

Elements of Urban Sustainability (2500045)

General Information

School	ETSECCPB
Departments	Departament d'Enginyeria Civil i Ambiental (DECA)
Credits	4.5 ECTS
Programs	GRAU EN ENGINYERIA CIVIL (pla 2020) PARS: ENGINYER/A DE CAMINS, CANALS I PORTS (pla 2022)
Course	2025/26

Main teaching language at each group

- Group 10Q1 Catalan (Q1)

Faculty

Responsible Faculty: Elisabeth Roca Bosch

Faculty: Francesc Baró Porrás, Josep Mercadé Aloy, Elisabeth Roca Bosch, Mercè Taberna Torres

Objectives of Education

Introduction to the concept of sustainable urban planning. Introduction to urban models and urban services associated with a reading of urban ecology and the cycles of water, energy and materials. Mechanisms and processes of management of urban systems from sustainability. Construction elements of urbanization associated with a sustainable model. The elements of the urbanization. Graduality and survival in the construction of networks. Referential levels of urbanization. Functionalist approach of networks versus complementarity of services. Social and environmental economic costs of the management of low-density urbanization. Processes of social segregation in access to urban infrastructures and services. Urban sustainability and criteria for a more sustainable urbanism. Environmental assessment of urban planning. Sustainability indicators. Ecobarris of reference. Introduction to the water cycle in urban systems. Technologies for reducing water consumption and water reuse in urban environments. Urban infrastructures for energy efficiency and local use of renewable energy resources. The cycle of materials and their impacts on urbanism. Technologies and systems for the collection of urban waste. Criteria for the organization of active mobility and public transport. Public space, urban landscape and green infrastructure. Noise management and air quality. Policies and forms of urban intervention and management. Concertation and participatory processes.

Competencies

Especific

Knowledge of the urban management regulation framework. (Specific technology module: Urban Transport and Services)

Knowledge of the influence of infrastructure in the planning of the territory and to participate in the urbanization of urban public space, such as water distribution, sanitation, waste management, transport systems, traffic, lighting, etc. (Specific technology module: Urban Transport and Services)

Generic

Scientific-technical training for the exercise of the profession of Technical Engineer of Public Works and knowledge of the functions of advice, analysis, design, calculation, project, construction, maintenance, conservation and exploitation.

Ability to project, inspect and direct works, in their field.

Ability to carry out territorial planning studies and environmental aspects related to infrastructure, in its field.

Capacity for maintenance, conservation and exploitation of infrastructure, in its field.
 Knowledge of the history of civil engineering and training to analyze and assess public works in particular and construction in general.
 Identify, formulate and solve engineering problems. Pose and solve construction engineering problems with initiative, decision-making skills and creativity. Develop a systematic and creative method of analysis and problem solving. (Additional school competition).

Total hours of student work

		Hours	Percentage
Supervised Learning	Large group	45.0 h	100.00 %
	Medium group	0.0 h	0.00 %
	Laboratory classes	0.0 h	0.00 %
	Guided Activities	0.0 h	0.00 %
Self Study		67.5 h	

Contents

1. Urbanization over time

The elements of urbanization Graduality and survival in the construction of networks Reference levels of urbanization Towards a sustainable territorial vision Functionalist approach of networks versus complementarity of services

Specific Objectives

Introduce the student to an evolutionary vision of urbanization. Highlight the contradiction between a compartmentalized normative vision for each service and maximalist in the demands of each element of urbanization; and the need for complementarity between services.

2. Urban ecology and metabolism

Approach from urban ecology to urban management. The city as an ecosystem. Urban metabolism: The consumption of energy and resources (water, soil, etc.). Environmental issues. Management strategies: The compact, complex, diverse and efficient city. The BCN Ecology Model.

Specific Objectives

Introduce the student to ecosystem thinking and the perspective of urban metabolism for urban management. Understand and apply desirable criteria in sustainable urban models.

3. Instruments for environmental assessment of urban planning

Elements of sustainability in urban legislation Environmental assessment in urban planning The measure of sustainability and environmental indicators. Applications of indicators in urban context.

Specific Objectives

Recognize the legal instruments applicable to urban planning practice to assess their environmental impact and improve their sustainability. Learn to use indicators in the analysis of urban sustainability. .

4. Ecocities in perspective

Concept of Eco-neighborhood Environmental, social and economic elements of an eco-neighborhood Analysis of experiences of reference eco-neighborhoods (Vauban (Freiburg)) Potentialities and Limits of eco-neighborhoods Comparison between the Vauban Eco-neighborhood and other European neighborhoods

Specific Objectives

Introduce the environmental, social and economic aspects to the concept of eco-neighborhood. Compare experiences in order to assess the degree of change towards an ecological urbanization model that an eco-neighborhood can represent.

5. Water cycle and sustainable urbanization

Introduce the environmental, social and economic aspects to the concept of eco-neighborhood. Compare experiences in order to assess the degree of change towards an ecological urbanization model that an eco-neighborhood can represent.

Specific Objectives

Understand the water cycle and the possibility of reusing water with elements of urbanization

6. The materials cycle: urban solid waste management

The cycle of materials and their impacts on urban planning. Principles of sufficiency, proximity and the polluter pays. Urban waste collection technologies and systems. Municipal collection and management experiences.

Specific Objectives

Understand the cycle of materials and waste management in the urban environment. Assess the urban repercussions of existing collection models.

7. Mobility, energy and sustainable urbanization

Sustainable mobility Criteria for sustainable mobility Law of Sustainable Mobility Studies of generated mobility Assessment of energy consumption, pollution generation, noise generation Experiences of rearrangement of transport and mobility associated with public transport Experiences of rearrangement of transport associated with pedestrian axles and bicycles

Specific Objectives

Introduce the student to the analysis of the close correlation between mobility model and sustainable energy model. Introduce the student to the uses of the key indicators for evaluating the energy and mobility model.

8. Atmospheric management: Noise planning and air quality

Noise management: Regulatory framework and acoustic planning. Sound maps and acoustic capacity. Air quality management: Regulatory framework and strategies for planning and managing air pollution. Plans to improve Air Quality in the Barcelona Metropolitan Region

Specific Objectives

Know the management strategies and planning tools for atmospheric problems such as noise and air pollution.

9. Public spaces, landscape and green infrastructure

Quality of public spaces, uses, activities and design. Urban parks and green corridors The management and arrangement of urban beaches.

Specific Objectives

Provide the student with criteria for assessing the quality of public spaces. Be able to make proposals for the arrangement and management of public spaces.

10. Management of the urban environment and the energy cycle

Urban infrastructures for energy efficiency and local use of renewable energy resources. The elements of urbanization and management favorable to renewable energy resources. Sustainable Energy Action Plans (SEAPs) Evaluation of the most effective actions to reduce CO2 generation.

Specific Objectives

Understand the energy cycle and the management of the implementation of renewable energy resources in the urban environment. Assess the urban repercussions of the models of the energy cycle and the actions of the Sustainable Energy Plans.

11. Costs and management of dispersed urbanization

Causes and trends of scattered urbanization in the RMB Economic, social and environmental costs of low-density urbanization. Policies and forms of intervention and urban management.

Specific Objectives

Causes and trends of scattered urbanization in the RMB Economic, social and environmental costs of low-density urbanization. Policies and forms of intervention and urban management.

12. Socio-territorial segregation, social equity and urbanization networks

Social segregation processes in access to infrastructure. Urban regeneration: Diversity and social stability.

Specific Objectives

Understand the processes of social segregation caused by unequal access to communication infrastructures and urban services. Provide analytical capacity to the student to assess proposals for urban regeneration that improve social inequities.

13. Participatory processes in urban planning and management

Agendas 21 and citizen participation. The agreement and the participatory processes in the urban intervention. Participatory experiences in Catalonia.

Specific Objectives

To know the antecedents of the citizen participation in the environmental management of the city. Know and analyze participatory experiences that improve urban practice.

Workshops

Presentation of the Practices consisting of 4 Workshops with their corresponding exercises. The student carries out a set of 4 Workshops on different elements of urbanization associated with the infrastructures of urban services and of transport and his relation with the urban territory and his management from a perspective of sustainability of the urban environment. All 4 Workshops are held in the same municipality or neighborhood (in case of analyzing an exceptionally complex municipality) to be freely chosen by the student.

Work 1: Territorial fit of the chosen field of study in relation to the infrastructure networks

Workshop 2: Graphic representation of the sanitation network in relation to the topography. Proposal for the implementation of a wastewater quality improvement system using an alternative lagoon-type system.

Exercise 2.2: * Identification of a residential area likely to support a system of lacunage and graphic representation of the solution adopted in relation to the chosen residential fabric * Preparation of a brief supporting report

Workshop 3: Identification and delimitation of a sector susceptible to transformation into an environmental area of coexistence with a sustainable mobility system. Exercise 3.3: * Proposal for the transformation of the environmental area with a new system for offering sustainable mobility * Preparation of a brief explanatory report Presentation of Workshop 4: Proposal for the transformation of an element of the unique road network including elements of sustainable urbanization for the water cycle and for sustainable mobility.

Workshop 4: Proposal for the transformation of a unique road network element with the inclusion of sustainable urbanization elements for the water cycle and sustainable mobility Exercise 4.2: * Representation of the plant, cross sections and details of the current state * Representation of the plant, cross-sections and construction details of the proposed state * Preparation of a brief justification report

Specific Objectives

Plantear los 4 Talleres como oportunidad de aplicar gradualmente los conocimientos adquiridos en las clases teóricas en un contexto conocido por el alumno.

Learn to place a given field of study in a broader context from a graphical representation of synthesis capable of intentionally characterizing the territory.

Learn to analyze the urban fabric to propose projects to improve the sanitation network as instruments of urban planning.

Learn to reorganize the mobility of the city with sustainability criteria as a project tool for public space.

Introduce the proposal for the transformation of an element of the road network with sustainability criteria as a construction project for the urban landscape.

Learn basic criteria for designing public space. Learn to adequately represent the proposals for the transformation of elements of the road network.

Activities

3 Visits to work or neighborhood in transformation

Analysis of urban tissues, planning systems, management and execution of urbanization projects. Innovation in urban service systems. Analysis of new urban service methodologies associated with information and communication technologies.

Dedication

4h 30m

Teaching Methodology

All this is planned with emphasis on participatory actions, which requires an active attitude of the student. The sessions are 3 hours long and 1.5 hours are dedicated to theoretical classes and concepts. During the course, 4 taller applications are developed in a study case selected for the student, so that it is possible to implement practical exercises in order to consolidate the objective of learning general specifications.

Use support material in detailed teacher format on the virtual ATENEA campus: contents, assessment activity program and learning direction and bibliography.

Since the majority of the sessions will be taught in the language indicated in the guide, the sessions may be composed of the support of other experts who are promptly duguin a terme in another language.

You will have 3 courses to visit territorial projects, urban projects, exhibitions or other activities that can relate to the contents of the course.

Grading Rules

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

The grade for the subject is obtained from the continuous assessment grades based on classroom exercises, urban planning workshops and the three field trips.

Continuous assessment consist in several activities, both individually and in group, of additive and training characteristics, carried out during the year (both in and out of the classroom).

The final assessment is: 40% (deliverables of assignments carried out in class + 3 visits) + 50% (4 workshops) + 10% active participation in the classroom.

Criteria for re-evaluation qualification and eligibility: students that failed the ordinary evaluation and have regularly attended all evaluation tests will have the opportunity of carrying out a re-evaluation test during the period specified in the academic calendar. Students who have already passed the test or were qualified as non-attending will not be admitted to the re-evaluation test. The maximum mark for the re-evaluation exam will be five over ten (5.0). The non-attendance of a student to the re-evaluation test, in the date specified will not grant access to further re-evaluation tests. Students unable to attend any of the continuous assessment

tests due to certifiable force majeure will be ensured extraordinary evaluation periods.

These tests must be authorized by the corresponding Head of Studies, at the request of the professor responsible for the course, and will be carried out within the corresponding academic period.

Test Rules

The final mark consists of a combination of activities carried out in the classroom and the visits which counts for 40%, four workshops of 50% + the remaining 10% will correspond to the participation and assistance in the classroom during the visits and fieldtrips.

Once the courses are finished, an extraordinary test will be realized for those who, having completed 4 practical exercises, will not be able to open the courses to the weight of continuous evaluation.

Office Hours

Contact the teachers by email to agree on consultation hours.

Bibliography

Basic

- El Urbanismo Ecosistémico. Barcelona, 2021.
- Bettini, V. [Elementos de ecología urbana](#). Madrid: Trotta, 1998. ISBN 9788481642612.
- Herce, M.; Magrinyà, F.; Miró, J.; (eds.). [Construcció de ciutat i xarxes d'infraestructures](#). 2a ed. Barcelona: Edicions UPC, 2006. ISBN 9788483018781.
- Herce, M. [Lec. 11. Sobre la movilidad urbana](#). Barcelona: Reverté, 2009. ISBN 9788429121186.