Fluid mechanics
MEE-S 204

FLUID Mechanics

Fluid mechanics is a branch of engineering science which deals with the behavior of fluids (liquid or gases) at rest as well as in motion.

Fluid Mechanics is basically a study of:

1) Physical behavior of fluids and fluid systems and laws governing their behavior.

2) Action of forces on fluids and the resulting flow pattern.

- Fluid is further sub-divided in to liquid and gas.
- The liquids and gases exhibit different characteristics on account of their different molecular structure.
- It is due to these aspects that solid is very compact and rigid in form, liquid accommodates itself to the shape of the container, and gas fill up the whole of the vessel containing it.

- Fluid mechanics cover many areas like:

1. Design of wide range of hydraulic structures (dams, canals, weirs etc) and machinery (Pumps, Turbines etc).

2. Design of complex network of pumping and pipe lines for transporting liquids. Flow of water through pipes and its distribution to service lines.

3. Fluid control devices both pneumatic and hydraulic.

4. Design and analysis of gas turbines and rocket engines and air–craft.

5. Power generation from hydraulic, stream and Gas turbines.

6. Methods and devices for measurement of pressure and velocity of a fluid in motion.

- **Density or Mass Density:** The density or mass density of a fluid is defined as the ratio of the mass of the fluid to its volume. Thus the mass per unit volume of the fluid is called density. It is denoted by ρ

The unit of mass density is Kg/m3

ρ = Mass of fluid /Volume of fluid

The value of density of water is 1000Kg/m3.

Specific weight or Specific density: It is the ratio between the weights of the fluid to its volume. The weight per unit volume of the fluid is called weight density and it is denoted by **w**.

$$w = \text{Weight of fluid} / \text{Volume of fluid}$$

$$= \text{Mass of fluid} \times g / \text{Volume of fluid}$$

$$w = \rho \times g$$