

Academic Year: ( 2019 / 2020 )

Review date: 20-05-2020

Department assigned to the subject: Thermal and Fluids Engineering Department

Coordinating teacher: SEVILLA SANTIAGO, ALEJANDRO

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**

This is a Basic course in Fluid Mechanics. Its Programme contains 7 parts:

FIRST PART: Introduction to Fluid Mechanics. The continuum hypothesis. Variables of interest.

SECOND PART: Hydrostatics: Application of Fluid Mechanics to a stagnant fluid. Pressure field in a stagnant fluid. Force and Moment acting on a solid surface. Archimedes Principle. Applications: Barometer, Manometers, Hydraulic presses ;

THIRD PART: Basic concepts of fluid flow kinematics. Reynolds Transport theorem.

FOURTH PART: Conservation equations for fluid volumes and control volumes. Mass, Momentum and Energy conservation equations. Bernoulli equation; examples. Angular momentum equation. Applications to engineering problems.

FIFTH PART: Dimensional Analysis. The Pi theorem. Application of Dimensional Analysis to Fluid Mechanics. Relevant dimensionless numbers in Fluid Mechanics. Applications.

SIXTH PART: Flow in ducts. Flow regimes. Mechanical energy conservation applied to pipe flow with friction losses. Friction factor. Moody's chart and Colebrook equation . Localized losses in pipe systems (bends, valves, expansions, other fittings. ). Illustrative examples of flow in pipes.

SEVENTH PART: 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:

- 3 quizzes that will take place during the semester
- laboratory work: 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.

<b>% end-of-term-examination:</b>	60
<b>% of continuous assessment (assignments, laboratory, practicals...):</b>	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