UNMANNED AIR VEHICLES

GROUP – I								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
AAE506	**Professional Elective**	3	-	-	3	30	70	100
Contact Classes: 45	**Tutorial Classes: Nil**	**Practical Classes: Nil**				**Total Classes: 45**		

OBJECTIVES:

The students will try to learn:

I	Introduce the major subsystems and the fundamental design phases of Unmanned Air Vehicle Systems (UAS).
II	Familiarize the basic aerodynamics and airframe configurations of unmanned air vehicles (UAVs).
III	Acquaint the various communication and navigation systems of UAVs.
IV	Accustom the basic control and stability aspects of UAVs.

COURSE OUTCOMES:

CO 1	**Recall** the functions of each major sub-systems of the unmanned air vehicle systems to select the suitable subsystem.
CO 2	**Demonstrate** the knowledge of basic design phases which will be considered for the design of unmanned air vehicle systems
CO 3	**Recognize** the significant role requirement parameters which determine the shape, size, performance, and costs of UAV systems as per role requirement
CO 4	**Demonstrate** the knowledge of the different types of drag in fixed, rotary-wing aircraft and UAV response to air turbulence in selecting the suitable airframe configuration
CO 5	**Illustrate** the different types of airframe configurations available for unmanned air vehicle systems
CO 6	**Outline** the scaling effects, package density, basic aerodynamics, and structures concepts used during the design of UAVs
CO 7	**Select** a suitable power-plant based on power generation systems for the given role requirement
CO 8	**Analyze** the attributes, performance, design issues and compromises of different types of aircrafts for UAV systems
CO 9	**Identify** the appropriate communication and navigation systems for the UAVs as per the role requirements
CO 10	**Categorize** the different techniques used to achieve the control and stability of UAV systems.
CO 11	**Apply** the fundamental concepts of UAS in design and development of UAV systems for real-world application

MODULE-I	**INTRODUCTION TO UNMANNED AIRCRAFT SYSTEMS**	**Classes: 10**

The systemic basis of UAS-system composition; Conceptual phase; Preliminary design; Selection of the system; Some applications of UAS.

MODULE-II	AERODYNAMICS AND AIRFRAME CONFIGURATIONS	Classes: 10

Lift-induced Drag; Parasitic Drag; Rotary-wing aerodynamics; Response to air turbulence; Airframe configurations, scale effects; Packaging density ; Aerodynamics; Structures and mechanisms; Selection of power-plants; Modular construction; Ancillary equipment.

MODULE-III	CHARACTERISTICS OF AIRCRAFT TYPES	Classes: 09

Long-endurance, long-range role aircraft; Medium-range, tactical aircraft; Close-range / battlefield aircraft;
MUAV types; MAV and NAV types; UCAV; Novel hybrid aircraft configurations; Research UAV.

MODULE -IV	COMMUNICATIONS NAVIGATION	Classes: 08

Communication media; Radio communication; Mid-air collision (MAC) avoidance; communications data rate and bandwidth usage; Antenna Types; NAVSTAR Global Positioning System (GPS) - TACAN - LORAN C - Inertial Navigation - Radio Tracking - Way-point Navigation.

MODULE -V	CONTROL AND STABILITY	Classes: 08

HTOL Aircraft - Helicopters - OTE/OTE/SPH - Convertible Rotor Aircraft - Payload Control -Sensors – culmon filter- Autonomy.

Text Books:

1. Reg Austin., Unmanned Aircraft Systems, John Wiley and Sons., 2010.

Reference Books:

1. Milman & Halkias, ―Integrated Electronics‖, McGraw Hill, 1999.
2. Malvino & Leach, ―Digital Principles & Applications‖, McGraw Hill, 1986.
3. Collinson R.P.G, ‒Introduction to Avionics‖, Chapman and Hall, India, 1996.
4. Bernad Etikin, "Dynamic of flight stability and control‖, John Wiley, 1972.

Web References:

1. www.tc.gc.ca/eng/civilaviation/publications/page-6557.html
2. www.dhl.com/en/about_us/logistics_insights/dhl_trend_research/

E-Text Books:

www.ebookstrust.com/9048197066/Ebooks%20Textbooks%20Handbook%20Of%20Unmanned.