



AÉRODYNAMIQUE ET ENERGÉTIQUE DES TURBOMACHINES

FUNDAMENTALS OF TURBOMACHINES

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| Lecturers : 16.0 | TC : 0.0 | PW : 4.0 | Autonomy : 0.0 | Study : 8.0 | Project : 0.0 | Language : AN

Objectives

The main objective of this course is to familiarize the students with the physical phenomena, mechanisms and basic computations behind turbomachinery flows. Starting with aerodynamics and thermodynamics applied to turbomachinery, we will detail the main tools used in the design of turbomachines. More specifically, we will tackle the design of an axial compressor given a specific efficiency objective. Practical work on a dedicated axial low-speed compressor test bench will be helpful to apprehend theoretical notions seen in class in a concrete case. Tutorial sessions will be devoted to the design of an axial compressor given specific objectives.

Keywords : turbomachines, compressor, turbine, aerodynamics, energetics, compressibility

Programme

Range of operation of turbomachines
Characteristic curves (nominal point and range of operation)
Usage of integral formulations for the fluid dynamics equations applied to turbomachines.
Aero-thermodynamics analysis in 1D
Real transformations in turbomachines, computation of losses.
2D analysis in the circumferential plane: velocity triangles, load factors for compressors, correlations.
2D analysis in the meridional plane: radial equilibrium.
Introduction to unsteady and 3D phenomena

Learning outcomes

- learn the operating rules of turbomachines
- know how to design an axial compressor
- master compressible aerodynamics
- know how to analyze turbomachinery flows

Independent study

Objectifs : Design a subsonic axial compressor (in support of tutorial sessions)
Write a numerical program for the design of the compressor (matlab, python,...)

Méthodes :

Core texts

N. A. Cumpsty, *COMPRESSOR AERODYNAMICS*, Longman Scientific & Technical, 1989
D Japikse, N. C. Baines *INTRODUCTION TO TURBOMACHINERY*, Concepts ETI, 1987

Assessment

Final mark = 50% Knowledge + 50% Know-how
Knowledge = 100% Final exam
Know-how = 100% continuous assessment