Universidad Zaragoza

Academic Year/course: 2024/25

69967 - BIM modeling of building facilities in dual mention

Syllabus Information

Academic year: 2024/25
Subject: 69967 - BIM modeling of building facilities in dual mention
Faculty / School: 110 - Escuela de Ingeniería y Arquitectura
Degree: 657 - Master in Mechanical Engineering
ECTS: 3.0
Year: 1
Semester: Second semester
Subject type: Optional
Module:

1. General information

Objectives of the subject

The main objective of the subject is the training of air conditioning professionals capable of using and applying tools and methodologies based on BIM. The application of BIM methodologies allows the management, design and calculation of all the energy processes that occur in the building, from its design, simulation, construction, life cycle, to its administrative management and its operation in real time (digital twins).

In addition, the subject through the BIM methodology aims to allow the student to develop projects in a global, integrated and critical way, in a collaborative environment (in the cloud) and interconnected with other disciplines. In turn, these methodologies make it possible to detect problems, inefficiencies and simulate different air conditioning strategies before their actual execution, which results in greater efficiency and sustainability of the built environments. The subject will focus on the representation, simulation and management of air conditioning projects with low energy consumption, low impact on the environment that use renewable energies.

The Dual Mention takes advantage of the knowledge and human and material resources available to the company to strengthen the integration of the learning of technologies with their practical application in a company.

Recommendations for taking the subject

Knowledge of air conditioning and renewable energies. It is advisable to take it at the same time as "Air conditioning workshop"

2. Learning results

1. Recognise and value BIM-based tools and methodologies to manage, design and calculate the energy processes that occur in the building.
2. Design air conditioning systems in buildings using BIM methodologies.
3. Successfully apply the BIM methodology to simulate different HVAC strategies.
4. To take on challenges aimed at the development of advanced professional tasks of the mechanical engineer.

3. Syllabus

In each Individual Training Plan, the specific objectives and milestones of the subject in the company are specified. There is a tutor in the company, who ensures the learning of technologies and work methodologies and their application to the company's production processes and products.

Syllabus

1. Block 01 Introduction
   1.1. What is BIM? Collaborative and networked environments
   1.2. Architectural and industrial modelling in BIM. Principles
   1.3. Energy analysis and simulation in BIM
2. Block 02 BIM modelling of CYPE MEP (*mechanical, electrical and plumbing*) buildings
   2.1. Building elements: use, envelopes, slabs and roofs
   2.2. Simulation of the energy demand and consumption of buildings
3. Block 03 BIM modelling of air conditioning installations
   3.1. HVAC strategies
   3.2. HVAC systems

3.2.1. Boilers.
3.2.2. HVAC Heat Pump System
3.2.3. Ventilation. Heat recovery systems
3.2.4. Production with renewable energies (solar thermal and photovoltaic)
3.2.5. Energy exchange terminal elements (underfloor heating, emitters, etc.)

4. Block 04 Development and management of projects using BIM methodology
   4.1. Energy rating of buildings
   4.2. Generation of the air conditioning project (reports, documents, measurement, budget and plans)
   4.3. 3D visualization, download, and exchange of data (including GIS)

Laboratory practices

Practice 01 Modeling a building in BIM (15%)

Practice 02 Simulation of the building's energy demand in BIM (20%)

Practice 03 BIM modelling of an efficient HVAC system for a building (50%)

Practice 04 HVAC project in BIM (15%)

4. Academic activities

- Participatory master class. (4 hours)
- Troubleshooting and technical cases. (4 hours)
  - Taught to the whole group, the teacher explains the basic principles of the subject and solves problems representative of the application to realistic cases of professional practice. The participation of the students is sought.
- Laboratory and computer practices, in small groups. (20 hours)
- Personalized teacher-student tutoring. The teacher will publish a schedule of tutorials.
- Study and personal and team work. (at least about 42 hours)
  - Study of theory, exercises, questions and problems in addition to those solved in class. This encourages autonomous work, studying the subject and applying it to the resolution of the cases raised. This directed activity, but of autonomous execution, is fundamental in the student's learning process and for the passing of the evaluation activities.
  - Preparation of work and practice reports, individually or through teamwork, as indicated in each activity.
- Presentation of the HVAC project (2 h)

The alternating contract includes the schedule that the student must remain at the university centre to attend training activities. During the working day in the company, a programme of activities is also agreed to achieve the objectives and milestones specified in the Individual Training Plan.

5. Assessment system

The subject is preferably proposed with a **continuous assessment** that consists of three blocks:

1. Evaluation of practices. (50%, minimum grade 4/10) Eventually, some practice can be carried out by taking advantage of the company's resources.
2. Practical work/projects (50%, minimum grade 4/10) The subject work is developed on technical cases of the company. The adjustment of its scope and the assessment criteria are established between the professor responsible for the subject and the company tutor.

In the event of not exceeding the minimum marks, there is the possibility of recovery on the same date established for the global exam.

The student also has the possibility of passing the subject through the **global evaluation** in the official calls. The evaluation will be carried out by means of a theoretical-practical test on the dates established by the center.

6. Sustainable Development Goals

9 - Industry, Innovation and Infrastructure
11 - Sustainable Cities and Communities
12 - Responsible Production and Consumption