COURSE CODE	COURSE TITLE	L	T	P	C
1154AE201	**AUTONOMOUS NAVIGATION FOR FLYING ROBOTS**	**2**	**0**	**2**	**3**

Course Outcomes:

CO -1 : Explain principles of flying vehicles.

CO -2 : Demonstrate dynamics and guidance of UAV.

CO -3 : Select sensors for navigation systems

CO -4 : Estimate the state and attitude of flying robot

CO -5 : Integrate various navigation technologies.

INTRODUCTION TO UAV

Introduction – Types of UAV – forces and moments - Resolution of forces – Evaluation of lift and drag – forces acting on flying vehicles – operating principles of fixed wing , flapping wing and rotorcraft UAV –Response of aircraft with altitude - Application of UAV.

UAV DYNAMICS AND GUIDANCE

Axis system - The Meaning of Velocities in a Moving Axis System - Development of the Equations of Motion –Aircraft Parameters - Longitudinal dynamics – Lateral Dynamics – Guidance – Types of Guidance – Autopilot Systems - GCS.

SENSORS FOR FLYING ROBOTS

Sensors – Accelerometers – Gyroscope – Digital Compass – MEMS

STATE ESTIMATION

POSE - Benchmark Maneuver - Low-pass Filters - State Estimation by Inverting the Sensor Model - Dynamic-observer Theory - Attitude Estimation - GPS Smoothing. Bayesian state estiamation.

NAVIGATION SYSTEMS

Introduction to Navigation systems – Dead Reckoning – Radio – Satellite – Inertial Navigation - Way point Navigation- Dijkstra’s Algorithm – A*(A- star) Algorithm – Introduction to Kalman filter– integration of navigation technologies.

List of experiments:

1. Linear control systems using PID.
2. Integration of navigation sensors using PID.
3. State estimation using MAT LAB
4. Determine the Closed loop time response for the given transfer function by Root locus technique using Matlab.

5. Design a PID control for the given transfer function and performance requirements using SISO tool in Matlab.
6. Simulate the longitudinal flight dynamics for the given Aircraft parameters using Matlab.
7. Integration of navigation sensors using Kalman filter.