Universidad Zaragoza

Academic Year/course: 2023/24

28713 - Hydraulic Engineering: the Basics

Syllabus Information

Academic year: 2023/24
Subject: 28713 - Hydraulic Engineering: the Basics
Faculty / School: 175 - Escuela Universitaria Politécnica de La Almunia
Degree: 423 - Bachelor's Degree in Civil Engineering
ECTS: 6.0
Year: 2
Semester: First semester
Subject type: Compulsory
Module:

1. General information

The main objective of the course is to provide students with knowledge of the concepts and technical aspects related to hydrostatic systems and pressurized piping systems.

These approaches and objectives are aligned with the next Sustainable Development Goal (SDG) of the United Nations Agenda 2030 (https://www.un.org/sustainabledevelopment/es/), in such a way that the acquisition of the learning resulta of the subject provides training and competence to contribute to some extent to its achievement.

-Objective 9: Industry, innovation and infrastructure (Goal 9.1: Build resilient infrastructure, promote sustainable industrialization and foster innovation).

2. Learning results

The student, in order to pass this subject, must demonstrate the following learning results:

- Master the general properties of fluids, with special attention to the fluid water.
- Master the laws relating to fluids at rest and the calculation of hydrostatic thrust.
- To know the general laws of fluids in motion and the technical aspects related to pressure conduction systems.

3. Syllabus

Topic 1. Introduction to Hydraulic Engineering.

Definition. System of units. Fluid properties. Concept of pressure. Compressibility. Surface tension.

Capillarity. Viscosity. Newtonian and non-Newtonian fluids.

Topic 2. Hydrostatic.

Definition. Properties of hydrostatic pressure. Pascal's principle. General equation of hydrostatics. Law of variation of pressure. Pressure gauges and piezometers. Communicating vessels. Archimedes' principle. Hydrostatic forces on flat and curved surfaces . Surface tension and capillarity.

Topic 3. Fluid kinematics.

Definition. Trajectories. Flow classification. Flow rate. Continuity equation.

Topic 4. Fluid dynamics.

Definition. Fundamental principles. Bernouilli's theorem: applications. Theoretical and real power of a hydraulic machine.

Equation of the quantity of motion. Real fluid dynamics: pressure drop. Pipelines: boundary layer, slope driving, localized pressure drops.

Topic 5. Hydraulic pumps, valves and water hammer.

Hydraulic pumps: performance, classification, operating point. Valves and water hammer: typologies, cavitation.

Topic 6. Calculation of pressure piping.

Schematization. Design. Hydraulic function check. Practical formulas for calculation.

Almost all the topics have associated problem statements and some of them, laboratory practices.

4. Academic activities

The following activities will be developed to achieve the learning results:

Expository classes: on theoretical arguments or problem solving.

Seminars/workshops: Theoretical or practical discussion activities carried out in the classroom or in other forums by visiting

teachers or, in general, speakers who do not belong to the teaching staff of the subject.

Laboratory practices: Practical activities carried out in the laboratories under the tutoring of the subject's teachers, which will be followed by autonomous activities by the students.

Visits: Didactic visits (guided by the teachers of the course) related to the topics developed throughout the subject.

Individual or group tutoring: Face-to-face or virtual activities to resolve doubts.

5. Assessment system

Continuous assessment system

In the continuous assessment model, the teacher will assess the student's participation in the theoretical classes, the demonstration of the acquired knowledge and the ability to solve problems. Finally, the student must take and pass two partial written tests(continuous assessment exams) throughout the subject.

The weights of the continuous evaluation activities are summarized below. Students who do not attend a minimum of 80% of the face-to-face activities or who do not pass the minimum required for the partial tests (practicals, exams or academic papers), will automatically pass to the global assessment model.

Assessment activity Weighting

Participation in face-to-face activities 5%

Practices 10%

Continuous assessment exam I 40%

Continuous evaluation exam II 45%

The continuous assessment exams will consist of a written test with a theoretical content (approximately 80%) and problems (approximately 20%). The first exam includes Topics 1 and 2 and the second exam includes Topics 3, 4, 5 and 6.

Global final assessment.

Students must opt for this modality when they do not pass the subject in the continuous assessment modality.

In this case, the evaluation consists of a single written test on theory (approximately 20%) and problems (approximately 80%) related to the content of the subject.

In the grade of the global test, the grade related to the participation in face-to-face activities and laboratory practices may also be considered.

The final grade of the global evaluation test will be given by:

Note: MAX (85% x Exam grade + 10% x Practical grade + 5% Presential activity grade; Exam grade)