



Course Overview

I. Introduction

II. A review of Fluid Mechanics I

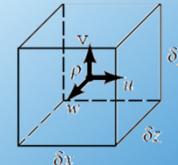
- Continuum mechanics vs. molecular dynamics
- Eulerian vs. Lagrangian (fields vs. particles)
- Fundamental principles
- Control volume vs. control mass
- Forces in a fluid flow
- Governing equations
- Dimensional analysis

Course Overview

- I. Introduction
- II. A review of Fluid Mechanics I

III. Differential system and Navier-Stokes equations

- Fluid kinematics – part II
 - Fluid element deformation
 - Fluid element rotation (vorticity)
- Navier – Stokes equations
 - Mass conservation for a fluid element
 - Momentum equation for a fluid element

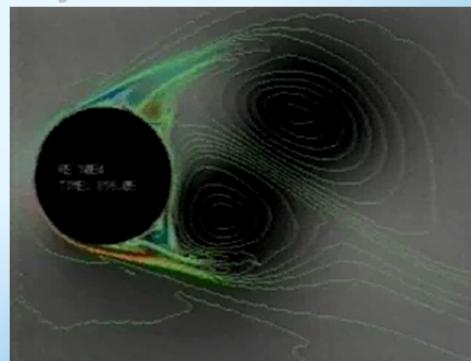


Chapter 1

By E. Amani

Course Overview

- I. Introduction
- II. A review of Fluid Mechanics I
- III. Differential system and Navier-Stokes equations



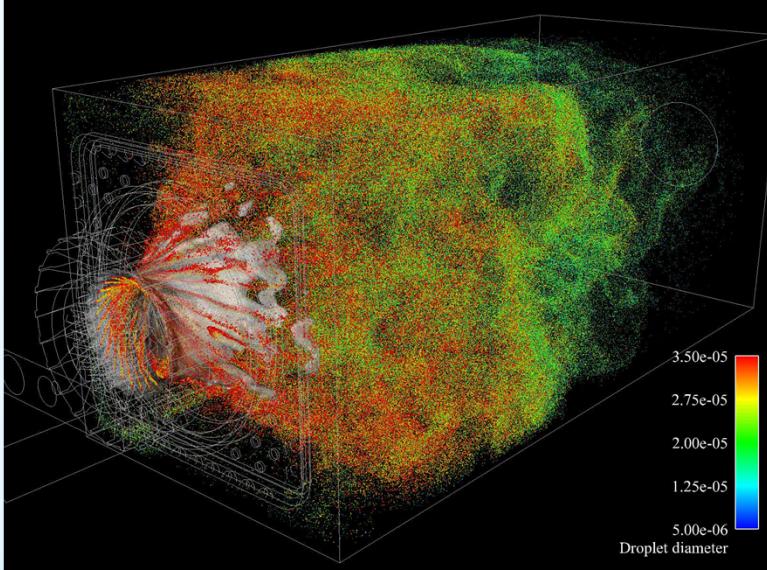
Chapter 1

Single-phase flow ▲

By E. Amani

Course Overview

I.
II.
III.



Chapter 1 Multiphase flow ▲ By E. Amani

Course Overview

I. Introduction
II. A review of Fluid Mechanics I
III. Differential system and Navier-Stokes equations

- Fluid kinematics – part II
 - Fluid element deformation
 - Fluid element rotation (vorticity)
- Navier – Stokes equations
 - Mass conservation for a fluid element
 - Momentum equation for a fluid element
 - Stream function (ψ) vs. primitive variables (U_x, U_y, p)

Chapter 1 By E. Amani

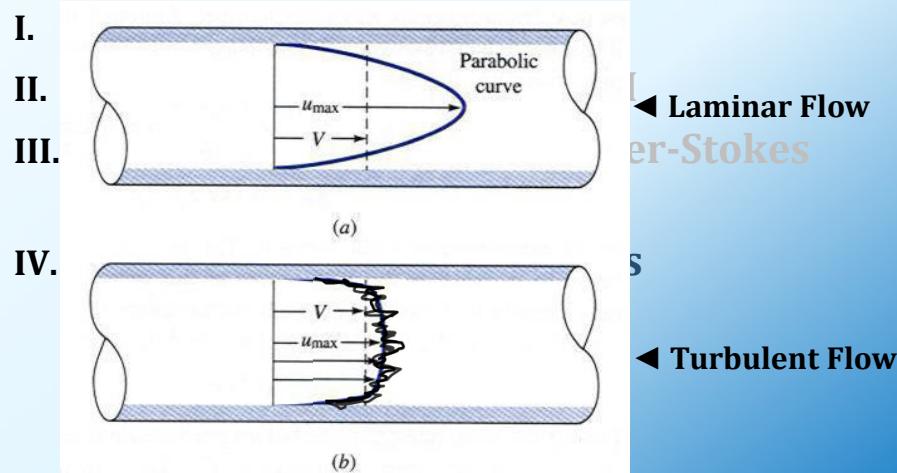
Course Overview

- I. Introduction
- II. A review of Fluid Mechanics I
- III. Differential system and Navier-Stokes equations
- IV. Internal flows – Flow in pipes
 - Laminar vs. turbulent flow

Chapter 1

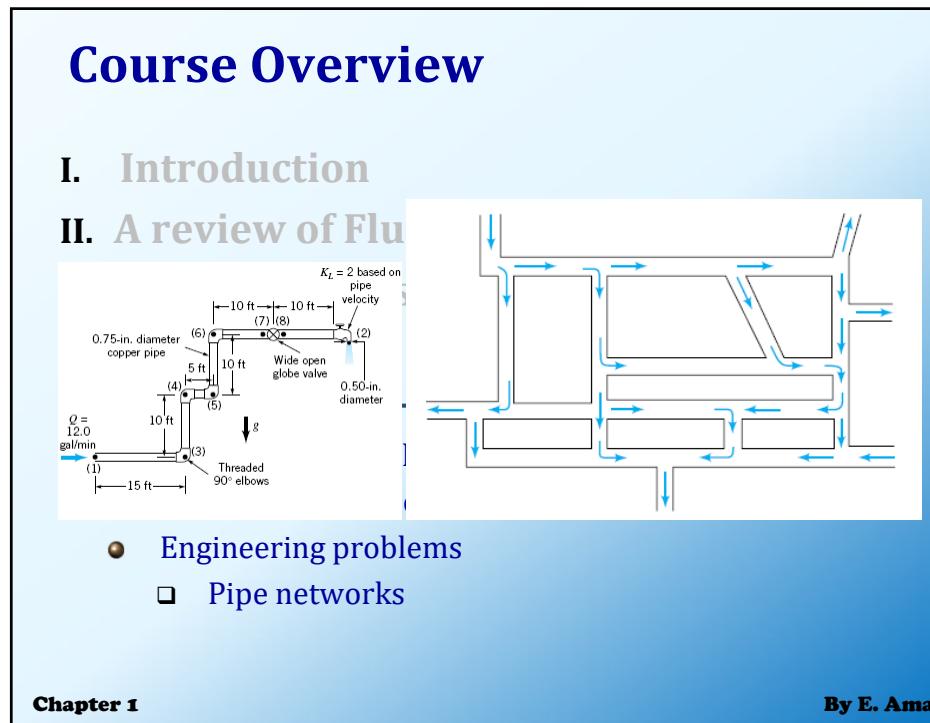
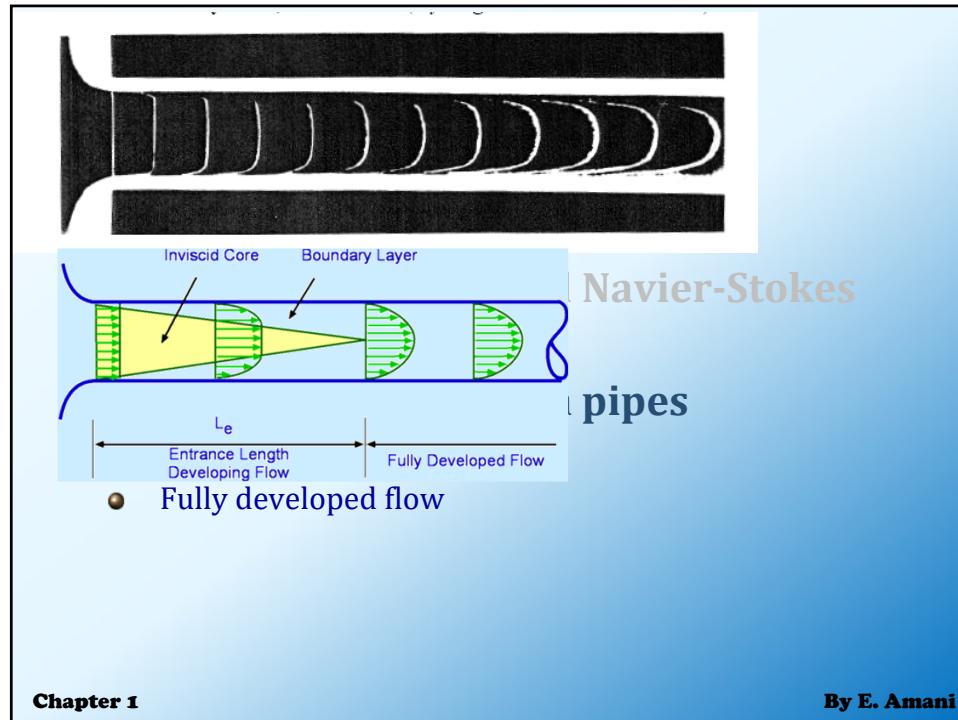
By E. Amani

Course Overview



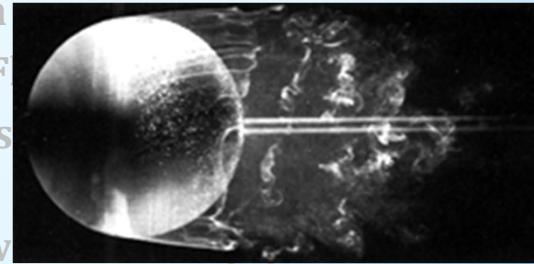
Chapter 1

By E. Amani



Course Overview

- I. Introduction
- II. A review of Fluid Mechanics I
- III. Differential system and Navier-Stokes equations
- IV. Internal flows
- V. External flows – Boundary layer



Chapter 1

By E. Amani

Course Overview

- I. Introduction
- II. A review of Fluid Mechanics I
- III. Differential system and Navier-Stokes equations
- IV. Internal flows – Flow in pipes
- V. External flows – Boundary layer
 - Flow over immersed bodies
 - Boundary layer

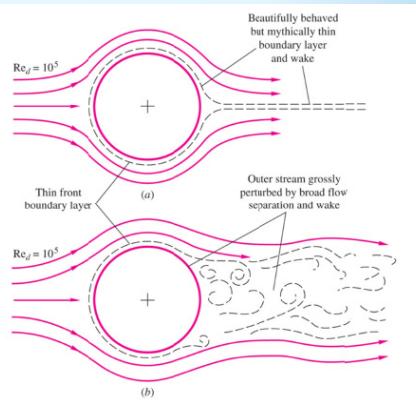
Chapter 1

By E. Amani

Course Overview

- I. Introduction
- II. A review of Fluid Mechanics I
- III. Differential system and Navier-Stokes equations
- IV. Internal flow
- V. External flow
 - Flow over a circular cylinder
 - Boundary layer flow

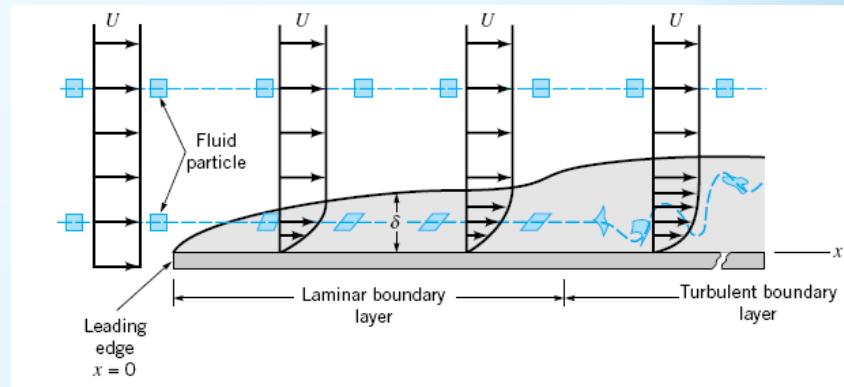
Chapter 1



By E. Amani

Course Overview

- I. Introduction



Chapter 1

By E. Amani

Course Overview

- I. Introduction
- II. A review of Fluid Mechanics I
- III. Differential system and Navier-Stokes equations
- IV. Internal flows – Flow in pipes
- V. External flows – Boundary layer

- Flow over immersed bodies
- Boundary layer
- Lift
- Drag

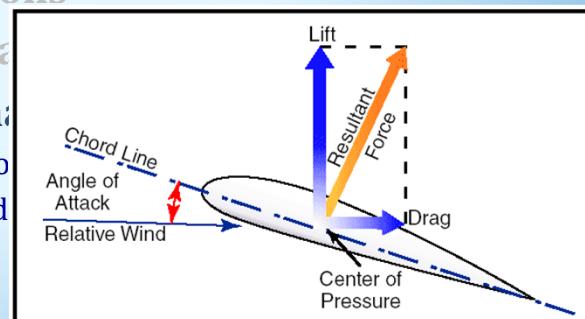
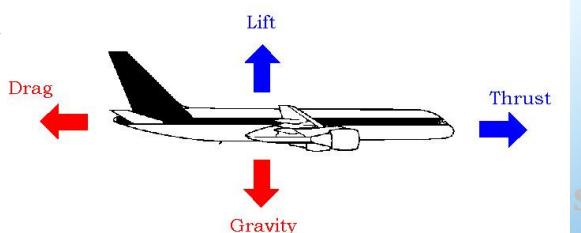
Chapter 1

By E. Amani

Course Overview

- I. Introduction
- II. A review
- III. Differential
- IV. Internal
- V. External

- Flow over immersed bodies
- Boundary layer
- Lift
- Drag



Chapter 1

By E. Amani

Course Overview

- I. Introduction
- II. A review of Fluid Mechanics I

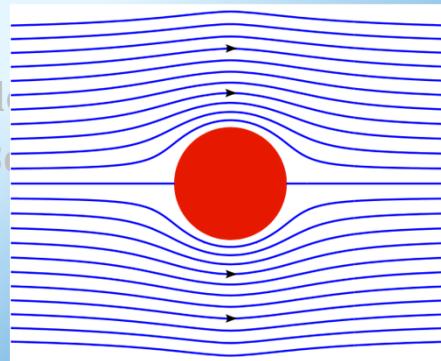
III. Differential system and Navier-Stokes equations

IV. Internal flows - Flows in pipes

V. External flows - Boundary layer

VI. Ideal-fluid flow

- Velocity Potential (Φ)



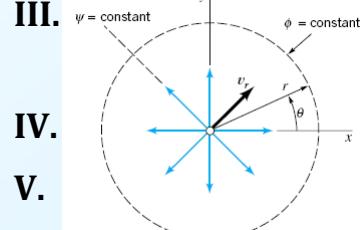
Chapter 1

By E. Amani

Course Overview

- I. Introduction
- II. A review of Fluid Mechanics I

III. Differential system and Navier-Stokes equations

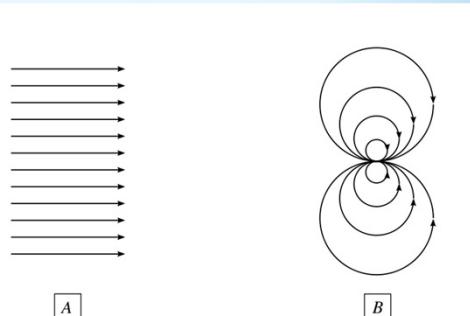


IV. Internal flows - Flows in pipes

V. External flows - Boundary layer

VI. Ideal-fluid flow

- Velocity Potential (Φ)
- Basic potential flows (source, sink, ...)

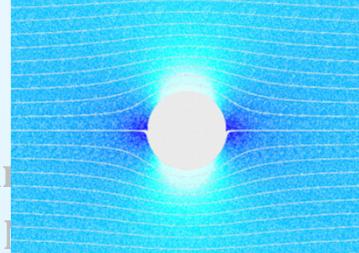


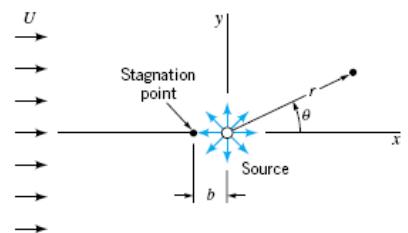
Chapter 1

By E. Amani

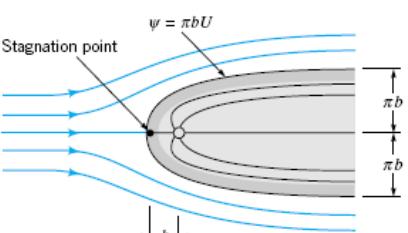
Course Overview

- I. Introduction
- II. A review of Fluid Mechanics
- III. Differential system and I





- Velocity Potential (Ψ)
- Basic potential flows (source, sink, ...)
- Methods of potential flow solution (superposition)



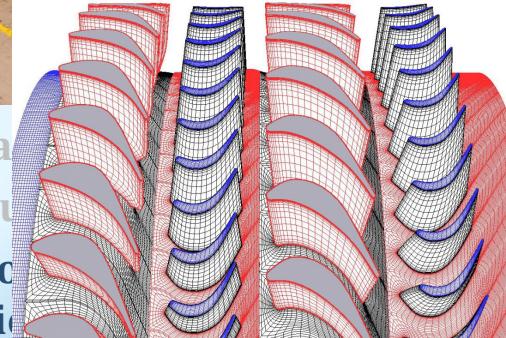
Chapter 1

By E. Amani

Course Overview

- I. Introduction
- II. A review of Fluid Mechanics
- III. Differential system and I
- IV. Internal fluid dynamics
- V. External fluid dynamics
- VI. Ideal-fluid dynamics
- VII. An introduction to fluid dynamics





Stokes

Grid

Chapter 1

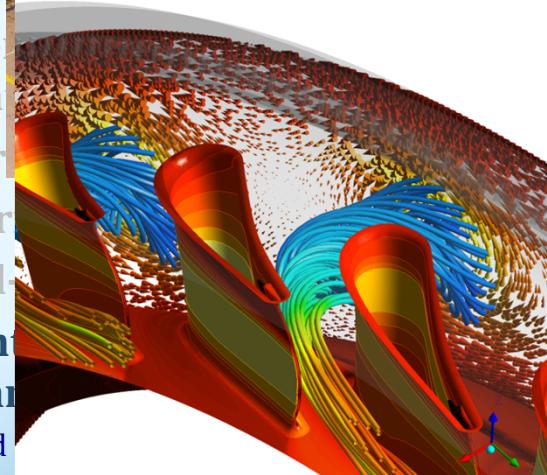
By E. Amani

Course Overview



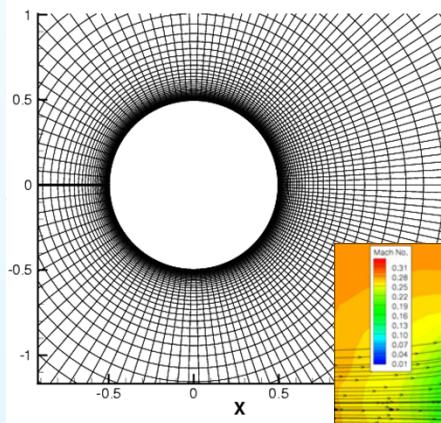
I. Introduction
II. A review of mechanics I
III. Differential equations
IV. Integrating differential equations
V. External forces
VI. Ideal fluid dynamics
VII. An introduction to fluid dynamics

Chapter 1 Grid

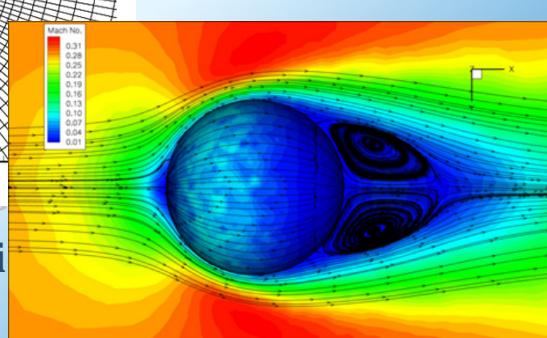


Stokes
By E. Amani

Course Overview



mechanics I
and Navier-Stokes



Mach No.
0.31
0.25
0.22
0.18
0.16
0.13
0.10
0.07
0.04
0.01

VII. An introduction to fluid dynamics

Chapter 1 Case study using ANSYS Fluent

By E. Amani

Course Overview

- I. Introduction
- II. A review of Fluid Mechanics I
- III. Differential system and Navier-Stokes equations
- IV. Internal flows – Flow in pipes
- V. External flows – Boundary layer
- VI. Ideal-fluid flow
- VII. An introduction to computational fluid dynamics

Chapter 1

By E. Amani

The end of chapter 1

Chapter 1

By E. Amani