AE6401 AERODYNAMICS – I

DETAILED SYLLABUS

UNIT I INTRODUCTION TO LOW SPEED FLOW

Euler equation, incompressible Bernoulli's equation. circulation and vorticity, green's lemma and stoke's theorem, barotropic flow, kelvin's theorem, streamline, stream function, irrotational flow, potential function, equipotential lines, elementary flows and their combinations.

UNIT II TWO DIMENSIONAL INVISCID INCOMPRESSIBLE FLOW

Ideal Flow over a circular cylinder, D'Alembert's paradox, magnus effect, Kutta joukowski's theorem, starting vortex, kutta condition, real flow over smooth and rough cylinder.

UNIT III AIRFOIL THEORY

Cauchy-riemann relations, complex potential, methodology of conformal transformation, kuttajoukowski transformation and its applications, thin airfoil theory and its applications.

UNIT IV SUBSONIC WING THEORY

Vortex filament, biot and savart law, bound vortex and trailing vortex, horse shoe vortex, lifting line theory and its limitations.

UNIT V INTRODUCTION TO BOUNDARY LAYER THEORY

Boundary layer and boundary layer thickness, displacement thickness, momentum thickness, energy thickness, shape parameter, boundary layer equations for a steady, two dimensional incompressible flow, boundary layer growth over a flat plate, critical reynolds number, blasius solution, basics of turbulent flow.

TEXT BOOKS

1. Houghton, E.L., and Caruthers, N.B., "Aerodynamics for Engineering students", Edward Arnold Publishers Ltd., London, 1989.

2. Anderson, J.D., "Fundamentals of Aerodynamics", MaGraw Hill Book Co., 1999.

REFERENCES

1. Milne Thomson, L.H., "Theoretical Aerodynamics", Macmillan, 1985.

2. John J Bertin., "Aerodynamics for Engineers", Pearson Education Inc, 2002.

3. Clancey, L J.," Aerodynamics", Pitman, 1986.

4. Kuethe, A.M and Chow, C.Y, "Foundations of Aerodynamics", Fifth Edition, John Wiley & Sons, 2000.

OBJECTIVES

- To introduce the concepts of mass, momentum and energy conservation relating to aerodynamics.
- To make the student understand the concept of vorticity, irrotationality, theory of air foils and wing sections.
- To introduce the basics of viscous flow.