Engineering fluid mechanics

Academic Year: (2022 / 2023) **Review date: 19-05-2023**

Department assigned to the subject: Thermal and Fluids Engineering Department

Coordinating teacher: MORENO BOZA, DANIEL

Type: Compulsory ECTS Credits : 6.0

Year : 2 Semester : 2

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Calculus I, II
Physics I, II
Linear Algebra
Writing and Communication Skills
Programming
Thermal Engineering
Machine Mechanics

OBJECTIVES

By the end of this subject, students will be able to have:
1. knowledge and understanding of key aspects of fluid mechanics;
2. the ability to apply their knowledge and understanding to identify, formulate and solve problems of fluid mechanics using established methods;
3. the ability to design and conduct appropriate experiments of fluid mechanics, interpret the data and draw conclusions;
4. workshop and laboratory skills in fluid mechanics.
5. the ability to select and use appropriate equipment, tools and methods to solve problems of fluid mechanics;
6. the ability to combine theory and practice to solve problems of fluid mechanics;
7. an understanding of applicable techniques and methods in fluid mechanics, and of their limitations;

DESCRIPTION OF CONTENTS: PROGRAMME

Introductory course on Fluid Mechancis composed of:

1. Introduction to Fluid Mechanics: continuum hypothesis, local thermodynamic equilibrium, equations of state and definition of fluid variables.
2. Flow kinematics: Lagrangian and Eulerian description, convective flux, and Reynolds transport theorem.
3. Conservation laws: integral and differential forms of the continuity, momentum, and energy equations.
4. Dimensional analysis: Pi theorem and physical similarity.
5. 1D Flow: Couette, Poiseuille, and other flows of practical interest.
6. Flow in pipes: major and minor losses.
7. Introduction to external flows.

LEARNING ACTIVITIES AND METHODOLOGY

Teaching methodology will incluye:
1. Lectures: The students will be provided with lecture notes and recommended bibliography.
2. Problem solving sessions, related with the course topics
3. Homework problems aiming at student self-evaluation.
4. Development and interactive presentation of guided works, including four lab session as direct application of theory.

ASSESSMENT SYSTEM

Continuous assessment will be based on the following criteria:

- Midterms: There will be 2 eliminatory partial exams throughout the course, which will cover material for the final regular exam. The weight of each partial exam is 45% for the first one and 40% for the

second one, in relation to the continuous assessment.
- Laboratory sessions: There will be 4 practical sessions, and students will submit the corresponding reports one week after each practice. The weight of the practical grade is 15% of the continuous assessment.
All students who do not pass the continuous assessment associated with the partial exams must take the final exam, which will consist of the two previously evaluated parts. In the regular session, the final grade is calculated with 40% from the continuous assessment grade and 60% from the regular final exam grade.

In the extraordinary session, the grade is determined either by 40% of the continuous assessment grade and 60% of the extraordinary final exam grade, or by 100% of the extraordinary final exam grade if the latter is higher than the former.

% end-of-term-examination:	60
% of continuous assessment (assigments, laboratory, practicals…):	40

BASIC BIBLIOGRAPHY

- Antonio Crespo Martínez Mecánica de Fluidos, Thomson.

- Frank M. White Fluid Mechanics, McGraw Hill.

- MARCOS VERA COELLO, CARLOS MARTÍNEZ BAZÁN, ANTONIO L. SÁNCHEZ PÉREZ, IMMACULADA IGLESIAS ESTRADÉ Ingenieria Fluidomecanica, Paraninfo, 2012

ADDITIONAL BIBLIOGRAPHY

- A. L. Sánchez Apuntes de Procesos Fluidotérmicos, Publicaciones de la Universidad Carlos III de Madrid., 2005

- Amable Liñán Martínez Apuntes de Mecánica de Fluidos, Publicaciones de la ETSI Aeronáuticos de Madrid, 2006