Degree competences to which the subject contributes

Specific:
3070. Knowledge of construction procedures, construction machinery and the techniques for organising, measuring and valuing works.

Teaching methodology

The subject consists of three classroom hours per week. For each of the various topics that make up the modules of the subject, students will be provided with learning material that covers the main concepts and contents, as well as a recommended reading list. The lectures on theory (1:30-2 h) will lay the groundwork for the various topics, and the practical sessions (1 h) will introduce students to the reality on the ground and specific case studies. We will therefore use a wide variety of learning materials, especially images, technical drawings and maps.

In laboratory sessions, we will critically assess the contents by comparing various texts and examine case studies of engineering works that have sparked public debate regarding suitability. We will also take a field trip to the transport hub in Martorell (Baix Llobregat).

Learning objectives of the subject

Knowledge of civil engineering history and ability to analyze and to value public constructions

Students will be introduced to the history of public works, the evolution of public works in terms of technical and construction-related knowledge, and the important role played by public works in the transformation of the land. Students will come to understand that civil-engineering actions-manifested through public works-tend to characterize the way in which the different Western societies have interacted with the environment and modified the land and nature in order to establish transport systems, water use and energy optimization, and also the ways in which these societies have set up city infrastructure.

Students will approach the history of public works as transversal knowledge that allows the assessment of regional structures created through engineering from a perspective of functional continuity over time. This dynamic approach will incorporate historical legacy into present-day reality.
Students will learn to assess public works in terms of their artistic value, technical legacy, design, and role in landscape creation over time, all of which lends cultural meaning to public works as creations of humankind. This assessment of monumentality, which extends to linear infrastructure, gives meaning to public works as cultural heritage. By gaining an understanding of regions and cities as products of a historical process, students will acquire a critical and thoughtful vision of engineering products—a vision which, consequently, better integrates public works and land in current planning practice. They will also learn to value and contextualize public-works heritage in actions at the regional and urban levels.

### Study load

<table>
<thead>
<tr>
<th>Total learning time: 112h 30m</th>
<th>Theory classes: 26h</th>
<th>23.11%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Practical classes: 10h</td>
<td></td>
<td>8.89%</td>
</tr>
<tr>
<td>Laboratory classes: 9h</td>
<td></td>
<td>8.00%</td>
</tr>
<tr>
<td>Guided activities: 4h 30m</td>
<td></td>
<td>4.00%</td>
</tr>
<tr>
<td>Self study: 63h</td>
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<td>56.00%</td>
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Content

<table>
<thead>
<tr>
<th>Module I. Introduction General concepts</th>
<th>Learning time: 7h 11m</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 2h</td>
</tr>
<tr>
<td></td>
<td>Laboratory classes: 1h</td>
</tr>
<tr>
<td></td>
<td>Self study: 4h 11m</td>
</tr>
</tbody>
</table>

**Description:**
Historical overview of public works: technical knowledge and land development. Public works as cultural heritage: functionality, continuity and monumentality. New vectors of civil engineering: landscape, region and city. Explanation of how content will be structured in the course: lectures on theory, practical sessions (case studies), critique sessions and individual work.

**Specific objectives:**
Students will receive an up-to-date overview of the history of public works and the relationship between engineering, land and cities. They will also learn how the concept of cultural heritage applies to civil engineering works.

The upcoming practical sessions will be described as an introduction to engineering in Catalonia and Spain. The featured public works will be placed in a particular socioeconomic and cultural context.
### Module II. Roman and medieval engineering

<table>
<thead>
<tr>
<th>Learning time: 21h 36m</th>
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<tbody>
<tr>
<td>Theory classes: 6h</td>
</tr>
<tr>
<td>Practical classes: 2h</td>
</tr>
<tr>
<td>Laboratory classes: 1h</td>
</tr>
<tr>
<td>Self study: 12h 36m</td>
</tr>
</tbody>
</table>

### Description:


Analysis of the formation of the medieval road system at two different scales: Catalonia and the Iberian Peninsula as a whole. Cattle trails and trade routes. The Way of St. James.

Traditional uses of water and wind energy. The legacy of Islamic hydraulic engineering. Mills, waterwheels and irrigation. Large dams in the Mediterranean region of Spain.

Students will answer two theory-related questions and one question related to the practical sessions. The questions will refer to texts covered during the module.

### Specific objectives:

Students will acquire an understanding of the crucial role played by public works during the Roman colonization of Europe, which was both a strategy of territorial expansion and an attempt at civilization. They will also explore early technical knowledge in engineering.

Students will gain an appreciation of the importance of early Roman roads in the history of the Iberian Peninsula's transport network.

Students will understand the importance of the medieval period as a stage in the formation of Europe's urban structure and transport system.

Analysis of the formation of the medieval road system at two different scales: Catalonia and the Iberian Peninsula as a whole. Cattle trails and trade routes. The Way of St. James.

Students will gain an understanding of water management in traditional societies. They will also learn to interpret the concept of the machine and the "mechanic arts."

Students' knowledge acquisition and practical understanding will be evaluated by means of monographic essays.
Module III. The origins of the land management

<table>
<thead>
<tr>
<th>Learning time: 14h 23m</th>
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</thead>
<tbody>
<tr>
<td>Theory classes: 4h</td>
</tr>
<tr>
<td>Practical classes: 1h</td>
</tr>
<tr>
<td>Laboratory classes: 1h</td>
</tr>
<tr>
<td>Self study: 8h 23m</td>
</tr>
</tbody>
</table>

Description:
Military engineers in Europe and Spain. The compilation of technical and scientific knowledge. Changes in the "art of war."
European monarchies' support for public works. The concept of hydraulic architecture: roads, canals and ports.

Urban development and planning. Fortifications and port works. A dream of order: newly founded cities
The bridge-building process: foundations, abutments, arches and deck.

Students will reconstruct the process of building an ancient bridge using original documentation (drawings, plans, construction details, rules of proportion, etc.).

Specific objectives:
Students will gain an understanding of the context of military engineering and develop an appreciation of its contribution to scientific and technical knowledge in Europe as a precursor to civil engineering.
By studying original maps, students will gain an understanding of the high level of Spanish engineering and land management in Latin America.
Students will gain an understanding of the concept of monumental scale as applied to bridges through a combination of three vectors: technique, mastery of design and urban location.
Working in groups of three, students will sort through graphic images from ancient documents to reconstruct the process of building a bridge.
Module IV. Emergence and development of contemporary engineering

Learning time: 21h 36m
- Theory classes: 5h
- Practical classes: 2h
- Laboratory classes: 2h
- Self study: 12h 36m

Description:
The French model: ponts et chaussées. The civil engineer in Great Britain and the impact of the industrial revolution.
Road planning, canals, water supply systems, ports and new towns. The first civil-engineering school.
The effects of industrial economic development: iron as a new construction material.

Comparison of the two largest canals: Suez and Panama. Texts justifying the construction of the canals on ideological and political grounds.

Students will answer two theory-related questions and one question related to the practical sessions. The questions will refer to texts covered during the module.

Specific objectives:
Students will gain an understanding of two key factors in the contemporary world and in the new capitalist economic model: the emergence of modern engineering and the important role of transport. They will also learn the basics of a road project: alignment, sections, profiles, bridges and engineering structures.
Students will interpret texts and maps in order to understand how the concept of “land as a resource” applied to 18th-century Spain.
Students will gain an appreciation of how the new possibilities of iron transformed engineering: Types of iron, strength of materials, calculation of structures and large-scale regional impacts.
Students will develop an understanding of regional strategy and the effects of the construction of the world’s two most important canals.
Students will gain an understanding of various concepts associated with railways: the formation of large railway networks, the transport revolution, and the new regional topography.
Students will carry out a critical analysis of texts on the Spanish and Catalan railway models.

Students’ knowledge acquisition and practical understanding will be evaluated by means of monographic essays.
## Module V Civil Engineering of the 20th century

<table>
<thead>
<tr>
<th>Learning time: 14h 23m</th>
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<tr>
<td>Theory classes: 4h</td>
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<tr>
<td>Practical classes: 1h</td>
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<tr>
<td>Laboratory classes: 1h</td>
</tr>
<tr>
<td>Self study : 8h 23m</td>
</tr>
</tbody>
</table>

### Description:


Regenerationism: "To irrigate is to govern." National water plans. River basin district confederations. Reservoirs and water conveyance projects. Hydroelectricity.


A critical discussion of Torroja’s reflections on the relationship between formal possibilities, aesthetics, and the responsibility of designers.

### Specific objectives:

Students will acquire an understanding of the impact of the automobile as the great transport paradigm shift. They will also learn about the functional and regional specialization of major infrastructures.

Students will engage in a critical discussion of 20th-century water policy in Spain.

Students will gain an appreciation of the major achievements of 20th-century civil engineering. They will also learn about technical accomplishments, functional and aesthetic values, control over the land, and landscape creation.

Students will reflect on the considerations that must be taken into account prior to an engineering project.
Module VI. The urban planning of engineers

<table>
<thead>
<tr>
<th>Learning time: 28h 47m</th>
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<tbody>
<tr>
<td>Theory classes: 5h</td>
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<tr>
<td>Practical classes: 4h</td>
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<tr>
<td>Laboratory classes: 3h</td>
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<tr>
<td>Self study: 16h 47m</td>
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</tbody>
</table>

Description:

Background to contemporary urban planning. The advent of industrial cities. Economic and demographic change. The city as the privileged place of production.

The emergence of urban development as a discipline and the logic of city-building. The bourgeoisie and the right to property. Modern road networks and alignments. Building ordinances.

Urban management in the alignment and opening of new streets. The relationship and tension between private space and the creation of public space.


Urban expansion and the urban-transport revolution. Expansion and renewal projects. The garden city and the linear city.


The urban-transport revolution: automobiles and electricity. Technological advances in the construction of housing. The emergence of city planning. Legal instruments. The contribution of modernism and its new urban-planning model.

Evolution of the contemporary city and urban planning. Key notions: zoning, major transport arteries and urban services. "Cascaded" planning.

Final synthesis. The continuous/compact city, suburban sprawl, the fragmented city, the metropolitan city and the dispersed city.

Images, data and texts on the Barcelona metropolitan area

Students will answer three theory-related questions and two questions related to the practical sessions. The questions will refer to maps, images and texts covered during the module.

Specific objectives:

Students will learn about key aspects that define the emergence of the contemporary urban phenomenon. Students will acquire an understanding of the tangible production of contemporary cities in terms of city layout instruments and legislation.

See the contribution of key engineers and assess the role of infrastructure in the constitution of the industrial city.

Students will learn about the modernity of Cerdà's development project, in Barcelona and in urban-planning practice.

Students will gain an understanding of the complex evolution of 20th-century cities based on changes in city models and planning instruments.

In this final synthesis, students will gain an understanding of the different types of planning associated with successive periods of city development.

In class, students will discuss the assigned documentation.

Students' knowledge acquisition and practical understanding will be evaluated by means of monographic essays.
The course will be evaluated on the basis of a series of activities held during class.
Two tests will be given corresponding to the subject's 6 content modules (from I to VI), which will be structured into questions regarding the theoretical concepts and questions aimed at evaluating the practical classes.
In classroom time, two practical exercises will be done based in comparison, discussion and critical approach about subjects and study cases of civil engineering throughout the history.
Finally, an individual assignment will be given out at the end of the subject where students will work about the relationship Urbanism and Infrastructures.
In all these tests the capacity for written communication will be evaluated, along with the ability to connect cases and concepts, as well as the ability to argue points of view.
The final subject note (NT) will be obtained from the scores received from the 2 module tests (M), the 2 practical exercises (E1 and E2), the individual assignment (T) according to the following calculation: $NT = 50\% (M) + 15\% (E1) + 10\% (E2) + 25\% (T)$

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.

Regulations for carrying out activities
Failure to perform a laboratory or continuous assessment activity in the scheduled period will result in a mark of zero in that activity.
Bibliography

Basic:


Complementary:


