

# Chapter 1: Introduction to Thermofluid

## Objectives:

- (1) Understand the scope of studies in the field of Thermofluid
- (2) Explain and apply the following Basic Concepts of Thermofluid:
  - System
  - Surroundings
  - Boundary
  - Properties of a System
  - State of Equilibrium
  - Work Transfer
  - Heat Transfer
- (3) Appreciate the correlation between Thermodynamics and Fluid Mechanics

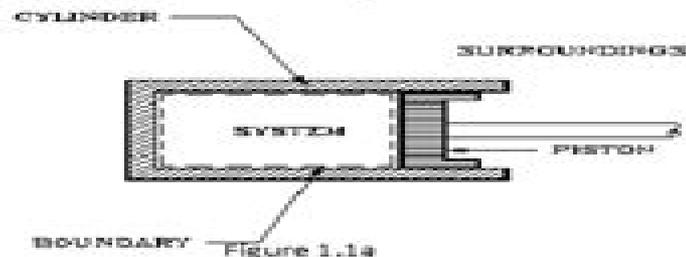
## 1.1 Introduction

Thermofluids is a branch of science and engineering that consist of 4 intertwined field of studies: Thermodynamics, Fluid Mechanics, Heat Transfer and Combustion. The word 'Thermo' refers to heat and 'Fluid' refers to liquid, gas or vapor. In this module, we shall focus on the Thermodynamics and Fluid Mechanics aspect of things, in particular, the energy considerations for thermal and fluid (mass) transfer.

## 1.2 Basic Concept of Thermofluids

### 1.2.1 Definitions of a system

A **system** is defined as a collection of matter (fluid) within a prescribed region of interest. For example, Figure 1.1a, the fluid contained between the cylinder walls and the piston may be said to be the system. Another similar idea known as the **control volume** can be applied as shown in Figure 1.1b.



**Surrounding** is the region enclosing the system as shown in Figure 1.1a. The surroundings may interact with the system via energy or mass transfer.

**Boundary** is the surface that separates the system from the surroundings. Do note that the boundary can be either a physical (Figure 1.1a) one or an imaginary one (Figure 1.1b). In the context of Figure 1.1b, this boundary is referred to as a **control surface**.

# Thermofluids Data University Of Cambridge

**M Mosston**



## **Thermofluids Data University Of Cambridge:**

*Thermofluids Data Book* University of Cambridge. Engineering Department,2008      *Thermofluids Data Book* University of Cambridge. Engineering Department,2008      *Thermofluids Data Book* ,2017      **Applied Continuum Mechanics for Thermo-Fluids** Jafar Ghazanfarian,2024-06-21 Applied Continuum Mechanics for Thermo Fluids presents the tensor notation rules and integral theorems before defining the preliminary concepts and applications of continuum mechanics It bridges the gap between physical concepts and mathematical expressions with a rigorous mathematical treatment After discussing fundamental concepts of continuum mechanics the text explains basic subjects such as the Stokes hypothesis the second coefficient of viscosity non Newtonian fluids non symmetric stress tensor and the full Navier Stokes equation With coverage of interdisciplinary topics the book highlights issues such as relativistic fluid mechanics stochastic mechanics fractional calculus nanoscale fluid mechanics polar fluids electrodynamics and traffic flows It describes fundamental concepts of vorticity dynamics including the definition of vorticity and circulation with corresponding balance equations and related theorems This text is intended for upper level undergraduate and postgraduate mechanical chemical aerospace civil engineering and physics students taking continuum mechanics advanced fluid mechanics convective heat transfer turbulence or any other similar courses In addition this book can be an excellent resource for scientists who want to initiate research on topics related to thermo fluids Instructors will be able to utilize a Solutions Manual and Figure Slides for their courses The eBook version includes the following enhancements Videos placed throughout the text containing further explanation of key topics Multiple choice quizzes to reinforce readers understanding of physical concepts      **Emerging Technologies in Computational Sciences for Industry, Sustainability and Innovation** Matteo Giacomini,Simona Perotto,Gianluigi Rozza,2025-12-24 This book presents up to date state of the art for industrial mathematics and covers emerging topics in computational sciences Mathematical models and computational methods have gained an increasing importance in the simulation of real world and industrial problems The employment of such methodologies deeply changed the standard ways of conceiving daily industrial production and strategies for sustainable exploitation of modern cities The goal pursued by this book is twofold On the one hand cases of successful interaction between mathematics and industry are presented Special emphasis is devoted to the benefits provided by the transfer of knowledge in different fields of applications including the social challenges of sustainable development On the other hand groundbreaking ideas and emerging technologies in computational science are discussed to foster cross fertilization of academic solutions and real world problems Math to Product M2P is meant to establish a platform for proposal discussion and promotion of current and new trends in industry sustainability and innovation with the goal of supporting creative and interdisciplinary thoughts Scientific technical areas covered include transfer of knowledge innovation in design computational science and engineering industrial optimization processes sustainable mobility aerospace automotive nautical and naval engineering Target audience is made up by grad

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