INSTITUTO POLITÉCNICO DE BRAGANÇA

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| Course Unit | Advanced Fluid Mechanics | | | Field of study | Fluid Mechanics and Hydraulics | | |
| Master in | Industrial Engineering - Mechanical Engineering | | | School | School of Technology and Management | | |
| Academic Year | 2022/2023 | Year of study | 1 | Level | 2-1 | ECTS credits | 6.0 |
| Type | Semestral | Semester | 2 | Code | 9572-356-1202-00-22 | | |

| Workload (hours) | 162 | Contact hours | T - | TP 60 | PL - | TC - | S - | E - | OT - | O - |
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T - Lectures; TP - Lectures and problem-solving; PL - Problem-solving, project or laboratory; TC - Fieldwork; S - Seminar; E - Placement; OT - Tutorial; O - Other

Name(s) of lecturer(s): Sérgio Manuel de Sousa Rosa

## Learning outcomes and competences

At the end of the course unit the learner is expected to be able to:
1. To develop a good understanding of the concepts of fluid dynamics and be able to apply at ducts network.
2. Learn the basis of compressible flows.

## Prerequisites

Before the course unit the learner is expected to be able to:
Use the differential and integral calculus and have knowledge of fluid mechanics

## Course contents

Viscous flow in ducts. Compressible flows. Flow in channels and networks. Boundary-layer.

## Course contents (extended version)

1. Viscous flow in ducts:
   - Reynolds number. Flow in ducts with circular section an others. Friction losses.
2. Compressible flows:
   - Speed of sound and Mach number. Adiabatic and isentropic flows. Shock-wave.
3. Flow in channels and networks:
   - Multiple-pipe systems. Flow in open channels.
4. Boundary-layer:
   - Geometry and Reynolds number effects. Boundary-layer equations. External flows.

## Recommended reading

1. F. M. White. "Fluid Mechanics", McGraw-Hill, 3th ed. , 1994.
2. I. H. Shames. "Mechanics of Fluids", McGraw Hill, 1992.

## Teaching and learning methods

Theoretical lessons: Theoretical exposition of the fundamental concepts, followed by presentation of practical applications. Practical lessons: Resolution of problems.
Work beyond classes: Individual study of the theoretical concepts and resolution of given problems.

## Assessment methods

1. Alternative 1 - (Regular, Student Worker) (Final)
   - Intermediate Written Test - 50% (1st test of 2 hours)
   - Final Written Exam - 50% (2nd test of 2 hours)
2. Alternative 2 - (Regular, Student Worker) (Supplementary)
   - Final Written Exam - 100%
3. Alternative 3 - (Regular, Student Worker) (Special)
   - Final Written Exam - 100%

## Language of instruction

Portuguese

## Electronic validation

| Sérgio Manuel de Sousa Rosa | Luís Manuel Ribeiro Mesquita | José Alexandre de Carvalho Gonçalves | José Carlos Rufino Amaro |
|---|---|---|---|
| 01-03-2023 | 02-03-2023 | 02-03-2023 | 10-03-2023 |