Universidad Zaragoza

Academic Year/course: 2022/23

28615 - Installations I

Syllabus Information

Academic Year: 2022/23
Subject: 28615 - Installations I
Faculty / School: 175 - Escuela Universitaria Politécnica de La Almunia
Degree: 422 - Bachelor's Degree in Building Engineering
ECTS: 6.0
Year: 2
Semester: Second semester
Subject Type: Compulsory
Module:

1. General information

1.1. Aims of the course

To get the student to acquire basic and practical knowledge about regulations, diagrams, layouts, calculation and control of the different fluid transport facilities that are involved in the building world. It is also intended that students acquire basic and practical knowledge about regulations, calculation and constructive solutions regarding thermal control in buildings.

Starting from a basic knowledge of the philosophy of work and operation of the architectural modeling tools of Revit, this course will allow you to acquire the basic knowledge and skills necessary to model the facilities of the building environment (heating, plumbing and sanitation) using the specific MEP tools that REVIT makes available to us.

These approaches and objectives are in line with the following Sustainable Development Goals (SDGs) of the United Nations 2030 Agenda (https://www.un.org/sustainabledevelopment/es/), in such a way that the acquisition of the course learning outcomes provides training and competence to contribute to their achievement to some degree:

- Target 6.2. By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations.
- Target 6.4. By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity.

1.2. Context and importance of this course in the degree

This course is the extension of the subject Basics of Installations, in which the necessary foundations have been laid for the understanding of the phenomena related to installation design.

This subject, together with Installations II, intends to provide the necessary skills so that the student can plan and design the premises of a building.

This knowledge is complemented with other building courses so that the student can have a global vision of the elements that make up a building and how they are carried out.

Building Information Modeling (BIM) or Information modeling for buildings is a work format that covers all areas of the development of a construction project, including facilities, taking advantage of the work developed in a methodology that allows feedback from the rest of the areas.

Within the complexity of the development of a project, its facilities are always an important issue. The air conditioning, electrical, plumbing and special equipment installations sector requires a higher level of coordination. This coordination not only applies to the design of the project, in which all the pieces of the puzzle must fit together perfectly, but also extends to the construction phase where they have to be manufactured, built / assembled and then maintained.

1.3. Recommendations to take this course

This subject does not need any previous requirements or demand specific complementary knowledge.

Nevertheless, knowledge and strategies from subjects related to Technical Drawing, Computer Science, Physics, Chemistry and Mathematics will be an asset for the development of the subject Installations I.

2. Learning goals

2.1. Competences

Upon passing the subject, the student will be more competent to ...

- Organize and plan his work
- Solve problems related to installations
- Make decisions on his own
- Communicate orally and in writing in their native language
- Carry out analysis and synthesis of complex problems
- Manage information
- Teamwork
- Critical reasoning
- Work in an interdisciplinary team
- Working in an international context
- Improvise and adapt to new situations
- Leading a team
- Have a positive social attitude towards social and technological innovations
- Reason, discuss and present their ideas
- Communicate through words and images
- Search, analyze and select information
- Learn autonomously
- Possess and understand knowledge in an area of ??study that starts from the general secondary education base, and is usually found at a level that, although supported by advanced textbooks, also includes some aspects that involve knowledge from the avant-garde from your field of study.
- Apply their knowledge to their job or vocation in a professional way and possess the competencies that are usually demonstrated through the elaboration and defense of arguments and problem solving within their area of ??study.
- Be able to collect and interpret relevant data (usually within their study area) to make judgments that include reflection on relevant issues of a social, scientific or ethical nature.
- Transmit information, ideas, problems and solutions to a specialized and non-specialized audience.
- Develop those learning skills necessary to undertake further studies with a high degree of autonomy.
- Apply the specific regulations on facilities to the building process.
- Constructively develop the facilities of the building, control and plan its execution and verify the service and reception tests, as well as their maintenance.
- Analyze and carry out evacuation projects for buildings.

2.2. Learning goals

The student, to pass this subject, must demonstrate the following results ...

At the end of the course, the student will have the aptitude to apply the specific regulations on facilities to the building process. Likewise, it will have the capacity to prepare manuals and maintenance plans and manage its implementation in the building, to constructively develop the facilities of the building, control and plan its execution and verify the service and reception tests, as well as their maintenance. And he will also know, conceive, design, define, detail and technically solve elements, processes and construction systems. Similarly, the student will have the ability to analyze and carry out evacuation projects for buildings.

2.3. Importance of learning goals

This subject has a marked engineering character, that is, it offers training with application content and immediate development in the labor and professional market. Through the achievement of the relevant learning results, the necessary capacity is obtained to understand the operation of the facilities in the buildings, which will be absolutely essential for the execution of any construction or reform of those included within the scope of the Building.

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Similarly, the student will have the ability to carry out installation projects in all types of buildings.

3. Assessment (1st and 2nd call)

3.1. Assessment tasks (description of tasks, marking system and assessment criteria)

The assessment will include two types of action:

- **Continuous assessment:**

It will take place throughout the entire learning period. Attention in class, completion of assigned tasks, resolution of questions and problems, active participation in the classroom, attendance at talks and visits, etc, will be taken into account. To be eligible for the Continuous Assessment system, you must attend at least 80% of the face-to-face activities (practices, technical visits, classes, etc.).

The qualifying and mandatory activities will be:

Written assessment tests: there will be two individual tests, one in April and the other in May at the end of the semester. They will include a theory part and a problem part. The final grade will be the arithmetic mean of the two tests, as long as there is no unit grade below 4 out of 10.

Test 1: It will consist of a theoretical part and another practice on plumbing installations for cold water and sanitary hot water, the theoretical part will have a value of 4 points and the practice of 6 points.

Test 2: It will consist of a theoretical part and another practice on sanitation and heating installations, the theoretical part will have a value of 4 points and the practice of 6 points.

Practices: Practices corresponding to the 4 topics of the course will be carried out, which will consist of a memory, calculations and model of the intallations. A delivery deadline will be established for each practice and the student must present the memory, calculations and plans for it on time. The final grade will be the arithmetic mean of the 4 practices, as long as there is no unit grade below 4 out of 10.

Making an oral presentation: there will be an oral presentation of one of the practices on the day established by the teacher.

In order to obtain the final passing grade, each of the activities on display must have a grade equal to or greater than 5.

The final qualification will be made according to the weighting table below:

Assessment	Weighing
Written assessment tests	30%
Practices - model	45%
Practices - memory and calculations	20%
Oral presentation	5%

Prior to the first call, the teacher will notify each student if they have passed or not the subject based on the use of the continuous assessment system, based on the sum of the scores obtained in the different tasks carried out throughout the course. In case of not passing in this way, the student will have two additional calls to do so (global assessment system), on the other hand, the student who has passed the course through this dynamic, may also choose the final assessment, in the first call, to upload grade but never to download.

For those students who have suspended the continuous assessment system, but have passed some of the tasks, they may promote them to the global final evaluation test, and it may be the case that they only have to take the written exam. In the first call in June, the written exam will be divided into two parts (as in the continuous assessment) and the student who has not passed the continuous assessment will have the option of taking one or both of the two written tests.

- **Global assessment:**

The student must opt ??for this modality when, due to their personal situation, they cannot adapt to the rhythm of work required in the continuous assessment system or have suspended or want to increase their grade.

The global final evaluation test will have the following group of qualifying activities:

Written assessment tests:

It consists of solving theoretical and / or practical application exercises with similar characteristics to those solved during the conventional development of the subject, carried out over a period of three hours. This test will contribute 30% to the final grade for the course.

Practices: They can be carried out integrated in the continuous evaluation. If this is not possible, the student must submit the reports, calculations and plans one week before the global evaluation exam. They will contribute 70% of the final evaluation grade.

The final qualification will be made according to the weighting table below:

Assessment	Weighing
Written assessment tests	30%
Practices - model	50%
Practices - memory and calculations	20%

The course will have been passed, based on the sum of the scores obtained in the different activities carried out, each contributing a minimum of 50%.

All the activities included in the global final evaluation test, except for the written test, may be promoted to the next official call, within the same academic year.

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

This course is organized as follows:

- **Lectures**: from the first day of the course, the student will begin to solve practical cases on facilities. In each case, the teacher will provide the plans of a building and through the application of rules and regulations, the students will design and calculate the installation suggested. The teacher will be a support to guide them in the application of the regulations and explain, at certain times, the parts of the installation that are necessary. The teacher will have slides with graphic examples that will make it easier for students to understand the facilities being designed.
- **Computer sessions**: They will be used to carry out a complete practical case of a building. There will be 14 sessions of 2 hours of practice for the production of the report, calculations and plans of the facilities in the suggested building.
- **Individual tutorials**: Carried out through personalized attention, individually, of the teacher in the department. These tutorials can be held in the classroom or online.

The approach, methodology and assessment of this guide are intended to be the same for any teaching scenarios. They will be adapted to the social-health situation at any particular time, as well as to the instructions given by the authorities concerned.

4.2. Learning tasks

The program offered to the student to help him achieve the expected results includes the following activities outlined above:

- Lectures
- Computer practice sessions
- Tutorials

4.3. Syllabus

This course will address the following topics:

Unit 1. Cold water installations.

1.1. Regulations on cold water installations.

1.2. Design of the installation: distribution systems, schemes and materials used in the development of cold water installations.

1.3. Testing and implementation of cold water installations

1.4. Practical cases on cold water installations:

- Design and calculations in single-family housing.
- Design and calculations on complete installations in housing building from hook-up to points of consumption.
- Calculation of pressure group.
- Hook-up calculations in other types of buildings.

Unit 2. Hot water installations.

2.1. ACS production systems: components and installation diagrams.

2.2. Solar ACS systems: components and installation diagrams.

2.3. Applicable regulations to ACS installations.

2.4. Testing and implementation of ACS facilities.

2.5. Practical case studies of ACS facilities, including compliance with HE-4 (minimum solar contribution from ACS):

- Calculation of boilers for individual and collective installations, and for different typologies of buildings.
- Calculation of pipelines and elements of the installation, both individual and collective.
- Calculation of solar energy installations including solar energy collector fields, tanks, pipelines, pumps, heat exchangers and installation elements.
- Calculation of losses by orientation and shadows on solar panels.

Unit 3. Sanitation facilities.

3.1. Applicable Regulations to sanitation facilities.

3.2. Design of the installation: components, distribution systems and materials to be used in the installation.

3.3. Testing and execution of sanitation facilities.

3.4. Case studies of sanitation facilities:

- Calculation of small evacuation networks
- Calculation of downpipes
- Calculation of collectors and catch basins
- Hook-up calculation
- Calculation of pumping systems for wastewater
- Calculation of ventilation

Unit 4. Heating installations.

4.1. Applicable Regulations to thermal installations.

4.2. Heating systems: diagrams and distribution systems for buildings.

4.3. Components of heating systems: types of boilers, chimneys, fuels used, heat emitters.

4.4. Machine rooms for heating and ACS.

4.5. Execution of heating installations.

4.6. Practical cases of heating installations:

- Introduction to CTE HE-1: Calculation of enveloping thermal transmittances.
- Calculation of thermal loads.
- Calculation of thermal emitters, hydraulic circuits and calculation of heat generation equipment.

Practical contents

Each topic discussed in the previous section has associated practices. The layout of a building in Autocad will be provided and the student will have to develop the following facilities:

- Practice 1. Design and calculation of the cold water installation in a residential building.
- Practice 2. Design and calculation of the ACS installation in a residential building.
- Practice 3. Design and calculation of the sanitation installation in a residential building.
- Practice 4. Design and calculation of the heating installation in a house.

4.4. Course planning and calendar

The overall distribution of the subject will be as follows:

- 26 classroom hours to solve practical cases.
- 28 hours of practice tasks and supervised work, in 2-hour sessions.
- 4 hours of written tests (two hours per test)
- 2 hours of oral presentation
- 40 hours of group work, over the 15 weeks of the semester.
- 50 hours of personal study, over the 15 weeks of the semester.

The written assessment tests will be related to the following topics:

- Test 1: Items 1 and 2.

- Test 2: Topic 3 and 4.

Further information concerning the timetable, classroom, office hours, assessment dates https://eupla.unizar.es/asuntos-academicos/examenes and other details regarding this course will be provided on the first day of class or please refer to the Faculty of EUPLA website and Moodle.

4.5. Bibliography and recommended resources

http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=28615

Resources

Material	Support
Theory of the syllabus Schedule slides Case Studies Paper / Digital	Papel/Digital
Technical manuals, regulations and regulations. Paper / Repository	Paper / Repository Digital/Moodle