COURSE DATA

DATA SUBJECT

Code: 34924
Name: Fluid mechanics
Cycle: Undergraduate Studies
ECTS Credits: 6
Academic year: 2025-26

STUDY (S)

Degree	Center	Acad. year	Period
1404 - Degree in Industrial Electronic Engineering	Escola Tècnica Superior d'Enginyeria	2	Second quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1404 - Degree in Industrial Electronic Engineering	Fluid mechanics	COMPULSORY

COORDINATION

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SUMMARY

This subject is the basis to solve practical problems, from an engineering point of view, in which fluid flow is involved. Its aim is that the students achieve the background related to fluids in movement so that it can be used in the design of pumps, compressors and agitators.

This is a basic subject which emphasizes the systematic application of fundamental principles to the analysis of a variety of fluid problems of practical nature where dissipation of mechanical energy is produced.

The subject contents are: **Kinematic and dynamic of fluids. Fluid flow. Hydraulic machines. Pumps. Compressors**, which are structured in the units showed in section 6.

The general objectives of the course are:

- To expand, in a practical context, the vision that the student has of the fluid behavior in other

subjects such as Physics.
- To present mechanical energy as an useful energy as well as the interchange ability of their components.
- To develop in students the ability to propose and solve numerical problems which occur with mechanical energy and pressure losses, as well as to interpret the results.
- Enhance students' skills in reasoning and systematic work.
- Promote and encourage those values and attitudes that must be inherent to engineers.

The theory classes will be taught in Spanish and the practical activities and laboratory sessions as stated in the assignment form on the web of the degree.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

There are no specified enrollment restrictions with other subjects of the curriculum.

OTHER REQUIREMENTS

To successfully pass the subject is necessary that students possess a series of prior knowledge at the level demanded in subjects studied previously. This knowledge comprises:
International system of units. Change of units.
Fluid knowledge.

COMPETENCES / LEARNING OUTCOMES

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CG11 - Knowledge, understanding and ability to apply the necessary legislation for practising professionally as a qualified industrial engineer.

CG19 - Understanding of the basics of fluid mechanics and their application to solving problems in the field of engineering. Design of piping, channels and fluid systems.

CG3 - Knowledge of basic and technological subjects that allows students to learn new methods and theories and provides them with versatility to adapt to new situations.

CG4 - Ability to solve problems with initiative, decision-making skills, creativity and critical reasoning and to communicate and transmit knowledge, abilities and skills in the field of industrial engineering (with specific industrial electronics technology).

CG5 - Knowledge to carry out measurements, calculations, assessments, appraisals, surveys, studies, reports, work plans and analogous work.

CG6 - Ability to deal with specifications, regulations and mandatory standards.

DESCRIPTION OF CONTENTS

1. BASIC CONCEPTS

The aim of Fluid Mechanics. Concept of pressure: in static systems and in fluids in movement. Fluid Velocity.

2. FUNDAMENTAL EQUATIONS FOR FLUID FLOW

Conservation of mass. Conservation of energy. Mechanical energy balance. Conservation of momentum. Transport equation for mechanical energy loss.

3. INTERNAL PIPE FLOW

Velocity profile in a circular conduit: Laminar and turbulent flows. Universal profile of velocity for smooth tubes. Velocity profile for rough tubes. Estimation of friction factor in conduits of circular section.

4. LIQUID FLOW IN PIPES

Design equations: - Mechanical energy balance; - Calculation of the losses of mechanical energy. Practical cases in the design of pipes for liquids: - Calculation of the pump power; - Calculation of the discharge flow; - Calculation of pipe diameter. Networks of pipes: Resolution of problems.

5. PUMPS FOR LIQUID DRIVING

The system. The pump: Types of pumps. Turbopumps: - Specific speed of a turbopump; - Laws of affinity; - Connexions of turbopumps. Interaction pump-system: - Installation point of a pump; - Discharge and head supplied by a pump; - Flow control.

6. COMPRESSIBLE FLOW IN PIPES. COMPRESSORS

Design Equations. Combination of mechanical energy balance and the rate equation: - Isothermal flow; - Adiabatic flow; - Polytropic flow. Equipment for the movement of gases. Work of compression. Staged operation.

7. OPEN CHANNEL FLOW

Flow in open channels: - Classification of open channel flow; -Classes of flow in open channels. Uniform flow: - Channel geometry; - Equations; - The most efficient section. Mechanical energy balance. Specific

head; - Using the mechanical energy balance in transitions; - Flow measurement. Momentum in open cannel flow: Hydraulic jump.

8. FLUID MIXING SYSTEMS. AGITATORS

Types of mixture. Mixing mechanisms. Types of agitators for liquid mixing. Homogenization of miscible liquids in stirred tanks: - Power consumption in a stirred tank; - Agitator capacity pumping; - Mixing time.

9. LAB OF FLUID MECHANICS

Simulation of hydraulic systems with EPANET2. Centrifugal pump. Reynolds experiment. Liquid flow. Multipump Testing Bench.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Theory	20,00
Laboratory	5,00
Classroom practices	35,00
Total hours	**60,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	5,00
Independent study and work	20,00
Preparation of lessons	38,50
Preparation for assessment activities	16,50
Resolution of case studies	10,00
Total hours	**90,00**

TEACHING METHODOLOGY

The development of the course is structured around the theory classes, practical activities and laboratory sessions. Some of these activities will be evaluated and will contribute to the final mark.

In the theory classes lecture model will be used to explain the most complex or difficult notions and always during periods of less than 30 minutes. Students will get an insight into many of the theoretical concepts by working with the material provided to them. (G3, G11, G19)

Problems will be developed in practical class sessions following two models. Some problems will be solved by the teacher so that students find out the way to address them, while others will be solved by students, individually or in groups under the supervision of the teacher. After the work, the problems will be collected, analyzed and corrected by the teacher or the students. (G3, G4, G5, G19) These are non-recoverable activities.

The proposed work for the students will be of several types: Questions or short exercises, problems similar in complexity to those of exams and self-correcting tests. All of these activities will be done in class or at home, and their contribution to the final mark will be established. After correction, the students will be informed of their results and will be given with a summary of the most common mistakes (G3, G4, G5, G19). These are non-recoverable activities.

For laboratory practice sessions, a practical guide will be supplied to the students and the experimentation will be carried out entirely by them under the supervision of the teacher (G5, G6, G19). Attendance at laboratory is a non-recoverable activity and mandatory to pass the course.

EVALUATION

In a first round, the assessment of student learning will be carried out using two models:

1. Through continuous assessment where activities delivered by students and the marks obtained in 2 individual exams will be taken into account (Model A).
2. From the mark of a final exam to be held on the scheduled date and the activities delivered in time along the course (Model B).

The student evaluation will be carried out considering two blocks: Block I: issues 1 to 5; and Block II: issues 6 to 8. The exam of Block I will be carried out after finishing the subject of this block, whereas the exam of Block II will be on the date of the first call.

The requirements to be qualified by the model A) are: deliver more than 70% of activities, getting an average score equal or greater than 5 in them and to get in each of the individual exams a mark equal or greater than 4. The final mark for this mode will be calculated using the following criteria:

5% From student participation (G3, G4, G19)

5% On-time delivery (G3, G4, G6, G11, G19)

30% From class, homework and laboratory grading (G3, G4, G5, G6, G11, G19)

60% From individual exams (G3, G4, G19)

To pass the course with this model a final mark equal to or greater than 5 must be obtained. Any student

who does not meet any of the mentioned requirements will have to pass the course on the first round by the model B), or go to the second call if a mark equal or greater than 4 is not achieved in the exam of block II.

In model B) the student has to do a final exam on the date scheduled of the whole of the subject which will only count up to 75% of the final mark (G3, G4, G19), whereas the remaining 25% of the mark will be obtained from class, homework and laboratory grading activities (G3, G4, G5, G6, G11, G19). In the final exam a mark equal or greater than 4 must be obtained and in order to pass the course the final mark must be equal or greater than 5.

The students who have not passed the course on the first round will have a second one in which the exam will count up to 85% whereas the remaining 15% will be obtained from the non-recoverable activities made along the course. The exam will allow the evaluation of the acquisition of learning outcomes and recoverable activities. For those non-recoverable activities (participation, on-time delivery and laboratory report) the mark obtained in the first round will be maintained. In the final exam a mark equal or greater than 4 must be obtained and in order to pass the course the final mark must be equal or greater than 5.

For the advancement of the assessment it is essential to assist the laboratory in a previous year.

In any case, the assessment system will be governed by that established in the Evaluation and Qualification Regulations of the University of Valencia for Degrees and Masters: (https://webges.uv.es/uvTaeWeb/MuestraInformacionEdictoPublicoFrontAction.do?accion=inicio&idEdictoSeleccionado=5639)

Copying or plagiarism of any activity that is part of the evaluation will result in the impossibility of passing the course, and the student will then be subject to the appropriate disciplinary procedures indicated in the ACTION PROTOCOL FOR FRAUDULENT PRACTICES AT THE UNIVERSITY OF VALENCIA (ACGUV 123/2020).

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