

## **CEN 212 FLUID MECHANICS**

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# FLUID FLOW PHENOMENA

- Definitions:

1. Inviscid Flow: It assumes the flow of a fluid which viscosity is zero.
2. Uniform Flow: If the velocity and the cross-sectional area is the same in each and every point, this type of flow is uniform.
3. Steady-state: If the properties of a fluid at any point do not change with time, this is called steady-state flow.
4. One dimensional flow: In many simple situations only one velocity component is required. This situation is called one-dimensional flow.

# FLUID FLOW PHENOMENA

- **TYPES OF FLOW**

The fluid flow is classified in to two types depending on the conditions present.

## **LAMINAR FLOW**

At low velocities fluids tend to flow without lateral mixing. This regime is called Laminar Flow.

## **TURBULENT FLOW**

At high velocities eddies form leading the lateral mixing. This regime is called Turbulent Flow.

# FLUID FLOW PHENOMENA

- REYNOLDS NUMBER

$$\text{Re} = \frac{\text{inertia forces}}{\text{viscous forces}} = \frac{\rho \cdot V \cdot D}{\mu}$$

The diagram illustrates the components of the Reynolds number equation. The equation is  $\text{Re} = \frac{\text{inertia forces}}{\text{viscous forces}} = \frac{\rho \cdot V \cdot D}{\mu}$ . Four arrows point from the variables in the equation to their physical meanings:  $\rho$  is labeled as Density,  $V$  is labeled as velocity,  $D$  is labeled as diameter of tube, and  $\mu$  is labeled as viscosity.

# FLUID FLOW PHENOMENA

- For a straight circular pipe;
- $N_{re} < 2100$       LAMINAR FLOW
- $2100 < N_{re} < 4000$       TRANSIENT REGION
- $N_{re} > 4000$       TURBULENT FLOW