

Programme Name	Introduction to Aeromodelling
Course Code	R5IL1030L6
Course Title	Aeromodelling

Course Outcomes

After completion of the Course, the student should be able to -

1. Understand the motivation, necessity and fundamental principles of aeromodelling, including modelling similarity and dimensional analysis (lift/drag coefficients, Reynolds number, Mach number, geometric similarity).
2. Analyse the aerodynamic characteristics of an aircraft, including airfoil behaviour, lift and drag, wing design (dihedral, twist) and static/dynamic stability.
3. Apply structural analysis principles (stress, strain, loading, load paths, construction methods) and appropriate manufacturing techniques (balsa, carbon fibre, composites) to model aircraft construction.
4. Select and integrate suitable propulsion systems (motors, batteries, ESC, propellers) and avionics components (transmitter, receiver, flight controller, servos) for a model aircraft.
5. Perform preliminary/conceptual aircraft design, including initial sizing, weight fractions and wing/thrust loading estimations.

Course Contents

Introduction & Fundamentals of Aeromodelling (4 hours)

Meaning, necessity and applications of aeromodelling; concept of aeromodelling and modelling objectives; dimensional analysis including lift/drag coefficients, Reynolds number, Mach number and geometric similarity.

Aerodynamics (6hours)

Aircraft aerodynamic fundamentals, airfoils, lift and drag; wing design considerations including dihedral and twist; static stability and control, and an introduction to dynamic stability.

Structures and Manufacturing (6 hours)

Stress, strain, loading and load paths; longerons, struts, monocoque and semi-monocoque construction; structural analysis, aerodynamic loading and manufacturing considerations; balsa, carbon fibre and composite manufacturing methods including moulds and adhesives.

Propulsion Systems and Avionics (6 hours)

Electric and jet propulsion fundamentals; motors, batteries, ESC and propeller selection (pitch, airfoil, eCalc); powertrain, transmitter, receiver, flight controller and servo integration.

Aircraft Design Stages (3 hours)

Initial sizing and weight fractions; force estimations and wing/thrust loading numbers for preliminary aircraft design.

Industrial Visit (Optional)

Students may get a chance to participate in an industrial visit to gain practical exposure to aeromodelling, UAV manufacturing, or related industries. (The visit is intended to supplement classroom learning and is not a mandatory component of the course.)

Total: 25 hours

Recommended Reading

Books

1. Simons, M., Model Aircraft Aerodynamics, 5th ed., Fox Chapel Publishing.
2. Lennon, A., Basics of R/C Model Aircraft Design: Practical Techniques for Building Better Models, Air Age Media.
3. Raymer, D. P., Aircraft Design: A Conceptual Approach, AIAA Education Series.
4. Abbott, I. H. and Von Doenhoff, A. E., Theory of Wing Sections: Including a Summary of Airfoil Data, Dover Publications.
5. Anderson, J. D., Introduction to Flight, McGraw-Hill Professional.

NPTEL / Government-hosted Video Lectures

1. Introduction to Aerodynamics – NPTEL, IIT Kharagpur (Prof. K.P. Sinhamahapatra).
2. NOC: Aircraft Design – NPTEL.
3. NOC: Design of Fixed Wing Unmanned Aerial Vehicles – NPTEL.