



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal - 500 043, Hyderabad, Telangana

COURSE CONTENT

UNMANNED AIR VEHICLES								
VII Semester: AE								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P		C	CIA	SEE
AAEC42	Elective	3	-	-	3	30	70	100
		Contact Classes: 45		Tutorial Classes: Nil		Practical Classes: Nil		Total Classes: 45
Prerequisite: Basic Aerodynamics, Propulsion and Flight Dynamics								
I. COURSE OVERVIEW:								
<p>The course focuses on fundamentals related to powered, aerial vehicle systems that do not carry a human operator, including the terminology related to unmanned air vehicles (UAV), subsystems, basic design phases, aerodynamics, and also provides insight into different types of airframes and power-plants. It imparts knowledge about navigation, communications, control, and stability of UAVs. The course is aimed to obtain the knowledge also in commercial, private, public, and educational interest in UAS applications.</p>								
II. COURSE OBJECTIVES:								
The student will try to learn:								
<ol style="list-style-type: none"> I. The major subsystems and the fundamental design phases of Unmanned Air Vehicle Systems (UAS). II. The basic drags and airframe configurations of Unmanned Air Vehicles (UAVs). III. The various communication media and navigation systems of UAVs. IV. The different techniques used to achieve the control and stability of UAVs. 								
III. COURSE SYLLABUS:								
MODULE-I: INTRODUCTION TO UNMANNED AIRCRAFT SYSTEMS (09)								
UAS; Categories of systems; The systemic basis of UAS-system composition; Conceptual phase; Preliminary design; Detail design; Selection of the system; Some applications of UAS.								
MODULE –II: AERODYNAMICS AND AIRFRAME CONFIGURATIONS (09)								
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 (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 (09)								
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 (09)								
HTOL Aircraft: Aero-stable configuration, Spatially stabilized configuration – Helicopters: SMR, CHR – Convertible rotor aircraft - Payload control -Sensors –Autonomy.								
IV. TEXT BOOKS:								
1. Reg Austin, “Unmanned Aircraft Systems”, John Wiley and Sons, 2010.								

V. REFERENCE BOOKS:

1. Paul Gerin Fahlstrom, "Introduction to UAV Systems", John Wiley & Sons, 2012.
2. Collinson R.P.G, "Introduction to Avionics Systems", Springer, 2011.
3. Bernad Etkin, "Dynamic of Flight: Stability and Control, John Wiley & Sons, 1995.

VI. WEB REFERENCES:

1. www.nasa.gov/centers/armstrong/images/UAV/index.html
2. www.drdo.gov.in/unmanned-aerial-systems-uas

VII. E-TEXT BOOKS:

1. www.springer.com/gp/book/9789048197064.