

**VASAVI COLLEGE OF ENGINEERING (Autonomous)**  
 IBRAHIMBAGH, HYDERABAD – 500 031  
**Department of Mechanical Engineering**  
**FUNDAMENTALS OF UNMANNED AERIAL VEHICLES**  
**(General Pool)**  
 (Open Elective-I)  
 SYLLABUS FOR B.E.III-SEMESTER

L:T:P(Hrs/week):2:0:0	SEE Marks:60	Course Code: U23OE320ME
Credits :02	CIE Marks:40	Duration of SEE:03Hours

COURSE OBJECTIVE	COURSE OUTCOMES	
	<i>On completion of the course, students will be able to</i>	
The objective of this Course is to understand the features of UAV, elements, navigation and guidance of UAV and to design and simulate UAV	1	Explain the types and characteristics of UAVs and their applications.
	2	Illustrate the concepts of aerodynamics of flight vehicle.
	3	Identify and explain the components, sensors and payload of UAVs, their navigation and guidance.
	4	Design and perform structural, aerodynamic analysis of UAV components

CO-PO and CO-PSO mapping															
CO	PO mapping												PSO mapping		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2				3	3	3				3	3	2	3
CO2	3	3				3	3	2				3	3	2	3
CO3	3	2				3	3	2				3	3	2	3
CO4	3	2				3	3	2				3	3	2	3

**Unit-I: Introduction to UAV**

UAV: Definition, History; Difference between aircraft and UAV; DGCA Classification of UAVs; Types and Characteristics of Drones: Fixed, Multi-rotor, and Flapping Wing; Applications: Defense, Civil, Environmental monitoring.

**Unit-II: Basics of Flight**

Different types of flight vehicles; Components and functions of an airplane; Forces acting on Airplane; Physical properties and structure of the atmosphere; Aerodynamics – aerofoil nomenclature, aerofoil characteristics, Angle of attack, Mach number, Lift and Drag, Propulsion and airplane structures.

**Unit-III: UAV Elements, Navigation and Guidance**

Components: Arms, motors, propellers, electronic speed controller (ESC), flight controller; Propulsion; Data Link; Sensors and Payloads: GPS, IMU, Light Detection and Ranging (LiDAR), Imaging cameras, Classification of payload based on applications; Hyper-spectral sensors; Laser Detection and Range (LADAR); Synthetic Aperture Radar (SAR); Thermal cameras; ultra-sonic detectors; Case study on payloads. Introduction to navigation systems and types of guidance; Mission Planning and Control.

**Unit-IV: Design & Simulation of UAV**

Introduction to CAD; Design of UAV components; Structural Analysis using CAE; Aerodynamic Analysis using CFD; Manufacturing of the components of UAVs: 3D printing; Case studies;

**Learning Resources:**

1. Andey Lennon, "Basics of R/C Model Aircraft Design" Model Airplane News Publication
2. John Baichtal, Building Your Own Drones: A Beginners' Guide to Drones, UAVs, and ROVs.
3. K Valavanis, George J Vachtsevanos, Handbook of Unmanned Aerial Vehicles, New York, Springer, Boston, Massachusetts : Credo Reference, 2014. 2016.
4. DGCA RPAS Guidance Manual, Revision 3 – 2020

**The break-up of CIE: Internal Tests+ Assignments + Quizzes**

1	No. of Internal Tests:	02	Max.Marks for each Internal Test:	30
2	No. of Assignments:	02	Max. Marks for each Assignment:	05
3	No. of Quizzes:	02	Max. Marks for each Quiz Test:	05
	Duration of Internal Test: 90 Minutes			