# GATE Syllabus

**Part I – ENGINEERING SCIENCE (XE)**

## Section – XE-B: Fluid Mechanics

# tutorialspoint
## SIMPLY EASY LEARNING

## Course Syllabus

### Unit 1: Flow and Fluid Properties

- ➢ Viscosity
- ➢ Relationship between stress and strain-rate for Newtonian fluids
- ➢ Incompressible and compressible flows
- ➢ Differences between laminar and turbulent flows
- ➢ Hydrostatics: Buoyancy, manometry, forces on submerged bodies

### Unit 2: Kinematics

- ➢ Eulerian and Lagrangian description of fluids motion
- ➢ Concept of local and convective accelerations
- ➢ Steady and unsteady flows

### Unit 3: Integral Analysis

- ➢ Control volume analysis for mass, momentum and energy

### Unit 4: Differential Analysis

- ➢ Differential equations of mass and momentum for incompressible flows: inviscid – Euler equation and viscous flows - Navier-Stokes equations, concept of fluid rotation, vorticity, stream function, Exact solutions of Navier-Stokes equation for Couette Flow and Poiseuille flow

### Unit 5: Inviscid Flows

- ➢ Bernoulli's equation - assumptions and applications, potential function, Elementary plane flows - uniform flow, source, sink and doublet and their superposition for potential flow past simple geometries

### Unit 6: Dimensional Analysis

- ➢ Concept of geometric, kinematic and dynamic similarity, some common non-dimensional parameters and their physical significance: Reynolds number, Froude number and Mach number

### Unit 7: Internal Flows

➢ Fully developed pipe flow, empirical relations for laminar and turbulent flows: friction factor and Darcy-Weisbach relation


### Unit 8: Prandtl boundary layer equations

➢ Concept and assumptions, qualitative idea of boundary layer and separation, streamlined and bluff bodies, drag and lift forces
➢ Flow measurements:
  • Basic ideas of flow measurement using venturimeter, pitot-static tube and orifice plate