



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal - 500 043, Hyderabad, Telangana

COURSE CONTENT

FLIGHT VEHICLE DESIGN LABORATORY								
VII Semester: AE								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AAEC44	Core	L	T	P	C	CIA	SEE	Total
		0	0	3	1.5	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 36			Total Classes: 36			
Prerequisite: Basic knowledge of Excel and MAT Lab.								
<p style="color: blue; font-weight: bold;">I. COURSE OVERVIEW:</p> <p>This course is designed to provide students an understanding of procedure followed in conceptual design of an aircraft, meeting the user-specified design requirements and safety considerations specified by the aircraft certification agencies. The course introduces theoretical basics of methods and models that are used in the conceptual airplane design and discusses the theoretical problem solving skills related to analysis and design of flight vehicle structures. This course explains re-sizing and of a baseline civil transport aircraft to meet a specified market requirement.</p> <p style="color: blue; font-weight: bold;">II. COURSE OBJECTIVES:</p> <p style="color: red; font-weight: bold;">The students will try to learn:</p> <p>I. The conceptual sketch of aircrafts based on client requirements such as type, role, payload, mission, aerodynamic & performance requirements.</p> <p>II. The Estimation total takeoff gross weight, thrust-weight ratio, wing loading parameters using data sheets.</p> <p>III. The Development of initial layouts for major components such as fuselage, empennage, landing gears and wings.</p> <p style="color: blue; font-weight: bold;">III. COURSE SYLLABUS:</p> <p>Week-1: OBJECTIVES AND REQUIREMENTS OF THE VEHICLE Data collection for conceptual sketch from existing aircraft includes : Batch I: Type of aircraft, Role, Mission. Batch II: Payload, Aerodynamic & performance requirements.</p> <p>Week-2: CONCEPTUAL SKETCH AND WEIGHT ESTIMATION Batch I: Conceptual sketch of candidate aircraft (3-view). Batch II: First estimation of gross take-off weight with trade-off studies</p> <p>Week-3: AIRFOIL DESIGN AND CONSTRAINT ANALYSIS Batch I: Air foil selection Batch II: Wing geometry selection</p> <p>Week-4: CONSTRAINT ANALYSIS Batch I: Determination of Thrust-to-Weight ratio. Batch II: Determination of Wing Loading.</p> <p>Week-5: INITIAL SIZING-I Batch I: Rubber engine Batch II: Fixed engine sizing</p> <p>Week-6: INITIAL SIZING-II Batch I: Configuration layouts. Batch II: Crew station, passengers and payload</p>								

Week-7: PREPARATION PERFORMANCE ESTIMATIONS

Batch I: Performance constraint analysis

Batch II: constraint analysis

Week-8: LOAD ESTIMATIONS-I

Batch I: Types of gear loads

Batch II: Landing gear loads

Week-09: LOAD ESTIMATIONS-II

Batch I: Types of propulsion systems

Batch II: Propulsion system load.

Week-10: COST ESTIMATION

Batch I: Cost estimation and parametric analysis

Batch II: Optimization and trade studies

Week-11: DESIGN CASE STUDY-I

Batch I: Design study of DC-3

Batch II: Design study B-747

Week-12: DESIGN CASE STUDY-II

Batch I: Dynamics of F-16

Batch II :Dynamics of SR-71

IV. REFERENCE BOOKS:

1. Daniel P. Raymer "Aircraft Design a Conceptual Approach", 5th Edition 1999.