

Gas dynamics

Course code: AGD2

ECTS Credits: 5

Department	: MFA	Lectures	: 12h30
Lecturers	: E. Goncalvès	Tutorials	: 13h45
Year of study	: 1 st year	Laboratory session	: 12h00
Semester	: 2 nd semester	Project	:
Assessment method(s)	: 1 written test, 1 practical work test	Home works	:
Language of instruction	: English	Total hours	: 38h25
Type of courses	: Compulsory		

Objective: Understanding of the physics of shock waves and expansion waves. Application to internal aerodynamics

Prerequisites: Basic fluid mechanics, with isenropic compressible flows. Basic knowlegde on hyperbolic PDE's and systems

Content:

1. **Shock waves**
 - Jump relations
 - Normal shock wave
 - Oblique shock wave
2. **One-dimensional unsteady compressible flows**
 - Cauchy problem
 - Method of characteristics
 - Simple-wave flows
 - Shock formation
3. **Two-dimensional stationary supersonic flows**
 - Method of characteristics
 - Simple-wave flows
 - Prandtl-Meyer expansion
4. **Air intakes**
 - Critical and supercritical regimes
 - Adaptation
 - Head losses in subsonic flow
5. **Supersonic nozzles**
 - Boundary layer and displacement effect
 - Flow rate and thrust
 - Adaptation and separation

Recommended reading:

J.D. Anderson Jr., *Modern compressible flow: with historical perspective*, McGraw Hill, 2002

S. Candel., *Mécanique des fluides*, Dunod, 1995

I. Ryhming, *Dynamique des fluides*, Presses Polytechniques et Universitaires Romandes, 2004 (3e edition)

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