INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)
Dundigal - 500 043, Hyderabad, Telangana

COURSE CONTENT

UNMANNED AERIAL VEHICLES								
VII Semester: AE								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
AAED36	**Elective**	3	0	-	3	40	60	100
Contact Classes: 48	**Tutorial Classes: Nil**	**Practical Classes: Nil**				**Total Classes: 48**		
Prerequisite: Nil								

I. COURSE OVERVIEW:

Unmanned Aerial Systems are developing aggressively, and many government and non-government agencies are considering acquiring such systems. The course will give students with a practical and theoretical foundation in UAV technology, as well as present them to perspectives on UAV development and execution from all sectors of society, including academia, industry, and government.

II. COURSES OBJECTIVES:

The students will try to learn

I. The major subsystems and the fundamental design phases of Unmanned Air Vehicle Systems (UAS).
II. Understand the capabilities and limitations of the UAS and data post-processing systems
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 OUTCOMES:

At the end of the course students should be able to:

CO 1 Demonstrate the knowledge of major sub-systems and basic design concepts for the development of unmanned air vehicle systems.
CO 2 Illustrate the different types of airframe configurations available for unmanned air vehicle systems.
CO 3 Analyze the attributes, performance, design issues, and compromises of different types of aircraft for UAV systems to select suitable aircraft.
CO 4 Select a suitable power-plant based on power generation systems for the given mission requirement.
CO 5 Identify the appropriate communication and navigation systems for the UAVs as per the role requirements.
CO 6 Categorize the different techniques used to achieve the control and stability of UAV systems

IV. COURSE CONTENT:

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 (10)
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 (11) 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**.**

V. TEXT BOOKS:

1. R. Jha., “Theory design and applications of UAV”, Taylor and Francis, 2nd Edition,1999.
2. Reg Austin, “Unmanned Aircraft Systems”, John Wiley and Sons, 2010.
3. Wright, J.R, and Cooper, J.E., “Introduction to Aircraft Aero-elasticity and Loads”, John Wiley,

VI. REFERENCE BOOKS:

1. Richard K. Barnhart, et al., “Introduction to Unmanned Aircraft Systems”, Taylor & Francis Group.
2. Zavrsnik, “Drones and Unmanned Aerial Systems: Legal and Social Implications for Security and Surveillance”. Springer, 2015.

VII. ELECTRONICS RESOURCES:

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

VIII. MATERIALS ONLINE

1. Course template
2. Tutorial question bank
3. Tech talk topics
4. Open end experiments
5. Definitions and terminology
6. Assignments
7. Model question paper – I
8. Model question paper - II
9. Lecture notes
10. E-learning readiness videos (ELRV)
11. Power point presentation