Course guide
2500032 - GECDIGRACN - Graphic Design and Numerical Analysis

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: 2022  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.

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

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.

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours large group</td>
<td>22.5</td>
<td>20.00</td>
</tr>
<tr>
<td>Guided activities</td>
<td>4.5</td>
<td>4.00</td>
</tr>
<tr>
<td>Self study</td>
<td>63.0</td>
<td>56.00</td>
</tr>
<tr>
<td>Hours medium group</td>
<td>22.5</td>
<td>20.00</td>
</tr>
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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:**
The AutoCAD environment: drawing area, menu area, and command area. Basic concepts and operations: objects; creation, selection and listing.
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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.
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:**
- 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

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### GRADING SYSTEM

Throughout the course, students must complete several practical exercises (during class) and an exam. The weight of each part is 30% for the exercises and 70% 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.

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### 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:

Complementary: