



AIRCRAFT DESIGN

PROF. A.K.GHOSH

Department of Aerospace Engineering
IIT Kanpur

PRE-REQUISITES : Introduction to Airplane Performance

INTENDED AUDIENCE : Btech, Mtech, PhD

INDUSTRIES APPLICABLE TO : DRDO, HAL, Boeing, Airbus, Bell, McDonnell Douglas, UAV
Factory, Lockheed Martin

COURSE OUTLINE :

This course will presents the entire process of aircraft conceptual design- from requirements definition to initial sizing, configuration layout, analysis, sizing, optimization, and trade studies.

ABOUT INSTRUCTOR :

Prof. A.K. Ghosh is a faculty of Aerospace Engg. Department of IIT Kanpur. He is also the in-charge of the flight laboratory and unmanned aerial vehicle of IIT Kanpur. His research areas include system identification through flight tests using conventional and neural network based methods, design of aircrafts and airborne projectiles, supercavitation, unmanned aerial systems. Before joining IIT Kanpur, he worked as a scientist with Defense Research Development Organization (DRDO). He has published many peer reviewed journal papers and conference papers, guided 13 doctoral students, and 38 masters students. He is also a mentor of multiple aerospace start-up companies, and also been associated with major industry contributions of high speed low drag aircraft bomb, Pinaka Mk-I, 105mm sabot round for tracked vehicles, etc.

COURSE PLAN :

Week 1 : Overview of the Design Process, Airfoil and Geometry Selection, Thrust-to-Weight Ratio and Wing Loading

Week 2 : Initial Sizing, Control-Surface Sizing, Configuration Layout

Week 3 : Aerodynamic Considerations, Structural Considerations, Vulnerability Considerations

Week 4 : Crew Station, Passengers, and Payload

Week 5 : Propulsion and Fuel System Integration, Fuel System, Landing Gear Arrangements

Week 6 : Step-by-Step Development of a New Design, Aerodynamics, Propulsion

Week 7 : Structures and Loads, Weights, Group Weights Method

Week 8 : Stability, Control, and Handling Qualities, Longitudinal Static Stability and Control, Lateral-Directional Static Stability and Control

Week 9 : Performance and Flight Mechanics, Equations of Motion, Operating Envelope

Week 10 : Cost Analysis, Operations and Maintenance Costs, Aircraft and Airline Economics

Week 11 : Sizing and Trade Studies, Vertical Flight--Jet and Prop, Extremes of Flight

Week 12 : Design of Unique Aircraft Concepts, Flying Wing, Tailless, Lifting Fuselage, and Blended Wing-Body, Conceptual Design Examples