5th Semester	RAE5C002	Aircraft Performance	L-T-P 3-0-0	3 CREDITS

COURSE OUTCOMES

1. Effectively use performance calculations for Aircraft design project
2. Demonstrate the ability to draw flight envelope diagrams and calculate the limit load factor and ultimate load factor
3. Understand flight maneuvering characteristics
4. Calculate the landing and takeoff distances
5. Apply propeller blade element theory

Module – I   GENERAL CONCEPTS: 7hrs

International Standard atmosphere, IAS, EAS, TAS, Propeller theory- Froude momentum and blade element theories, Propeller co-efficients, Use of propeller charts, Performance of fixed and variable pitch propellers, High lift devices, Thrust augmentation

Module – II   DRAG OF BODIES   6hrs

Streamlined and bluff body, Types of drag, Effect of Reynold's number on skin friction and pressure drag, Drag reduction of airplanes, Dragpolar, Effect of Mach number on drag polar

Module – III STEADY LEVEL FLIGHT   10hrs

Steady level flight, Thrust required and Power required, Thrust available and Power available for propeller driven and jet powered aircraft, Effect of altitude, maximum level flight speed, conditions for minimum drag and minimum power required, Effect of drag divergence on maximum velocity, Range and Endurance of Propeller and Jet airplanes.

Module – IV   GLIDING AND CLIMBING FLIGHT   9hrs

Shallow and steep angles of climb, Rate of climb, Climb hodograph, Maximum Climb angle and Maximum Rate of climb- Effect of design parameters for propeller , Absolute and service ceiling, Gliding flight, Glide hodograph

Module – V   ACCELERATD FLIGHT   **9hrs**

Estimation of take-off and landing distances, Methods of reducing landing distance, level turn, minimum turn radius, bank angle and load factor, Constraints on load factor, Pull up and pull down maneuvers, maximum turn rate, V-n diagram.

Books

1. Houghton,E.L. and Carruthers, N.B. Aerodynamics for engineering students, Edward Amold Publishers, 1988.

2.   Anderson, Jr., J.D. Aircraft Performance and Design, McGraw-Hill International Edition, 1999

3. Kuethe, A.M. and Chow, C.Y., Foundations of Aerodynamics, John Wiley & Sons, 1982.

4. J.J.Bertin, Aerodynamics for Engineers, Prentice-Hall, 1988.

5. L.J. Clancey, Aerodynamics, Pitman, 1986

6. Anderson, Jr., J.D. Introduction to Flight, McGraw-Hill International Edition, 1999

Digital Learning Resources

      Course Name: Aircraft Performance

      Course Link: https://nptel.ac.in/courses/101/104/101104061/

      Course Instructor: Dr. A.K. Ghosh, IIT Kanpur