

MECHANICS OF FLUIDS

Lecture 0 – Overview

Lecturer: Hamidreza Norouzi

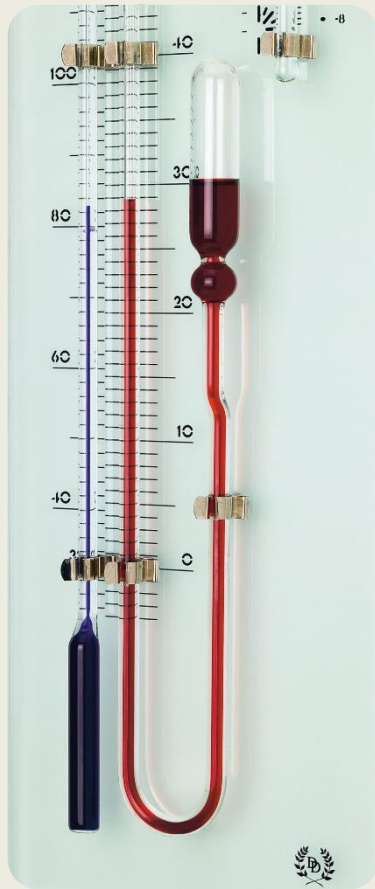


Note

- All the art-work contents of this lecture are obtained from the following sources, unless otherwise stated:
 - *Fluid Mechanics, 8th edition, Frank M. White, McGraw-Hill, 2016.*
 - *Fluid Mechanics: Fundamental and Applications, 3rd edition, Yunus A. Cengel, John M. Cimbala, McGraw-Hill, 2014.*

Topics that we will learn

Fluid statics



- Concept of pressure
- Pressure change in fluids
- Manometer and barometers
- Buoyancy
- Hydrostatic force distribution on surfaces

Topics that we will learn

Fluids at motion



- Fluid motion description (streamline and velocity field)
- Stress, fluid deformation, strain rate
- Viscosity and fluid classifications
- Vorticity
- Control volume and system
- Reynolds theorem

Topics that we will learn

Integral analysis of flow



- Control Volume analysis
- Conservation of mass (continuity)
- Conservation of linear momentum
- Streamline analysis of momentum equation (Bernoulli equation)
- General energy equation

Topics that we will learn



Differential analysis of fluid flow

- Eulerian and Lagrangian approach
- Fluid acceleration
- Conservation of Mass
- Stress tensor
- Conservation of Momentum
- Newtonian fluids and Navier-Stokes equations

Topics that we will learn

Dimensional analysis and similarity



- Dimensions and units
- Dimensional homogeneity
- Pi theorem
- Similarity
- Dimensionless groups in Chemical Engineering

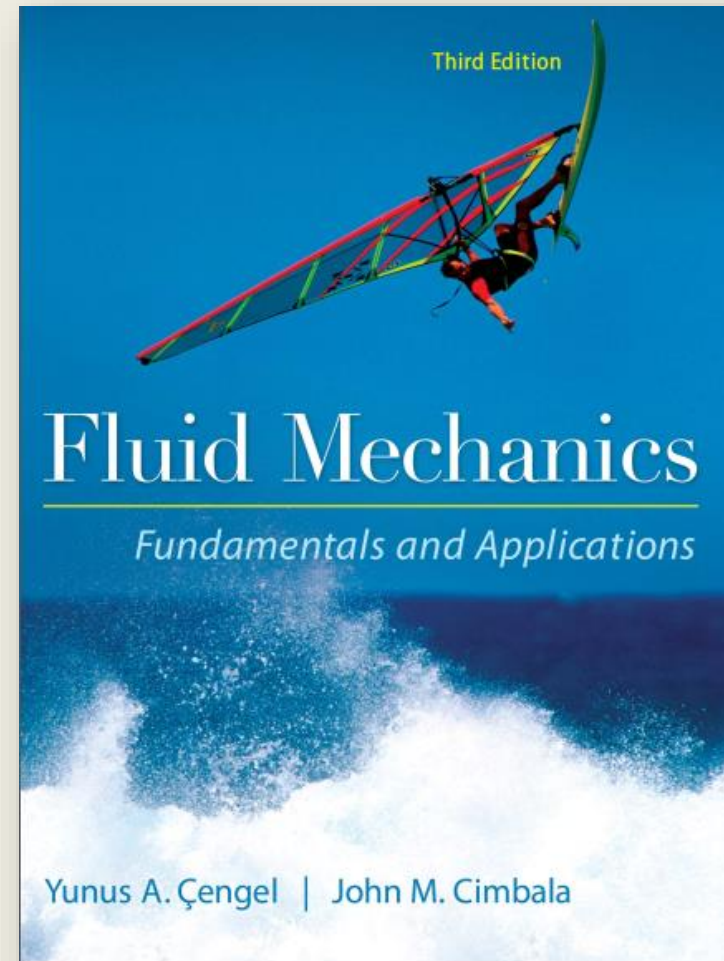
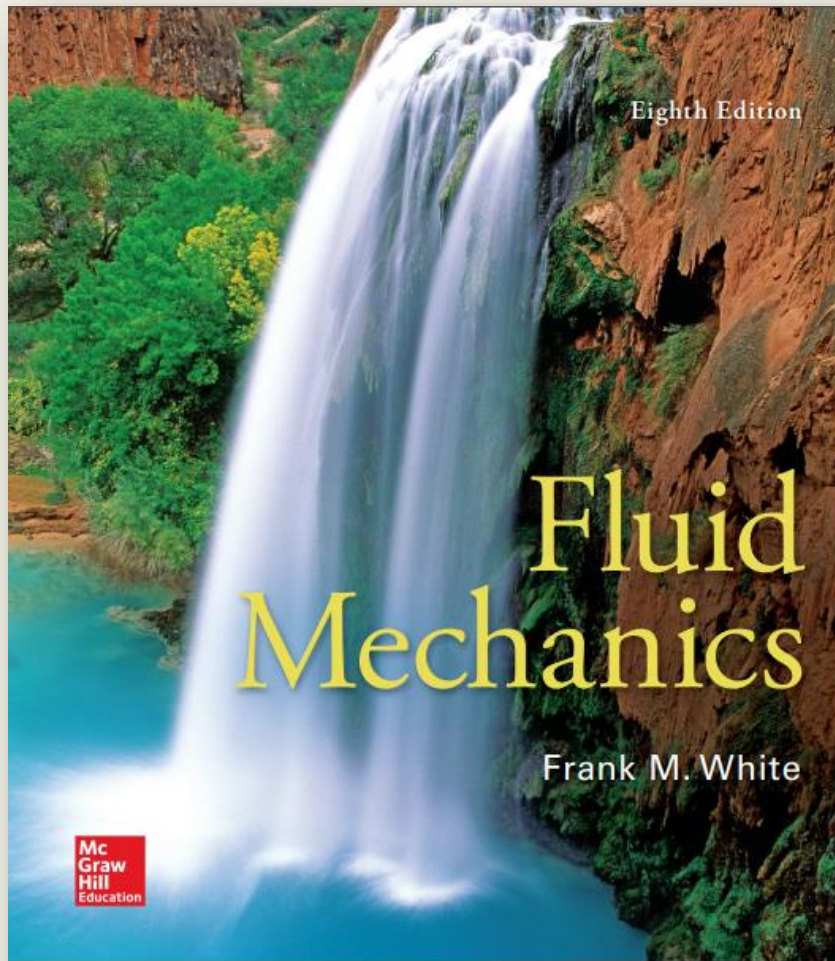
Topics that we will learn

Internal flows

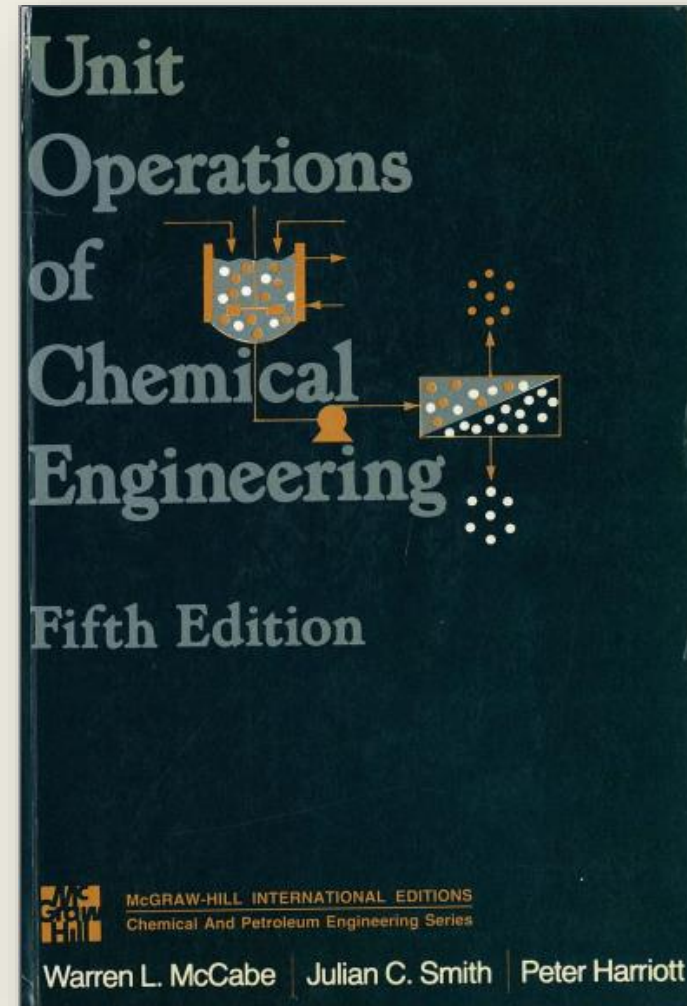
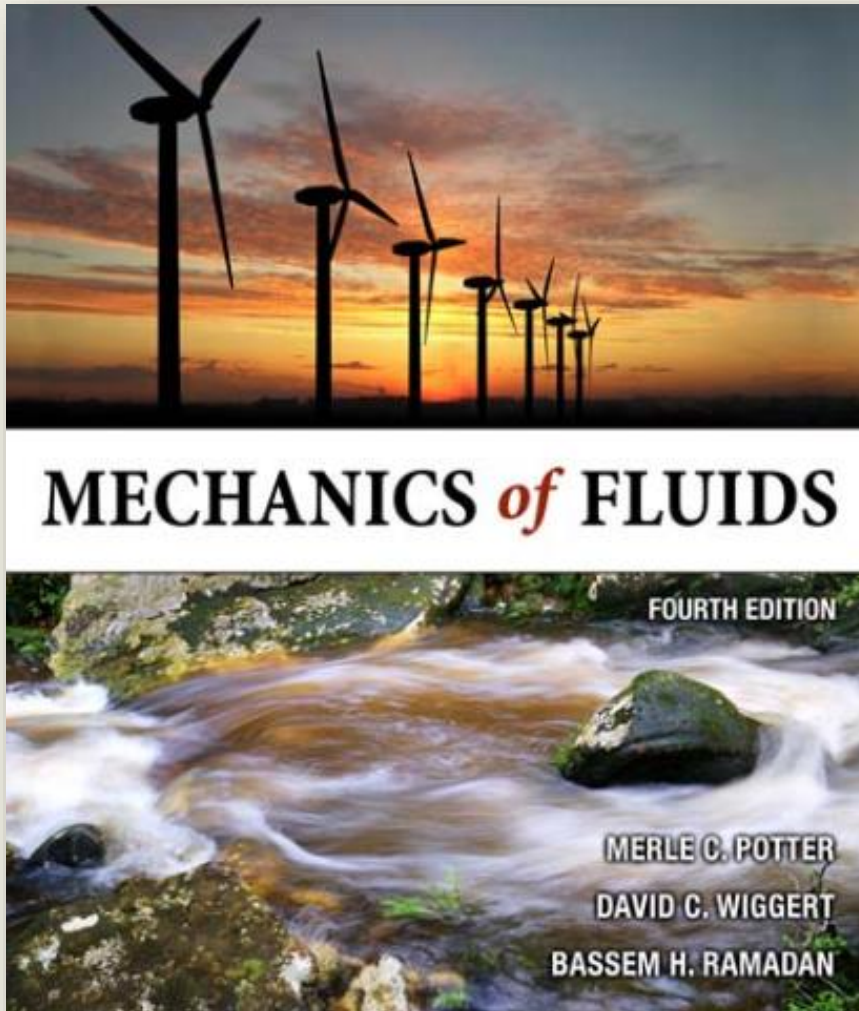


- Flow regimes
- Friction factor and head loss
- Head loss in laminar flow
- Turbulent flow modeling
- Head loss in turbulent flow
- Non-circular ducts
- Pipe systems
- Pipe sizing

For reading



Additional reading materials



Evaluation

- Exam #1: 20%
- Exam #2: 35%
- Final examination: 30%
- Assignments: 15%
 - *Teacher assistant: Majid Mansouri Boroujeni*