

Course guide

2500028 - GECPROBPUB - Engineering Projects

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 CIVIL ENGINEERING (Syllabus 2020). (Compulsory subject).

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

LECTURER

Coordinating lecturer: MARGARITA MARTÍNEZ DÍAZ

Others: ÁLVARO GAROLA CRESPO, CARLES LABRAÑA DE MIGUEL, MARGARITA MARTÍNEZ DÍAZ

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Generical:

14380. 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.
14381. Understanding of the multiple technical and legal conditions that arise in the construction of a public work, and ability to use proven methods and accredited technologies, in order to achieve the highest efficiency in construction while respecting the environment and the protection of the health and safety of workers and users of public works.
14382. Knowledge, understanding and ability to apply the necessary legislation during the exercise of the profession of Technical Engineer of Public Works.
14383. Ability to project, inspect and direct works, in their field.
14388. Knowledge and ability to apply business management techniques and labor legislation.
14389. Knowledge of the history of civil engineering and training to analyze and assess public works in particular and construction in general.
14390. 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).
14391. Conceive, project, manage and maintain systems in the field of construction engineering. Cover the entire life cycle of an infrastructure or system or service in the field of construction engineering. (Additional school competition).

TEACHING METHODOLOGY

The whole syllabus of the subject will be explained and worked on a specific project that will be presented on the first day of class.

The subject consists of 4 hours of face-to-face classes in the classroom per week, on two different days. Two hours are in a large group and will be devoted to theoretical explanations by the professor and the deepening of the topics with examples or exercises. The other 2 hours are in medium group and during them the students will work in small groups on activities proposed by the professors and that are linked to topics already seen in the classes in large group and that will have as a guiding thread the project chosen for the course. It seeks to consolidate the general and specific objectives, while motivating students by bringing them closer to a real case.

Professors will provide students with specific support material on each topic and additional material related to the activities to be done. In addition, students will be able to consult the bibliography indicated in the teaching guide if they need to complete this material.

If feasible, a relevant lecturer will be invited to tell students some interesting experiences. Depending on who the guest is, this session could be taught in a language other than the subject. In any case, work will be done so that no student has comprehension problems.

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

Knowledge about the methodology for carrying out an engineering project. Capacity to analyse safety and health problems in construction projects, and also to apply environmental impact analysis and assessment methodologies.

- 1 Ability to carry out the organization and planning of a work.
- 2 Ability to carry out a quality control plan for materials in a Civil Engineering project / work.

Knowledge of the documents that make up an engineering project. Knowledge of project elements such as environmental impact, economic studies, alternative studies. Knowledge of formal design and comprehensive project management. Knowledge of the different types of projects depending on the type of infrastructure (urbanization, road, hydraulic work, services, building, etc.). Legal Framework and regulations applicable to the drafting of a project. Technical conditionings. Collection of information and completion of previous studies. Economic approach. Profitability analysis. Approach and selection of alternatives. Multicriteria analysis. Works contract. The consulting and assistance contract. Project management. Legislation on public procurement. Quality and safety in the execution of the work. Integrated project management.

That the student acquires knowledge about the different phases of the engineering projects, of the aspects that must be taken into account in each one and of the methodologies used.

That the student acquires the ability to evaluate the impacts of an engineering project during all phases and from a holistic point of view (eg environmental, social, economic impact, etc.).

That the student knows basic aspects of engineering projects related to bidding, planning, management, safety and health, quality control or environmental impact.

At the end of the course the student will have acquired the ability to:

1. Carry out a study of alternatives, prior to adopting the solution to be designed
2. Know how to formally propose an engineering project
3. Know how to propose proposals for a tender
4. Make a comprehensive management analysis of a project
5. Make a cost / benefit and cost / efficiency analysis of a project

Knowledge of the documents that make up a project in engineering. Knowledge of project elements such as environmental impact, social impact, economic studies, alternative studies. Knowledge of formal design and comprehensive project management. Knowledge of the different types of projects Ability to plan, organize and manage projects. Incorporation of techniques for integrated project management, so that the entire useful life of the infrastructure is taken into account. Project financing. Profitability analysis. Risk analysis. Tender and works contract. Health and security. Quality control.

STUDY LOAD

Type	Hours	Percentage
Self study	84,0	56.00
Hours large group	30,0	20.00
Guided activities	6,0	4.00
Hours medium group	30,0	20.00

Total learning time: 150 h

CONTENTS

Topic 0 - Introductory session to the subject

Description:

Presentation of the subject: objectives, teaching methodology, evaluation methodology, syllabus.

Presentation of the project that will serve as a guide for the different topics and activities.

Specific objectives:

To make known to the student the organization and the contents of the subject.

Motivate the student by linking the subject to a real and meaningful project.

Full-or-part-time: 4h 48m

Theory classes: 2h

Self study : 2h 48m

Topic 1 - Introduction to projects: types and key aspects

Description:

Description of the different types of projects in which a civil engineer can participate.

Key aspects of any project: safety and health, environmental impact and quality control. Regulations and methodologies.

Group activity - Key aspects of engineering projects

Specific objectives:

Description of the different types of projects in which a civil engineer can participate.

Key aspects of any project: safety and health, environmental impact and quality control. Regulations and methodologies.

Full-or-part-time: 9h 36m

Theory classes: 2h

Practical classes: 2h

Self study : 5h 36m

Topic 2 - Documents to be prepared during the design process

Description:

Phases of the engineering project and regulatory documents to be developed in each

Exercises

Group activity - Analysis of documents integrated in the project process

Specific objectives:

Learning the steps to take before, during and after the implementation of an engineering project. Ability to distinguish and prepare the necessary documents in each case.

Full-or-part-time: 12h

Theory classes: 2h

Practical classes: 3h

Self study : 7h

Item 3 - Study of alternatives using multicriteria analysis methods.

Description:

Objectives of multicriteria analysis. Choice and weighting of criteria. Weighted averages method, Press method, Electre method.

Exercises

Group activity - Analysis of alternatives by multicriteria methods

Specific objectives:

Learn the importance of multicriteria analysis and the objective choice of an alternative in an engineering project. Learning specific methodologies.

Full-or-part-time: 21h 36m

Theory classes: 4h

Practical classes: 5h

Self study : 12h 36m

Item 4 - Analysis of project profitability

Description:

Principles and objectives of project profitability analysis. Indices and methodologies used: differences

Fundamentals, indices and methodology for the elaboration of the cost-benefit analysis of an engineering project

Exercises

Group activity - Profitability analysis

Specific objectives:

That the student knows how to assess the degree of profitability of an engineering project

Learn the usefulness of cost-benefit analysis and limits. Learn how to make this analysis.

Full-or-part-time: 24h

Theory classes: 4h

Practical classes: 6h

Self study : 14h

Item 5 - Comprehensive project management

Description:

Concept of comprehensive management. Objectives, agents and classical methodologies.

Current techniques for comprehensive project management. New business philosophy. Management support tools

Exercises

Group activity - Project management

Specific objectives:

Learn to manage a project efficiently and in an integrated way

Know and be able to use the newest techniques for project management

Full-or-part-time: 12h

Theory classes: 2h

Practical classes: 3h

Self study : 7h

Item 6 - Project financing

Description:

Basic concepts. Modalities and cases.

Exercises

Group activity - Project financing

Specific objectives:

Learning about the different modalities of financing an engineering project and its adaptation according to the case.

Full-or-part-time: 12h

Theory classes: 2h

Practical classes: 3h

Self study : 7h

Item 7 - The risk in engineering projects.

Description:

Risk concepts. Indices and methodologies for measuring it. Strategies

Exercises

Group activity - The risk in engineering projects

Specific objectives:

Identification of the risk associated with an engineering project. Ability to assess it

Full-or-part-time: 12h

Theory classes: 2h

Practical classes: 3h

Self study : 7h

Item 8 - The bidding process

Description:

Agents involved in the bidding process. Regulations in the case of Public Works. Documentation. Strategy Exercises
Group activity - Bidding for projects

Specific objectives:

Learn how to prepare a tender proposal for an engineering project

Full-or-part-time: 14h 23m

Theory classes: 1h

Practical classes: 5h

Self study : 8h 23m

Item 9 - Innovation and entrepreneurship

Description:

Concept of innovation. Useful tools. Entrepreneurship concept. Factors to consider. Cases.
Group activity - Innovation and entrepreneurship

Specific objectives:

Bringing the student closer to the world of engineering entrepreneurship

Full-or-part-time: 9h 36m

Theory classes: 2h

Practical classes: 2h

Self study : 5h 36m

Evaluation tests

Full-or-part-time: 12h

Laboratory classes: 5h

Self study : 7h

GRADING SYSTEM

The evaluation will be eminently continued.

Professors will propose four activities and deliveries to students during the course, for a total value of 4 points out of 10. These activities will be worked on in small groups, but each student will have to specify in the deliveries what his/her specific role was.

In addition, at the end of the course, a session will be established for each group to present all the activities carried out in the context of the project worked on. This final defense will have a maximum value of 1 point.

Finally, at the end of the semester the students will have to do an evaluation test worth 5 points. In this test, theoretical questions and exercises associated with the learning objectives of the subject will be proposed.

EXAMINATION RULES.

Students who have not made the corresponding deliveries of each proposed internship will not be able to take the assessment test.

Students who fail the ordinary assessment who have regularly taken the assessment tests of the suspended subject will have the option of taking a re-assessment test in the period set in the academic calendar. Students who have already passed it or students who have qualified as not presented will not be able to take the re-assessment test for a subject. Neither do students who have not made the corresponding deliveries of each proposed internship. The re-evaluation grade is based only on the exam, which will be out of 10 points. In any case, the maximum grade in the case of taking the re-assessment exam will be five (5.0). The non-attendance of a student summoned to the re-evaluation test, held in the set period may not lead to the performance 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.

If a student copies the assessment test or the re-assessment test, he / she will fail the subject without the possibility of recovery. The head of studies will also be informed

BIBLIOGRAPHY

Basic:

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- Cuatrecasas, L. Gestión económico-financiera de la empresa [on line]. Barcelona: Edicions UPC, 1996 [Consultation: 02/03/2021]. Available on: <http://hdl.handle.net/2099.3/36180>. ISBN 8483011662.
- Heerkens, G. Project management. 2nd ed. New York: McGraw-Hill, 2014. ISBN 9780071818483.
- Engelschalk, Michael; Le, Tuan Min. "Two Decades of World Bank Lending for Customs Reform: Trends in Project Design, Project Implementation, and Lessons Learned". Wulf, Luc de; Sokol, José B. Customs modernization handbook [on line]. Washington: DC World Bank, 2005. 7 [Consultation: 20/12/2023]. Available on: https://search-ebscohost-com.recursos.biblioteca.upc.edu/login.aspx?direct=true&AuthType=ip,uid&db=nlebk&AN=126562&site=ehost-live&ebv=EB&ppid=pp_127.- SINHA, K.C. y LABI, S. Transportation Decision Making Principles of Project Evaluation and Programming [on line]. Hoboken, NJ: John Wiley, 2007 [Consultation: 21/03/2023]. Available on: <https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?pq-origsite=primo&docID=792589>. ISBN 9781283294874.