SUBJECT NO-MA51003, SUBJECT NAME- Fluid Mechanics

LTP- 3-1-0,CRD- 4

SYLLABUS :-

Prerequisite: PDE

Kinematics of Fluids in Motion - Continuum Hypothesis, Lagrangian and Eularian description, Stream lines, Path lines, streak lines, vortex lines, velocity potential, vorticity vector, equation of continuity. Equations of Motion - Pressure at a point in a moving fluid, conditions at boundary, Euler's equations of motion, Bernoulli's equation. Potential flows. Three-dimensional flows : Sources, sinks, doublets, images in rigid infinite plane and in solid sphere, Weiss' sphere theorem, flows involving axial symmetry, Stokes stream function. Two-dimensional flows - stream function and complex potential for two – dimensional, irrotational - incompressible flows, two-dimensional image systems, Milne-Thomson circle theorem and its applications, Blasius theorem, use of conformal transformations, Kutta- Joukowski condition, Karman vortex street. Viscous flows - stress analysis in fluid motion, relations between stress and rate of strain, Navier – Stokes equations of motion of a viscous fluid, some exact solutions of Navier – Stokes equations, use of Harmonic functions, flow past a sphere, Reynolds number, Prandtl's boundary layer theory, Karman's integral equation, similarity solution, boundary layer for an axially symmetric flow, laminar flow with adverse pressure gradient and separation, inviscid compressible flow - Propagation of pressure change, sound velocity, subsonic and supersonic flow, Mach number, flow through a nozzle, compressible laminar boundary layer, shock boundary layer interaction.