

Academic Year: (2022 / 2023)

Review date: 30-05-2022

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

The objective of this course is to provide the student a basic understanding of Fluid Mechanics: Mass Conservation Law, Momentum Conservations Law and Energy Conservation Law.

Knowledge mastered in this course:

- Identify the fluid domain and understand the interaction with its surroundings.
- Apply properly the above mentioned conservation laws to obtain forces, moments, power and heat exchange.
- Determine the dominant terms in the conservation equations
- Determine the adequate methodology to obtain the required variables in an engineering problem (calculus, experiments, etc.)
- Present results in a rational manner, in terms of the relevant parameters.
- Comprehension of basic terminology to understand technical documentation and specific literature.

Specific capacities:

- Obtention of pressure fields in fluid statics.
- Determination of forces and moments exerted by a fluid on a surface.
- Determination of power and heat exchange between a fluid and its surroundings.
- Determination of head losses in flow in ducts.
- Application of Dimensional Analysis principles to reduce the number of parameters in a generic problem.

General capabilities:

- Analysis based on scientific principles.
- Multidisciplinary approach (use knowledge from several disciplines: Mechanics, Thermodynamics, Calculus, etc.)
- Capacity to locate and understand basic literature on the subject.

Attitudes:

- Analytical attitude
- Critical attitude
- Cooperative attitude

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 include:

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

The continuous evaluation will be based on:

- Midterms: a total of 2 midterms during the course.
- Lab sessions: 4 laboratory sessions; reports are due one week after each session.

All students must do the final exam. The final grade will be the sum of 40% continuous assessment and 60% of the grade of the final exam.

In the extraordinary examination, the final grade will be either the sum of 40% continuous assessment and 60% of the grade of the final extraordinary exam or 100% of the grade of the final extraordinary exam, whatever is higher.

% end-of-term-examination:	60
% of continuous assessment (assignments, 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 Ingeniería Fluidomecánica, 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