MA532:Fluid Mechanics (3-0-0:3)

Lagrangian and Eulerian methods of description,governing equations of fluid motion, stream line, velocity potential, path line, velocity and circulation, equations of continuity in Lagrangian and Eulerian methods,equivalence of the two forms of equations of continuity,boundary surface, acceleration, Euler's equations of motion, integrals of Euler's equations of motion, Lagrange's equations of motion, Cauchy's integrals, equation of energy.

Motion in two dimensions, stream function, complex potential, source, sink and doublet, image, images in two dimensions, images of a source with regard to a plane, a circle and a sphere, image of a doublet, circle theorem, Blasius theorem.

Vortex motion, Helmholtz properties of vortices, velocity in a vortex field, motion of a circular vortex, infinite rows of vortices, Ka'rma'n vortex street.

Viscous fluid, Navier-Stokes equations, diffusion of vorticity, dissipation of energy, steady motion of a viscous fluid between two parallel planes, steady flow through cylindrical pipes, Reynolds' number. Boundary layer, laminar boundary layer, boundary layer equations, boundary layer thickness, boundary layer on a flat plate, similarity solutions.

Waves motion in a gas, speed of sound, equation of motion of a gas, subsonic, sonic and supersonic flows of a gas, isentropic gas flow, flow through a nozzle, shock formation, elementary analysis of normal and oblique shock waves.

Text Books and References

1. L. M. Milne-Thomson, “Theoretical Hydrodynamics”, Dover Publications
2. F. Chorlton, “Textbook of Fluid Dynamics”, CBS Publisher
3. W. H. Besant andA. S. Ramsey, “A Treatise of Hydromechanics”, G. Bell Publisher
4. F. M. White, “Fluid Mechanics”, McGraw-Hill Education (India) Pvt. Ltd
5. G. K. Batchelor, “An Introduction to Fluid Dynamics”, Cambridge University Press