

COURSE CODE	COURSE TITLE	L	T	P	C
1152AE204	Aircraft Design	1	0	4	3

Course Category:

Programme Elective

a. Preamble :

This course gives brief knowledge on aircraft conceptual design process including, design techniques such as cost reduction, DFM and case studies of civil and military aircraft design.

b. Prerequisite Courses:

Aircraft Stability & Control

c. Related Courses:

- Flapping wing dynamics

d. Course Educational Objectives :

- To understand the conceptual design of an Aircraft and stability analysis
- To familiarize with cost analysis and design considerations for manufacturing

e. Course Outcomes :

Upon the successful completion of the course, students will be able to:

CO Nos.	Course Outcomes	Knowledge Level (Based on revised Bloom's Taxonomy)
CO1	Describe the aircraft design process as per Airworthiness requirements	K2
CO2	Explain component design of aircraft	K3
CO3	Analyze design consideration for drag and stability	K4
CO4	Explain cost effects and design consideration for manufacturing	K3
CO5	Prepare conceptual design of civil and military aircraft	K3

f. Correlation of COs with POs :

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H	H			H	H		H	H
CO2	H		H	H	H			H	H		H	H
CO3	H		H	H	H			H	H		H	H
CO4	H	H	H	H	H			H	H		H	H
CO5	H	H	H	H	H			H	H		H	H

H- High; M-Medium; L-Low

g. Course Content :

UNIT-1: Introduction

3

Anatomy of an aircraft, introduction to aircraft design parts and components of fixed wing(electronic components), rotor craft. flapping wing, unconventional uas, hybrid uas.

UNIT-2: Aircraft Design concepts**3**

Aircraft design: weight estimation, basic dimensions, weight estimation of rotor craft- a rough layout.

UNIT-3: Selection of main parameters**3**

Aircraft design: selection of main parameters, basic definitions, L/D, T/W, W/S and its effects on aircraft performance and stability.

UNIT-4: Design Layout Preparation**3**

Aircraft Design-conceptual layout, selection of structural components, parallel motor matching, V-n diagram's, center of gravity and layout.

UNIT-5: Flight Instrumentation**3**

Introduction to flight instrumentation, introduction to mathematical modeling and simulation, introduction to parameter estimation of systematic simulation

Total Periods: 30 + 30 = 60**List of experiments:****Multi-rotor:**

Study of uas

1. Weight estimation and selection of components
2. Study frames and balancing
3. Ground test of commercial autopilot system
4. UAS assembling and testing
5. UAS repair techniques

Fixed wing:

1. Study of uas
2. Design of uas
3. Assembling and testing
4. Simulation of fixed wing uas
5. Simulation of multi rotor uas
6. Signal conditioning and calibration of uas sensors
7. Parameter estimation of fixed wing uas
8. Study of system identification
9. Lab project

Total : 75 Hrs**Learning Resources****i. Text Books :**

1. Ajoy Kumar Kundu, "Aircraft Design", Cambridge Aerospace Series (No. 27)

ii. Reference:

1. Daniel P. Raymer, "Aircraft Design: A Conceptual Approach", Fourth Edition (AIAA Education) 4th Edition