

Instructor Guide- Basics of Turbulent Flows



This instructor guide can be used to implement the module “Basics of Turbulent Flows” in the classroom.

Module Aim

The overall aim of this module is supporting educators introducing various topics related to turbulent flows fundamentals with simulation. This module serves as a foundation, providing slides that can easily be expanded to go into detail 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 Real Viscous Flows course.

Contents

- Lesson 1- Intro to Basics of Turbulent Flows
- Lesson 2- Stability and Turbulence
- Lesson 3- Description of Turbulence
- Lesson 4- Governing Equations of Turbulent Flows
- Lesson 5- Closure of RANS Equations
- Lesson 6- Turbulent Boundary Layers
- Simulation examples (including simulation files)
 - » Kelvin-Helmholtz instability between Two Fluids
 - » Wind Flow between Two Buildings
- Homework (including simulation files)
 - » Transition on a Flat Plate
 - » Turbulent Flow over a Flat Plate
- Quiz Questions

Module Duration

Approximately 2 hours.

Learning Outcomes

Students are able to:

1. Gain fundamentals of turbulent flows
2. Learn the concept of laminar-turbulent transition
3. Obtain in-depth knowledge of Turbulence
4. Understand underlying governing equations
5. Understand the concept of turbulent boundary layers
6. Solve simple fluid flow problems using Ansys Fluent

References and additional resources

This content was adapted from the [Ansys Innovation Course Fluid Kinematics](#).

Additional Ansys Education Resources of interest:

- [Lecture Unit: Introduction to Fluid Mechanics with Ansys Discovery](#)
- [Case Study: Flow over an Airfoil in Ansys Discovery](#)

Turbulent Flow Students Solution Manual

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