Universidad Zaragoza

Year : 2020/21

28713 - Hydraulic Engineering: the Basics

Syllabus Information

Academic Year: 2020/21
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

1.1.Aims of the course

The main objective of the course is to get students to acquire knowledge of the concepts and technical aspects related to hydrostatic systems and pressured pipes systems.

1.2.Context and importance of this course in the degree

The course "Hydraulic Engineering: the Basics", with 6 ECTS credits, is a subject of the EUPLA Degree in Civil Engineering. It is a semestral and mandatory subject of the second year of the degree.

The main objective of this subject, jointly to the other subject "Extension of hydraulic engineering and hydrology", is to provide a solid knowledge about fundamental hydraulics and hydrology to be used in more practical courses (subjective-specific courses or elective subjects).

1.3.Recommendations to take this course

The subject of "Hydraulic Engineering: the Basics" has not mandatory prerequisites although it is advisable to students who take it to have previously passed the subjects of Mathematics applied to Engineering I and II, and General Physics of the Civil Engineering Degree.

2.Learning goals

2.1.Competences

As stated in the compulsory Common Competence C07 of the EUPLA Accademic Memory of the Degree in Civil Engineering, the main competence of this subject will be to acquire knowledge of the concepts and technical aspects related to hydrostatic and pressured pipe systems.

Furthermore, as generic competences, the student will acquire:

G01. Organizational and planning skills

G02. Capacity to solve problems

G03. Ability to make decisions

G04. Aptitude for oral and written communication of the native language

G05. Capacity for analysis and synthesis

G06. Ability to manage information

G07. Capacity for teamwork

G08. Capacity for critical reasoning

G09. Ability to work in an interdisciplinary team

G10. Ability to work in an international context

G11. Adaptation capacity to face new situations

G12. Leadership aptitude

G13. Positive social attitude towards social and technological innovations

G14. Ability to reason, discuss and present your own ideas

G15. Ability to communicate through words and images

G16. Ability to search, analyze and select information

G17. Capacity for independent learning

G18. Acquire and understand knowledge in an area of ??study that starts from the general secondary education base and is usually supported by advanced textbooks, but includes some aspects that involve cutting-edge knowledge in this field

G19. Apply their knowledge to their work or vocation in a professional way and acquire the competencies that are usually demonstrated through the elaboration and defense of arguments and problem solving within their area of ??study

G20. Ability to collect and interpret relevant data (usually within their area of ??study) to make judgments that include reflection on relevant issues of a social, scientific or ethical nature

G21. Transmit information, ideas, problems and solutions to a specialized and non-specialized audience

G22. Develop those learning skills necessary to undertake further studies with a high degree of autonomy

G23. Know and understand respect for fundamental rights, equal opportunities between women and men, universal accessibility for people with disabilities, and respect for the values ??of the culture of peace and democratic values.

G24. Promote entrepreneurship

G25. Knowledge in information and communication technologies.

2.2.Learning goals

The student, to pass this subject, must demonstrate having acquired the following learning outcomes:

- Knowledge of the general properties of fluids, with special attention to fluid water
- Knowledge of the laws relating to hydrostatics and capacity for the calculation of hydrostatic forces
- Knowledge of the general laws of fluids dynamics related to pressured pipes systems.

2.3.Importance of learning goals

The subject of "Fundamentals of Hydraulic Engineering and Hydrology" has a marked engineering character with direct and immediate application in the professional field of the civil engineering.

In particular, upon completing and passing this course, the student will acquire:

- Knowledge of the general properties of fluids, with special attention to fluid water.
- Knowledge of the laws related to hydrostatics and the calculation of hydrostatic forces
- Knowledge of the general laws of fluids dynamics related to pressured pipes systems.

3.Assessment (1st and 2nd call)

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

Assessment tasks are the basic elements in the entire teaching-learning process since it is the only mechanism that allows, at any time during an educational period, to evaluate the degree of achievement of the proposed learning results and, if appropriate, apply the necessary corrections.

At the beginning of the course the student will choose one of the following two assessment methodologies:

- **Continuous assessment system**: it is an assessment system characterized by the obligation to participate in face-to-face activities of the subject and to take and pass the practical tests, partial exams and academic work proposed in the subject, within the established deadlines In the case the student passes all the continuous assessment tests, they will be exempt from the global exam.
- **Global final evaluation exam**: it is a final and global exam on all the theoretical and practical content of the subject.

Continuous evaluation system

Following the spirit of the reform of the European Higher Education Area (EHEA), the evaluation of the subject contemplates a continuous evaluation system as the most consistent to be in line with the guidelines set by this new framework.

In the continuous assessment model, the professor will assess the student's participation in face-to-face activities and their ability to solve problems and laboratory practices. Finally, the student should take and pass two partial exams ("continuous assessment exams") throughout the course.

The following table summarizes the weights of the activities cited in the evaluation process. All students who do not attend a minimum of 80% of the face-to-face activities (classes, seminars, technical visits, laboratory practices, etc.) or who do not obtain the minimum thresholds required for the partial tests, practices, exams or academic work proposed in the course, should pass to the global assessment model.

Assessment task	**Weight**
Participation in face-to-face activities	2.5%
Laboratory tasks	12.5%

I Continuos evaluation exam	40%
II Continuos evaluation exam	45%

Global final evaluation exam

The students must choose this modality when, due to their personal situation, they cannot adapt to the rhythm of work required in the continuous evaluation modality. In this case, the evaluation consists of a single exam on theory, problems and practices related to the content of the subject.

In the global final evaluation exam, the score regarding participation in classroom activities and laboratory practices may also be considered in the final and global score. The final scole will be given by:

Score: MAX (85% x Exam Score + 12.5% ??x Laboratory tasks score + 2.5% Face-to-face task scores; Final Exam score)

4.Methodology, learning tasks, syllabus and resources

4.1.Methodological overview

The methodology followed in this course is oriented towards the achievement of the learning objectives. A wide range of teaching and learning tasks are implemented, such as lectures, practice sessions, laboratory sessions, tutorials, and autonomous work and study.

- A strong interaction between the professor and the student is promoted. This interaction is brought into being through a division of work and responsibilities between the students and the teacher. Nevertheless, it must be taken into account that, to a certain degree, students can set their learning pace based on their own needs and availability, following the guidelines set by the professor.
- This course is conceived as a stand-alone combination of contents, yet organized into three fundamental and complementary forms, which are: the theoretical concepts of each teaching unit, problem-solving or resolution of questions and laboratory work, and at the same time supported by other activities.

If classroom teaching were not possible due to health reasons, it would be carried out on-line.

4.2.Learning tasks

This course is organized as follows:

- **Lectures**: Theoretical activities carried out mainly through exposition by the professor, where the theoretical supports of the subject are displayed, highlighting the fundamentals, structuring them in topics and or sections, interrelating them
- **Practice sessions**: The professor resolves practical problems or cases for demonstrative purposes. This type of teaching complements the theory shown in the lectures with practical aspects
- **Laboratory sessions**: The lecture group is divided up into various groups, according to the number of registered students, but never with more than 5 students, in order to make up smaller sized groups
- **Tutorials**: These are carried out by giving individual, personalized attention with a professor from the department They can be on-site or online
- **Autonomous work and study**
    - Study and understanding of the theory taught in the lectures
    - Understanding and assimilation of the problems and practical cases solved in the practical classes
    - Preparation of seminars, solutions to proposed problems, etc.
    - Preparation of laboratory workshops, preparation of summaries and reports
    - Preparation of the written tests for continuous assessment and final exams.

This course has 6 ECTS credits, which represents 150 hours of student work in the subject during the trimester, in other words, 10 hours per week for 15 weeks of class.

A summary of a weekly timetable guide can be seen in the following table. These data are obtained from the course file in the Accreditation Report of the degree, taking into account the level of experimentation considered for this course is moderate.

Activity	Weekly hours
Lectures	3
Laboratory sessions	1
Other Activities	6

Nevertheless, the previous table can be shown in greater detail, taking into account the following overall distribution:

- 51 hours of lectures, with 50% theoretical demonstration and 50% solving type problems
- 5 hours of laboratory workshop, in 1 or 2-hour sessions
- 4 hours of written assessment tests, two hours per test
- 90 hours of personal study, divided up over the 15 weeks of the 2nd semester.

4.3.Syllabus

This course will address the following topics:

Theory

- Topic 1: Introduction to Hydraulic Engineering
- Topic 2: Hydrostatics
- Topic 3: Kinematics of fluids
- Topic 4: Fluid dynamics
- Topic 5: Hydraulic pumps and valves
- Topic 6: Calculation of distribution network of pressured pipes

Practical contents

All the topics mentioned in the previous section are related to exercises and laboratory experience.

- Problems Topic 1
  Problems on fluid compressibility
- Problems Topic 2
  Problems on hydrostatic systems, calculating the intensity and the location of hydrostatic forces
- Problems Topic 4
  Problems on the fluid dynamics equation (conservation of mass, energy, and momentum)
- Problems Topic 5
  Problems on hydraulic pumps, valves, and cavitation
- Problems Topic 6
  Problems on pressure piping systems

- Practice 1: Pressure gauges
- Practice 2: Viscosity
- Practice 3: Hydrostatic force on vertical and inclined gates
- Practice 4: Osborne Reynolds apparatus for flow regime analysis
- Practice 5: Study of Bernoulli equation and the concept of pressure loss through the Venturi tube

4.4.Course planning and calendar

Calendar of face-to-face sessions and presentation of works

The dates of the two final exams will be those officially published on the EUPLA website.

For students who opt for the continuous assessment system, the I continuous assessment exam will be held during the month of November and its date will be communicated on the first day of class. The second exam will be held on the last day of class.

The laboratory activities will be developed progressively throughout the semester. The following dates will be the deadlines for the delivery of the reports related to these tasks:

- Reports about laboratory tasks 1, 2, 3: date of the I continuous assessment exam
- Practices 4 and 5: date of the exam of the first call

The I continuous evaluation exam will consist of a written exam on theoretical topics (approximately 20%) and problems (approximately 80%) related to topics 1 and 2.

The II continuous evaluation exam will be held on the same date of the global exam (non-continuous evaluation) and will consist of a written exam on theoretical arguments (approximately 20%) and problems (approximately 80%) related to topics 3, 4, 5 , 6.

The global evaluation exam will take place at the end of the semester (1st call) and in September (2nd call) and will consist of a global written test on theoretical arguments (approximately 20%) and problems (approximately 80%) related to the topics covered in class.

4.5.Bibliography and recommended resources

http://biblos.unizar.es/br/br_citas.php?codigo=28713&year=2020