

COURSE CODE	COURSE TITLE	L	T	P	C
1154AE205	UNMANNED AERIAL VEHICLE	2	0	2	3

**Course Category:**

University Elective

**a. Preamble :**

This course provides hands on experience on design, fabrication and flying of UAV category aircraft. Students will get in-depth skill set on design and fabrication techniques of UAV.

**b. Prerequisite Courses:**

- NIL

**c. Related Courses:**

- Fundamentals of Flight
- Flapping wing Dynamics

**d. Course Educational Objectives :**

- To understand the preliminary concepts of model aircraft design
- To impart practical skill on fabrication and flying of UAV category aircrafts

**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 parts and functions of UAV & Indian Aviation regulations of UAV	K2
CO2	Explain the concepts of Aerodynamics, Propulsion & Structures of Model Aircrafts	K3
CO3	Describe the working principle and components of UAV	K2
CO4	Demonstrate the design process of UAV	K3, S3
CO5	Demonstrate design, fabrication and Flying of UAV	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	M			H	H			
CO2	H		H	H				H	H			
CO3	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 UAV 6L+3P**

Introduction - Parts and functions of Fixed, Rotorcraft and flapping wing UAV – various configurations of UAV – Various configurations of wing, tail, fuselage and engines of UAV & importance in performance – Forces acting on UAV – Introduction to UAV design process - Indian Aviation regulations – Applications of UAV

*Experiment: Aircraft simulation and flying concepts Identification of UAV components*

**UNIT-II Basics of Aeronautics 12 L + 3P**

Basic aerodynamics – Generation of Lift and concepts of fundamental theorems of lift – Aerofoil nomenclature – Stall – Coefficients of forces – Low Reynolds number aerofoil characteristics – Structural Components of UAV – Structural Loads acting on airplane – Basics of thermodynamics – Work and energy principles – UAV Internal combustion Engines – UAV Electric motors – Basics of propellers - Terminology - effects of altitude and Mach number on Structural and Propulsion Components - Forces acting on Airplane – Range and Endurance – Basics of Flight Mechanics

*Experiment: Design and fabrication of Fuselage, Tail and Wings*

**UNIT-III Introduction to UAV systems 6L + 2P**

UAV systems – Fundamentals of Airborne systems and ground control station – Components and their functions – Basic electronics for UAV systems – Motor – ESC – Transmitter – Receiver – Battery - Servo Motors - Introduction to Engine powered UAV – Terminologies in UAV Fabrication and assembly techniques

*Experiment: Assembly and ground testing of Airborne systems  
Validation and verification of Ground Control station*

**UNIT-IV UAV design 3L + 3P**

Introduction – Performance and geometrical scaling techniques - Weight Estimation – Selection of Parameters – Wing loading and thrust loading - Wing and Fuselage design – Tail design - Launching and recovery design - Landing Gear design – CG Location and its effects on Aircraft stability – Structural Design and V – n diagram – Concepts of Unaccelerated and accelerated flight performance – Methods of drag reduction – Design sheet preparation

*Experiment: 1. Selection of design parameters for specific role and payload,  
2. Preliminary design of aircraft for specific payload*

**UNIT-V UAV Fabrication & Flying 2L + 5P**

UAV Fabrication tools and safety precautions – Fabrication techniques for wing, tail and fuselage – Selection of subsystems and Assembly – Introduction to flying – Safety issues.

*Experiment: Fabrication and flying of UAV*

**Total: 45 Periods**