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. Capacity of the 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 1.5 hours per week of classroom activity (large size group) and 1.5 hours weekly with half the students (medium size group).

The 1.5 hours in the large size groups are devoted to theoretical lectures, in which the teacher presents the basic concepts and topics of the subject, shows examples and solves exercises.

The 1.5 hours in the medium size groups is devoted to solving practical problems with greater interaction with the students. The objective of these practical exercises is to consolidate the general and specific learning objectives.

Support material in the form of a detailed teaching plan is provided using the virtual campus ATENEA: content, program of learning and assessment activities conducted and literature.
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>
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</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>
</tbody>
</table>

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.

**Full-or-part-time:** 12h
Theory classes: 2h
Practical classes: 3h
Self study: 7h

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**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

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**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

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**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

GRADING SYSTEM

The mark of the course is obtained from the ratings of continuous assessment and their corresponding laboratories and/or classroom computers.
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 teachings of the laboratory grade is the average in such activities.
The evaluation tests consist of a part with questions about concepts associated with the learning objectives of the course with regard to knowledge or understanding, and a part with a set of application exercises.

EXAMINATION RULES.

If the student does not submit at least 50% of the evaluable practical exercices 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:
- Omura G. i Benton, B. C.. Mastering AutoCAD 2021 and AutoCAD LT 2021. Sybex,

Complementary: