Turbulence

ECTS credits
1 credits

Semester
Fall

In brief

Course langage: French

Presentation

Learning objectives

In this module, we present the mechanisms of development of hydrodynamic instabilities and the appearance of turbulence. Both from the point of view of the phenomenological description and from the point of view of the equation of the associated phenomena in the framework of a linearized approach. Then we focus on the modeling of turbulence by presenting the main methods of modeling turbulent flows, highlighting the advantages and weaknesses of each of them.

Description of the programme

This module presents the classical elements of the linear theory of instability development (notions of threshold, eigenmodes...) and then applies them to different situations (Kelvin-Helmholtz, Rayleigh-Bénard instabilities, capillarity-gravity waves). Then the appearance of turbulence and the necessary use of the Reynolds decomposition are discussed. The rest of this module presents the most common 1st order turbulence models, with the specificities of each.

Generic central skills and knowledge targeted in the discipline

- Model and analyze turbulent flows, choosing the most appropriate model (C2)
- Mastering of the modeling and of the numerical simulation of turbulent flows (C2)

How knowledge is tested

DS: written test, 100%.

Bibliography

1. Abid, F. Anselmet, C. Kharif, Instabilités hydrodynamiques et turbulence, Cépaduès Éditions (2017).
2. Charru, Instabilités hydrodynamiques, EDP Sciences (2007).
3. Chassaing, Turbulence en mécanique des fluides, Cépaduès Éditions (2000).

Teaching team

Fabien Anselmet (ECM)

Malek Abid (AMU)

Sustainable Development Goal



Affordable and clean energy



Climate action

Total des heures		**24h**
CM	Master class	16h
TD	Directed work	8h

Useful info