4^{TH} SEMESTER
Aerodynamics -1

Subject code-RAE4C001

Module-I:

Basic Fluid Mechanics

Continuity, momentum and energy equations. Type of flow (steady/unsteady, laminar/Turbulent, compressible/incompressible, viscous/in-viscous, Rotational/Irrational, 2-d/3-dect…), Euler and Lagrangian descriptions, Pathlines, Streamlines and Streaklines, Angular velocity, Vorticity, Circulation, Kelvin's circulation theorem, Stream function, Velocity potential and Relationship between them.

Module-II:

Two-Dimensional Inviscid Incompressible Flows

Source, Sink, Free and Forced vortex, uniform parallel flow. Their combinations, Ideal Flow over a circular cylinder, D'Alembert's Paradox, Magnus effect, Kutta-Jonkowski's Theorem, Starting Vortex, Kutta condition, Pressure and velocity distributions on cylinder with and without circulation in ideal and real fluid flows,

Module-III:

Airfoil Characteristics

Airfoil section geometry and wing platform geometry with its nomenclature, fundamental aerodynamic variables, Aerodynamic forces and moments and pressure coefficient, Centre of pressure, aerodynamic centre. calculation of airfoil lift and drag, pressure distributions with different angle of attack, typical airfoil aerodynamic characteristics at low speeds. speed of sound, Mach number..

Module-IV:

Airfoil And Wing Theory

Classical thin airfoil theory for symmetric and cambered airfoils., Vortex Filament, Biot and Savart Law, Bound Vortex and trailing Vortex, Horse Shoe Vortex, Lifting Line Theory and its limitations.

Module-V:

Viscous Flow

Boundary layer and boundary layer thickness, displacement thickness, momentum thickness, Energy thickness, Boundary Layer growth and poit of separation, Reynolds Number, Critical Reynolds Number, Boundary layer equations for a steady, two dimensional incompressible flow, Blasius solution, Prandtl's mixing ength hypothesis, Free shear layers