

Semester 2
Major: Energetics and Propulsion (EPROP)

Fluid mechanics

Course code: AFM2

ECTS Credits: 5

Department	: MFA	Lectures	: 15h00
Lecturers	: M.Meldi	Tutorials	: 15h00
Year of study	: 1 st year	Laboratory sessions	: 09h00
Semester	: 2 nd semester	Project	:
Assessment method(s)	: 1 written test, 1 practical work test	Home works	:
Language of instruction	: English	Total hours	: 39h00
Type of courses	: Compulsory		

Objective: To give the students not only a basic technical background but also physical and phenomenological bases that will enable them to handle complex problems.

Prerequisites: Basic fluid dynamics

Content:

- 1. Physical mechanisms and flow models**
 - Description of a fluid
 - Balance equations
 - Models of flow motion
- 2. Incompressible viscous flows**
 - Important physical properties
 - Characteristic scales
 - Examples of exact solutions
 - Elementary notions of flow stability analysis
- 3. Laminar boundary-layer**
 - Localisation of viscous effects in High Reynolds number flows
 - Boundary layer characteristic parameters
 - Prandtl equations;
 - Integral balance: Von Karman equation
 - Boundary layer on a flat plate
 - Effect of a pressure gradient
 - Flow separation and its consequences
- 4. Turbulent flows, an introduction**
 - Mean flow equations
 - Physical consequences of turbulent agitation
 - Concept of turbulent diffusivity; near wall flows
- 5. Compressible flow of a perfect fluid**
 - Introduction
 - Description of compressible and inviscid flows
 - Stagnation quantities
 - Steady one-dimensional compressible flow

Recommended reading:

H. Oertel, *Prandtl's essentials of fluid mechanics*, Springer, 2003

D.J. Tritton, *Physical fluid dynamics*, Oxford Science Publications, 1998

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