

COURSE CODE	COURSE TITLE	L	T	P	C
1152AE208	Autopilot Design	1	0	4	3

Course Category:

Programme Elective

a. Preamble :

This course gives brief knowledge on state space representation and simulation of aircraft dynamics. This course also deals with the concepts of longitudinal and lateral autopilot design along with case studies.

b. Prerequisite Courses:

Airplane Performanace

c. Related Courses:

- Aircraft Stability and Control
- Flight Mechanics and control lab

d. Course Educational Objectives :

- To understand the simulation of aircraft
- To familiarize with lateral and longitudinal autopilot design

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	Derive Aircraft dynamics in state space model approach	K2
CO2	Simulate the aircraft dynamics in modern tools	K3, S3
CO3	Explain the parameter estimation	K4, S3
CO4	Explain the longitudinal and lateral autopilot design	K3
CO5	Describe autopilot system for aircraft	K3, S3

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			
CO2	H	H	H	H				H	H			
CO3	H	H	H	H				H	H			
CO4	H	H	H	H				H	H			
CO5	H	H	H	H				H	H			

H- High; M-Medium; L-Low

g. Course Content :

UNIT I INTRODUCTION TO AUTOPILOT DESIGN 9

Introduction to flight control design - Introduction to Flight Mechanics and Aircraft static and Dynamic Stability, Aircraft Transfer Functions and state space representation.

UNIT II AIRPLANE DESIGN AND AIRFRAME SELECTION 9

Design of airplane for the given payload – UAV airframe selection process

UNIT III FLIGHT INSTRUMENTATION AND PARAMETER ESTIMATION 9

Parameters in airplane dynamics – estimation methods – output error and least square method – measurement techniques – methods of parameter estimation

UNIT IV AIRCRAFT DYNAMICS ANALYSIS & SIMULATION 9

Root locus Analysis & Eigen value analysis, PIO, Atmospheric disturbance, Sensor and Actuator modelling, Numerical Techniques & Aircraft simulation.

UNIT V CASE STUDY 9

Case Study – Airplane Autopilot – Longitudinal and lateral – simple commands

List of Experiments

1. Flight instrumentation for given airframe
2. DAQ design and ground testing
3. Data handling techniques
4. Parameter estimation
5. Longitudinal autopilot design

Total Periods : 75 Hrs

Learning Resources

i. Text Books :

1. Abhijit Das, Siddhartha Mukhopadhyay ,“Nonlinear Autopilot Design for Aerospace Vehicles Paperback”, VDM Verlag (4 March 2010)
2. Robert C Nelson, “Flight Stability and Automatic Control” (SIE) 2nd Edition