

## 60817 - Hydraulic Machinery and Systems

### Syllabus Information

**Academic year:** 2023/24

**Subject:** 60817 - Hydraulic Machinery and Systems

**Faculty / School:** 110 - Escuela de Ingeniería y Arquitectura

**Degree:** 532 - Master's in Industrial Engineering

**ECTS:** 6.0

**Year:** 1

**Semester:** First semester

**Subject type:** Optional

**Module:**

### 1. General information

This subject focuses on the calculation and design of fluid installations and their

active elements: pumps and turbines. The hydraulic design of a fluid machine consists of determining the best constructive form it should have. A simplified unidimensional theory describes the influence of the machine's internal geometry on the fluid/machine interaction energy. Pumping installations, the most common in industrial engineering practice, are discussed.

<https://www.un.org/sustainabledevelopment/es/>. These approaches and objectives are aligned with the following Sustainable Development Goals (SDGs) of the United Nations Agenda 2030 (<https://www.un.org/sustainabledevelopment/es/>), so that the acquisition of the learning results of the subject provides training and competence to contribute to some extent to their achievement

### 2. Learning results

To apply the knowledge of fluid mechanics, as well as the calculation, design and testing of fluid mechanical systems and machines to engineering problems of fluid installations.

To understand the operation and applications of fluid machines.

To know how to size a fluid machine subject to general technical specifications as well as an installation of fluid distribution.

To apply efficiency, economy, and reliability criteria in the design of fluid installations.

### 3. Syllabus

Topic 1 Integral equations of fluid mechanics. Application to conduits and hydraulic machines (HHMM)

Topic 2 Dimensional analysis and similarity. Application to conduits and hydraulic machines

Topic 3 Flow in conduits and simple pipe systems

Topic 4 Pumping and ventilation installations.

Topic 5 Flow regulation and start-up of installations.

Topic 6 Fluid machines. Introduction and general aspects

Topic 7 Geometry and kinematics of HHMM. Powers and performances

Topic 8 Fundamental theory of hydraulic turbomachines

Topic 9 Similarity in turbomachines. Specific parameters

Topic 10 Water hammer and cavitation

### 4. Academic activities

1. Master classes. There will be three weekly hours: two of theory and one of problems/cases.

2. Laboratory practices. 10 hours distributed into five sessions. In each session, there will be work groups of 3/4 students.

3. Personal study and work. In this non-attendance part each student must dedicate, at least, about 80 hours, which are necessary for the study of theory, problem solving, and script review.

4. Possible visit to a hydroelectric plant where the student should be able to identify all the elements that make up a hydraulic power generation plant, as well as to observe its operation.

5.- Assessment tests. 6 hours

### 5. Assessment system

PROGRESSIVE (CONTINUOUS) ASSESSMENT

-Throughout the term, various problems and activities will be proposed to help the student test their knowledge and skills in the subject.

-There will be two partial tests throughout the term, including theory questions and problems. Each partial exam accounts for 40% of the final grade.

-The practices (and their reports) account for 20% of the final grade.

#### GLOBAL TEST:

The global written test will consist of two parts:

\* The first will contain theory and practice questions, and will account for 30% of the final grade.

\* The second will include problems and will represent 50% of the final grade.

-The practices (and their reports) account for 20% of the final grade.

The final grade to pass the subject must be equal to or higher than 5.0.

On the other hand, the second call for exams will be carried out through a comprehensive test conducted in the period established for this purpose in the academic calendar. Only the grade for the practices is kept from one call for exams to the other during the same academic year.