

EU objectives**At the end of this course, students will be able to :**

- List the different types of turbomachinery and their industrial applications.
- Building a speed triangle
- Apply one-dimensional theory and Bernoulli's theorem to relative flow
- Carry out an overall study of energy exchanges in a turbomachine to calculate performance
- Represent the operating characteristics of turbomachinery
- Analyse the flow in a centrifugal pump and the characteristic curves
- Carry out a study of a turbomachine and its coupling with a hydraulic network
- Explain the physical meaning of the parameters associated with fluid flow, whatever the type of flow.
- Analysing free surface flows and creeping flows
- Analyse compressible flows for a perfect gas and transform them into relevant mathematical models
- Quickly pre-dimension a Laval nozzle
- Compare the aerodynamic performance of simple profiles
- Identify the presence of a shock wave and calculate the variations in the characteristics of the flow as it passes.

Description of the ECUEs**TURBOMACHINERY 1:**

Description and classification of turbomachinery and its applications; Principle of energy conversion in turbomachinery: kinematics of turbomachinery, thermodynamic study; Dimensional analysis and similarity of turbomachinery with incompressible fluids; Centrifugal fans and pumps: description, efficiency, classification of work, coupling to a hydraulic network; Cavitation.

ROTATIONAL, CREEPING AND FREE-SURFACE FLOWS :

- Representation of plane, isovolume rotational and irrotational flows by analytical functions
- Flow in open channels
- Creeping flow and hydrodynamic lubrication

COMPRESSIBLE FLOWS AND AERODYNAMICS

- Compressible perfect gas flows
- Isentropic flows in nozzles
- Straight shock waves
- Aerodynamics

Prerequisites

Integration, solving differential equations, thermodynamics, mechanics, ideal and viscous fluid mechanics

Bibliography

CENGEL, Yunus A. & CIMBALA, John M. Fluid Mechanics: Fundamentals and Applications. McGraw-Hill, 2010. Techniques de l'Ingénieur (BM 4280: Turbomachinery - Description, basic principles; BM 4283: Turbomachinery - Mechanism of energy conversion; B4402: Characterisation and similarity of hydraulic turbomachinery. Machines à fluide: principes et fonctionnement, M. Pluiose, Ellipses, 2010; Ingénierie des turbomachines, M. Pluiose, Ellipses, 2003.