and directed learning and bibliography.

Although most of the sessions will be given in the language indicated in the guide, it may be that the sessions in which there is the support of other invited experts may be held in another language (Catalan or English).

LEARNING OBJECTIVES OF THE SUBJECT

Sustainable development concepts (economic, environmental and social). Concept of sustainable construction, its evolution, benefits, strategy for its implementation. Life cycle of civil buildings and constructions.

Description and analysis of the Environmental Assessment of Construction Projects. Tools, examples. Environmental Impact Statement, corrective, preventive and compensatory measures. Environmental Works Directorate, environmental monitoring. Developed based on practical cases.

1. Know the basic concepts that make environmental principles an integrated whole with the complete life cycle of projects and actions in the territory.
2. Quantify the environmental impact of construction materials and its waste.

Sustainable construction. Subject to introduce construction in the field of environmental impact management in construction and bring it closer to the concept of sustainable construction. Environmental concepts linked to sustainable development and analysis of the life cycle of actions in the territory will be raised.

Know the evolution, benefits and implementation strategies of the concept of sustainable construction.

Know the life cycle of buildings and civil constructions.

Know how to interpret the Environmental Impact Declaration (EPD) of products under construction.

Know the main tools for the sustainability analysis of construction projects.

Know the main aspects of environmental management of works.

STUDY LOAD

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

Total learning time: 150 h

CONTENTS

Concepts of sustainability and sustainable development

Description:

Evolution of the concepts of sustainability and sustainable development and current developments.

Reading of selected texts and organization of debates around the topics of sustainability and sustainable development

Full-or-part-time: 19h 12m

Theory classes: 4h

Practical classes: 2h

Laboratory classes: 2h

Self study : 11h 12m

Concepts of sustainable construction

Description:

Introduction to construction projects and stakeholders.
Exploration of different concepts within sustainable construction.
Analysis of case studies
Visit to a construction site where sustainable construction techniques are implemented

Full-or-part-time: 43h 12m

Theory classes: 8h
Practical classes: 3h
Laboratory classes: 7h
Self study : 25h 12m

Life cycle of buildings and civil constructions

Description:

Scope and functional unit.
LCA, LCC, S-LCA.
Material flow analysis.
Analysis of case studies

Full-or-part-time: 33h 36m

Theory classes: 8h
Practical classes: 4h
Laboratory classes: 2h
Self study : 19h 36m

Tools for the sustainability assessment of construction projects

Description:

Multi-criteria decision-making methods for integrated sustainability assessment
Analysis of case studies

Full-or-part-time: 28h 47m

Theory classes: 6h
Practical classes: 4h
Laboratory classes: 2h
Self study : 16h 47m

Environmental impact statements

Description:

Environmental Product Declarations.
Product Environmental Footprint.
Embodied carbon.
Generating an EPD and embodied carbon calculation

Full-or-part-time: 19h 12m

Theory classes: 4h
Practical classes: 2h
Laboratory classes: 2h
Self study : 11h 12m

GRADING SYSTEM

Qualification formula:

Exams: NE Exam grade

Papers: NT Paper grade;

Final course grade (NFA) $NFA=0.4*NE+0.6*NT$

Grading and admission criteria for re-evaluation:

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 it).

The evaluation tests consist of questions on concepts associated with the learning objectives of the subject in terms of knowledge or understanding.

It is necessary to complete the work in order to pass the course.

Qualification and admission criteria for reassessment: students who have failed the ordinary assessment and have regularly taken the assessment tests for the failed subject will have the option of taking a reassessment test within the period set in the academic calendar. Students who have already passed it or students qualified as not presented may not take the reassessment 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 summoned to the reassessment test, held in the period set, may not lead to another test at a later date.

Extraordinary evaluations will be carried out for those students who, due to accredited force majeure, have not been able to take any of the continuous evaluation tests. These tests must be authorized by the corresponding head of studies, at the request of the professor responsible for the subject, and will be carried out within the corresponding school period.

EXAMINATION RULES.

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 it).

The evaluation tests consist of questions on concepts associated with the learning objectives of the subject in terms of knowledge or understanding.

It is necessary to complete the work in order to pass the course.

BIBLIOGRAPHY

Basic:

- Halliday, S. Sustainable construction. 2nd ed. New York: Routledge, 2019. ISBN 9781138200289.
- Yates, J. K.; Castro-Lacouture, D. Sustainability in Engineering Design and Construction [on line]. Boca Raton, FL: CRC Press, 2016 [Consultation: 22/11/2023]. Available on: <https://www-taylorfrancis-com.recursos.biblioteca.upc.edu/books/mono/10.1201/9781315368665/sustainability-engineering-design-construction-yates-daniel-castro-lacouture>. ISBN 9781315368665.
- Gibbons, O.P.; Orr, J.J.; Archer-Jones, C.; Arnold, W.; Green, D. How to calculate embodied carbon [on line]. 2nd ed. IStructE, 2022 [Consultation: 26/10/2023]. Available on: <https://www.egbc.ca/getmedia/a7603519-43cc-4795-8558-6960b2b7b5d1/HTCEC-2nd-edition.pdf.aspx>. ISBN 9781906335571.
- Ishizaka, A.; Nemery, P. Multi-Criteria Decision Analysis: methods and software [on line]. Chichester, West Sussex: Wiley, 2013 [Consultation: 26/10/2023]. Available on: <https://onlinelibrary-wiley-com.recursos.biblioteca.upc.edu/doi/book/10.1002/9781118644898>. ISBN 9781118644898.
- Favier, A.; Wolf, C.; Scrivener, K.; Habert, G. A sustainable future for the European cement and concrete industry [on line]. ETH Zurich, 2018 [Consultation: 26/10/2023]. Available on: https://europeanclimate.org/wp-content/uploads/2018/10/AB_SP_Decarbonisation_report.pdf.
- International Standard Organization. Gestión ambiental: UNE-EN ISO 14040:2006 Gestión ambiental: análisis de ciclo de vida: principios y marco de referencia. 2a ed. Madrid: AENOR, 2007. ISBN 9788481435214.
- Asociación Española de Normalización y Certificación (AENOR). UNE-EN ISO 14044: gestión ambiental: análisis del ciclo de vida: requisitos y directrices. Madrid: Aenor, 2006.