28815 - Fluid Engineering

Información del Plan Docente

Academic Year	2016/17
Academic center	175 - Escuela Universitaria Politécnica de La Almunia
Degree	424 - Bachelor's Degree in Mechatronic Engineering
ECTS	6.0
Course	2
Period	Second semester
Subject Type	Compulsory
Module	---

1.Basic info

1.1.Recommendations to take this course

1.2.Activities and key dates for the course

2.Initiation

2.1.Learning outcomes that define the subject

2.2.Introduction

3.Context and competences

3.1.Goals

3.2.Context and meaning of the subject in the degree

3.3.Competences

3.4.Importance of learning outcomes

4.Evaluation

5.Activities and resources

5.1.General methodological presentation

The learning process designed for this subject is based on the following:

Strong interaction between the teacher/student. 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 teacher.

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The current subject Materials Engineering 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, the solving of problems or resolution of questions and laboratory work, at the same time supported by other activities.

The organization of teaching will be carried out using the following steps:

1. Face-to-face generic activities:

- **Theory Classes** : The theoretical concepts of the subject are explained.
- **Practical Classes** : Problems and practical cases are carried out.
- **Monitored Practices** : Exercices and practical cases are carried out, complementary to the theoretical concepts studied.

2. *Supervised Autonomous Activities* : These activities are carried out independently by students under the supervision of the teachers of the subject. The student will have questionnaires available per unit and suggested exercises and will be allowed to attend face-to-face or group tutorials to focus on solving them.
3. *Reinforcement activities* : Through the virtual learning portal (Moodle) or email of the University of Zaragoza, teachers of the subject will develop, for particular cases for which conventional tutoring can not be applied, support and help activities for students who need it solving doubts or providing solutions to problems connected with the units covered.

5.2.Learning activities

The programme offered to the student to help them achieve their target results is made up of the following activities...

Involves the active participation of the student, in a way that the results achieved in the learning process are developed, not taking away from those already set out, the activities are the following:

- **Theory/Practice Lectures:** Theoretical activities or problems carried out mainly through exposition by the teacher.
- **Practical classes:** Theoretical discussion activities or exercices and practical cases presented by students
- **Practical laboratory testing:** This work is tutored by a teacher in laboratory. These activities will continue with an autonomous student work.
- **Individual tutorials:** These tutorials may be face-to-face or virtual (Moodle or email).
- **Group tutorials:** Scheduled tracking learning activities in which the teacher meets with a group of students to answer questions, exams or problems

The subject 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. 40% of this work (60h) will be held in the classroom and or lab and the rest will be autonomous.

A summary of a weekly timetable guide can be seen in the following table.

Activity	Weekly school hours
Lectures	2-3
Practical laboratory testing	1-2
Other Activities	6

There is a tutorial calendar timetable set by the teacher that can be requested by the students who want a tutorial.

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5.3.Program

CONTENTS

- **THEORETICAL CONTENT**

1. Introduction to Hydraulic engineering

Definition. Measurement units. Fluids properties (weight and mass, specific weight, specific or absolute density, relative density. Pressure. Manometers. Liquids and gases compressibility. Surface tension. Capillarity. Viscosity.

2. Hydrostatics

Definition. Properties of hydrostatic pressure: direction and intensity. Pascal principle. General equation. Law of pressure variation. Archimedes principle. Hydrostatic forces on flat and curve surfaces.

3. Fluids Kinematics

Definition. Kinematic parameters. Trajectory, tracer line, current line, flow line pipe. Classification of fluid.

4. Fluids Dynamics.

Definition. Basic principles. Theorem of Bernouilli for ideal fluids, applications. Theoretical power of a hydraulic machine. Equation of motion. Dynamics of real fluids. Loss of charge. Real power of hydraulic pump. Motion of real liquids in pipes.

5. Hydraulic pumps, valves and water hammer

Hydraulic pumps and liquid pumping. Pump efficiency. Classification of hydraulic pumps. Valves and water hammer. Valve typology. Cavitation.

6. Pressurized pipes and channels

Pressurized long pipe system. Design of a pressurized pipe system. Checking how a pressurized pipe system works. Practical formulae for hydraulic calculation of pressurized pipes. Open channel flow. Channels and parameters characteristic of flow. Equations.

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PRACTICAL CONTENTS

Problems

1.1 Compressibility of fluids

1.2 Hydrostatic systems, calculation of intensity, etc.

1.3 Fluids dynamics, equation for conservation of energy, charge loss, etc.

1.4 Hydraulic pumps, water hammer, etc.

1.5 Pressurized pipe systems.

Practice

2.1 Manometers

2.2 Viscosity

2.3 Hydrostatic thrust

2.4 Osborne Reynolds apparatus

2.5 Venturi meter

5.4.Planning and scheduling

Continuous assessment.

The student must attend at least 80% of class activities, do and pass the practical tests, written tests and assignments.

The following aspects are taken into account:

1. Attendance: 2.5% of final mark.
2. Practical problems: 12.5 of final mark.
3. Written tests: Test 1, 40% and Test 2 45% of final mark.

Global final test

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Students who fail to pass the subject in a continuous assessment or who cannot attend at least 80% of the sessions, will be assessed by a global written test that will include theory and practical questions.

5.5.Bibliography and recomended resources

References

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