Course guide
2500235 - GEA0235 - Sustainable Mobility and Smart-City

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: MIGUEL ANGEL ESTRADA ROMEU

Others: JOSÉ MAGÍN CAMPOS CACHEDA, MIGUEL ANGEL ESTRADA ROMEU

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 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.

Learning will focus on the development of a course project, where students will have to plan the mobility systems of a city.

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.

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

The regulations and instruments for urban mobility planning and its environmental management are presented. Non-motorized mobility planning and its relationship with the urban form and the design of public space are addressed.
New technologies for a smarter, healthier, more resilient, efficient and inclusive city are exposed: Mobility 4.0 applications and the role of ICT - Apps, Technology and data transmission in ITS, Sound-reducing, reflective, luminescent pavements; Shared vehicle management systems. Transportation System Management (TSM), Hybrid Vehicle, Electric Vehicle, Natural Gas Vehicle (NGV) DUM - Urban Merchandise Distribution, E-commerce, Just-in-time.
New models of mobility governance are proposed. Concepts such as smart citizens, smart communities and the role of citizen participation are discussed.

1. Know the principles of environmental and sustainable mobility management to know how to propose mobility plans and environmental management strategies of private and collective transport.
2. Know the role of ICT tools and Apps for shared vehicle and on-demand transport strategies. Non-motorized mobility and electrification.

Sustainable Mobility and Smart-City. The basic concepts for an environmental and sustainable management of mobility will be raised both in terms of private transportation as a group. The role of ICT and electrification in mobility will be introduced.

STUDY LOAD

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

Total learning time: 150 h

CONTENTS

Introduction to sustainable mobility

Description:
Concept of sustainable mobility. Past, present and future of mobility. Analysis vectors

Full-or-part-time: 4h 48m
Theory classes: 2h
Self study : 2h 48m

Sustainable urban mobility planning

Description:
Objective function. System actors. User services, investment costs, operation costs.
External costs. Individual benefits versus society and sustainable development goals (ODS). Monetization of externalities.
Accidents, Congestion, air quality, greenhouse effect, noise pollution, barrier effect. regulations
Generation and attraction of people and goods trips depending on the urban plot, location of activities and type of buildings or infrastructures
Propulsion and control technology. Combustion, electromobility, hydrogen battery. Autonomous vehicle modes of transport. New technologies. Urban Distribution of Goods
Perception of system attributes. digitization New paradigms. Mobility services and MaaS
a. Management of the offer. Infrastructure, Control, access restriction, ZBE. b. Demand management. New collaborative systems. Pigouvian pricing. Vickery model. technology

Full-or-part-time: 64h 48m
Theory classes: 27h
Self study : 37h 48m

Project-based sessions

Description:
Introduction to the project. Land use and mobility session
Private vehicle session
Session on Public Transport and Non-Motorized Network
Project Session 4
Integration of sustainable mobility measures

Full-or-part-time: 60h
Practical classes: 14h
Laboratory classes: 11h
Self study : 35h

Governance and Decision Making

Description:
Governance of mobility
decision making Cost-benefit analysis. Multicriteria analysis. Actor-Effect Matrix.

Full-or-part-time: 14h 23m
Theory classes: 6h
Self study : 8h 23m

GRADING SYSTEM

The subject's grade is obtained from the continuous assessment grades.

The continuous assessment consists of doing 5 activities in groups of 2-4 people based on an urban mobility project, of an additive and formative nature, carried out during the course (inside and outside the classroom). The grading of the group activities will be based on the arithmetic mean of the 5 tests (AA). There will be a multiple choice exam (E) of the theoretical content of the subject.

The final grade of the subject is N= 0.6AA+0.4E

Re-assessment (RE)
Qualification and admission criteria for reassessment (Re):

Students who have failed the ordinary assessment and who have regularly taken the assessment tests of the failed subject will have the option of taking a re-assessment test in the period set in the academic calendar. Students who have already passed, or students rated as not submitted or who have not handed in all the exercises/problems (AA) may not take the reassessment test of a subject.

The reassessment (RE) will consist of a single exam that covers all the content of the course. The maximum grade for the reassessment will be five (5.0) and the final grade for the course will be the maximum grade between the continuous assessment and the reassessment exam, that is, MAX(EO/RE).

The non-attendance of a student to the re-assessment test, held in the set period, may not lead to another test at a later date. Extraordinary assessments will be carried out for those students who, due to a reported extraordinary event, 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.

If any of the laboratory or continuous assessment activities are not carried out in the scheduled period, it will be considered a zero score. The exam will be done individually, with test-type questions that can be theoretical or problem-type questions. The exam can include short questions to be developed by the students and exercises to be solved.

BIBLIOGRAPHY

Basic:

- Vandycke , N.; Viegas, J.M. Sustainable mobility in a fast-changing world: from concept to action [on line]. Cham, Switzerland: Palgrave Macmillan, 2022 [Consultation: 16/11/2023]. Available on: https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?pq-origsite=primo&docID=7109272. ISBN 3031089618.
- Holguín-Veras, José ; Amaya-Leal, Johanna ; Wojtowicz, Jeffrey ... [et al]. Improving Freight System Performance in Metropolitan Areas: A Planning Guide [on line]. National Academy Press, 2015 [Consultation: 27/10/2023]. Available on: https://nap.nationalacademies.org/catalog/22159/improving-freight-system-performance-in-metropolitan-areas-a-planning-guide. ISBN 9780309308571.
- Daganzo, Carlos F.; Ouyang, Yanfeng. Public transportation systems: principles of system design, operations planning and real-time control. Hackensack, NJ: World Scientific Publishing, 2019. ISBN 9789813224087.