UNMANNED AIR VEHICLES

Semester : VII

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

OBJECTIVES:

The course should enable the students to:

I. Introduce to the student about the basic ideas of Unmanned AirVehicles.
II. Familiarize the students about the aerodynamics and airframeconfigurations.
III. Accustom the student to the wide variety of unmanned airvehicles.
IV. Acquaint the student about the various communication and navigation systems of unmanned air vehicles.

COURSE OUTCOMES (Cos):

CO1: Describe the concept of UAS-system composition and design concepts with some applications of UAS.
CO2: Understand the concept of aerodynamics, airframe configurations, structures, mechanisms, selection of power-plants, modular construction and ancillary equipment.
CO3: Explore the concept of Long-endurance, long range, Medium-range, tactical aircraft and aircraft configurations.
CO4: Describe the concept of communications, Mid-air collision avoidance, communications data rate and bandwidth usage Inertial Navigation - Radio Tracking - Way-point Navigation.
CO5: Understand the concept of convertible rotor aircraft payload control, culmon filter and autonomy.

COURSE LEARNING OUTCOMES (CLOs):

1. Understand the unmanned aerial vehicle types based on the design and application
2. Understand different elements of UAS (composition) and their importance
3. Describe the design concepts of UAS
4. Apply the knowledge of selection of the system
5. Understand the different types of drags for UAVs
6. Describe the range of airframe configurations available for UAVs
7. Remember the aerodynamic efficiency factors
8. Analyze the structures and mechanical design factors in the design of UAVs
9. Understand the design of a UAS-based flight mission.
10. Apply the knowledge of different types of power- plants in selection.
11. Recognize and recommend potential airframe for long- endurance long-range UAVs
12. Apply acquired knowledge and critical thinking skills to select airframe for medium-range, tactical aircraft
13. Understand the MUAV types
14. Analyze the different types of MAV, NAV and UCAV
15. Understand the novel hybrid aircraft configurations and UAVs for Research purpose
16. Understand the communication media and radio communication between GCS and aircraft

17. Apply the knowledge of regulations to avoid mid-air collision
18. Understand the technology of communication data rate and bandwidth usage
19. Apply knowledge of GPS
20. Identify the different navigation systems and tracking
21. Understand the issues and challenges of control and stability of different types of UAVs
22. Apply the knowledge of payload control
23. Ability to understand the role of different sensors and autonomy in control and stability of UAV systems

UNIT-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.

UNIT-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.

UNIT-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.

UNIT-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.

UNIT-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,―IntegratedElectronics‖,McGrawHill,1999.
2. Malvino& Leach, ―Digital Principles & Applications‖, McGraw Hill,1986.
3. CollinsonR.P.G, –Introductionto Avionics‖, Chapman and Hall, India, 1996.
4. BernadEtikin, "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/
3. www.books.google.co.in/books?id=guGVDQAAQBAJ&pg=PT3&lpg=PT3&dq

E-Text Books:

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