

Course guide

2500032 - GECDIGRACN - Graphic Design and Numerical Analysis

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). (Optional subject).
Academic year: 2023 **ECTS Credits:** 4.5 **Languages:** Catalan

LECTURER

Coordinating lecturer: AGNÈS VILA RIUS

Others: AGNÈS VILA RIUS

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

- 14406. Ability to analyze the problem of safety and health in construction sites. (Common module to the Civil branch)
- 14410. Knowledge of the typology and calculation bases of prefabricated elements and their application in manufacturing processes. (Specific technology module: Civil Construction)
- 14411. Knowledge about the project, calculation, construction and maintenance of building works in terms of structure, finishes, facilities and own equipment. (Specific technology module: Civil Construction)
- 14413. Capacity for the construction and conservation of roads, as well as for the dimensioning, the project and the elements that make up the basic road equipment. (Specific technology module: Civil Construction)
- 14414. Capacity for the construction and conservation of railway lines with knowledge to apply specific technical regulations and differentiating the characteristics of the mobile material. (Specific technology module: Civil Construction)
- 14415. Ability to apply construction procedures, construction machinery and construction planning techniques. (Specific technology module: Civil Construction)
- 14416. Capacity for the construction of geotechnical works. (Specific technology module: Civil Construction)

TEACHING METHODOLOGY

The course consists of 3 hours per week in the classroom (computers).

During the class, the teacher explains the main theoretical concepts and assists students while they work on the practical exercises on the computer.

Support material is shared on the virtual campus ATENEA.

LEARNING OBJECTIVES OF THE SUBJECT

Basic knowledge of computer use and programming, operating systems, databases and software as applied to engineering.

- 1 Ability to use graphic design tools in engineering. Use of AutoCAD.
- 2 Ability to create project plans with work software.

The aim of the subject is to give students a solid education in one of the design tools that is most used in the world of engineering (AutoCAD). The learning process is based on the detailed study of the numerical and geometric foundations of the design, ensuring the knowledge is applicable and can be subsequently extended in the exercise of the profession. In this sense, we analyse in detail the two-dimensional geometry, which is widely used in engineering. Three-dimensional modelling, of more restricted application, is presented as an example at the end of the course. The course also covers all practical aspects needed to create engineering drafts using the reference design software.

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STUDY LOAD

Type	Hours	Percentage
Self study	63,0	56.00
Hours medium group	22,5	20.00
Hours large group	22,5	20.00
Guided activities	4,5	4.00

Total learning time: 112.5 h

CONTENTS

Topic 1. Computer-aided design

Description:

Basic properties of CAD systems. Graphic devices; hardware. Existing software; AutoCAD. Interaction with other types of software. Application examples.

Full-or-part-time: 2h 24m

Theory classes: 1h

Self study : 1h 24m

Topic 2. The AutoCAD environment. Basic concepts

Description:

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Full-or-part-time: 12h

Theory classes: 2h

Practical classes: 3h

Self study : 7h

Topic 3. 2D Geometry (I): elementary notions

Description:

Objects: straight lines, circles, arcs

References to objects: base points, intersection, perpendicularity.

Simple geometric constructions.

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

Theory classes: 6h

Practical classes: 3h

Self study : 12h 36m

Topic 4. Geometry 2D (II): transformations in the plane

Description:

Transformations. Translations.

Symmetries, turns. Parallelism. Coordinate systems. Measurement of distances and angles.

Homotheses and similarities. Advanced geometric constructions.

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

Theory classes: 3h

Practical classes: 6h

Self study : 12h 36m

Topic 5. Data structure of AutoCAD graphic files

Description:

Coding of graphic objects; input and output formats. Accuracy. Virtual screen. Regeneration.

Import and export files. Input and output formats.

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

Theory classes: 6h

Self study : 8h 23m

Topic 6. Advanced techniques. File exploitation

Description:

Criteria and interpolation techniques. Splines. Classification. Smoothing of splines.

Exploitation of graphic files. Advanced operations with objects. Area calculation. Examples of application: digitization and graphic treatment of measures; rethinking.

Advanced exploitation of graphic files: introduction to programming within AutoCAD. Application examples: programming of numerical algorithms for solving engineering problems.

Blogs, external references. Attributes. Complementary techniques (dimensioning).

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

Theory classes: 6h

Practical classes: 3h

Laboratory classes: 3h

Self study : 16h 47m

Topic 7. 3D Geometry. Introduction

Description:

Generation of 3D figures from 2D models. Movements in space. Examples of modeling solids.

Full-or-part-time: 7h 11m

Practical classes: 3h

Self study : 4h 11m

GRADING SYSTEM

Throughout the course, students must complete several practical exercises (during class) and an exam. The weight of each part is 60% for the exercises and 40% for the exam.

The exam is performed in a computer classroom and consists of a written theoretical part and a practical part, which is performed on the computer.

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.

EXAMINATION RULES.

If the student does not submit at least 50% of the evaluable practical exercises performed in class or does not attend the exam, he or she will obtain a "No Presentat" (Not Present) mark.

In any other case, the previous section applies.

For further details, see Mètode de Qualificació.

BIBLIOGRAPHY

Basic:

- Benton, B.C. Mastering AutoCAD 2021 and AutoCAD LT 2021 [on line]. 2nd ed. Indianapolis, Indiana: Sybex, 2021 [Consultation: 26/10/2022]. Available on: <https://ebookcentral.proquest.com/lib/upcatalunya-ebooks/detail.action?docID=6438333>. ISBN 9781119715382.

Complementary:

- Puig Adam, P. Curso de geometría métrica. Tomo I - Fundamentos. 16a ed. Madrid: Gómez Puig Ediciones, 1986. ISBN 8485731050.

- Kincaid, D.; Cheney, W. Análisis numérico: las matemáticas del cálculo científico. Argentina: Addison-Wesley Iberoamericana, 1994. ISBN 0201601303.