

Instructor Guide- Internal Compressible Flows



This instructor guide can be used to implement the module “Internal Compressible Flows” in the classroom.

Module Aim

The overall aim of this module is supporting educators introducing various topics related to Internal Compressible Flows with simulation. This module serves as a foundation, providing slides that can easily be expanded to go into details for various topics depending on specific course curriculum. Details of how simulation can aid visualization and exploration of concepts through images and homework.

It is important to note that this module is meant to supplement materials taught in an introductory course and not to replace the course in its entirety.

Suitable Courses

It is well suited for an Introduction to Internal Compressible Flows course

Contents

- Lesson 1- Introduction to Internal Compressible Flows
- Lesson 2- Fanno and Rayleigh Flows
- Lesson 3- Quasi 1-D Flows
- Lesson 4- Converging-Diverging Nozzle
- Lesson 5- Diffusers and Wind Tunnels
- Lesson 6- Method of Characteristics
- Simulation examples (including simulation files)
 - » Compressible Flow through a Converging Nozzle
 - » Compressible Flow through a Converging-Diverging (CD) Nozzle
- Homework (including simulation files)
 - » Rayleigh Flow
- Quiz Questions

Module Duration

Approximately 2 hours.

Learning Outcomes

Students are able to:

1. Understand internal compressible flow.
2. Describe the effect of friction and heat addition on 1D flow.
3. Analyze flow through variable area geometry.
4. Design the nozzle shape using method of characteristics.

References and additional resources

This content was adapted from the [Ansys Innovation Course Internal Compressible Flows](#).

Additional Ansys Education Resources of interest:

- [Fluid Statics using Ansys Fluent](#)
- [Fluid Kinematics using Ansys Fluent](#)
- [Governing Equations of Fluids using Ansys Fluent](#)

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