INSTITUTO POLITÉCNICO DE BRAGANÇA

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 -

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

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