

DESIGN OF UAV SYSTEMS
PROFESSIONAL ELECTIVE - II

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P		C	CIE	SEE
A5AE42	PCC	3	0	0	3	30	70	100
COURSE OBJECTIVES								
1. To understand the evolution and the basic classification of unmanned aerial vehicles. 2. To develop aerodynamic configuration for a UAV. 3. To select navigation and control modes for a UAV. 4. To understand the method of testing and certification involved in development of UAV.								
UNIT-I	INTRODUCTION TO UAV DESIGN							
Introduction to Unmanned Aircraft Systems (UAS), Introduction to Design and Selection of the System, Characteristics of Aircraft Types, Design Standards and Regulatory Aspects								
UNIT-II	AERODYNAMICS AND AIRFRAME CONFIGURATION							
Aerodynamics and Airframe configurations- Lift-induced Drag, Parasitic Drag, Rotary-wing Aerodynamics, Response to Air Turbulence, Airframe Configurations								
UNIT-III	AIRFRAME DESIGN							
Aspects of Airframe Design- Scale Effects, Packaging Density, Aerodynamics, Structures and Mechanisms, Selection of power-plants, Modular Construction, Ancillary Equipment Design for Stealth- Acoustic Signature, Visual Signature, Thermal Signature, Radio/Radar Signature, Examples in Practice								
UNIT-IV	COMMUNICATION, NAVIGATION AND CONTROL STATIONS							
Communication Media, Radio Communication, Mid-air Collision (MAC) Avoidance, Communications Data Rate and Bandwidth Usage, Antenna Types, NAVSTAR Global Positioning System (GPS), TACAN, LORAN, INS, Radio Tracking, Way-point Navigation Control Station Composition, Open System Architecture, Mini-UAV 'Laptop' Ground Control Station, Close-range UAV Systems GCS, Medium- and Long-range UAV System GCS, Sea Control Stations (SCS), Air Control Stations (ACS).								
UNIT-V	TESTING AND CERTIFICATION							
Introduction to System Development and Certification, System Development, Certification, Establishing Reliability, System Ground Testing, System In-flight Testing								
Text Books:								
1. Reg Austin, "Unmanned Air Systems: UAV Design, Development and Deployment", First Edition, Wiley Publishers, 2015. 2. Paul Fahlstrom, Thomas Gleason - Introduction to UAV Systems-Wiley (2012).								
Reference Books:								
1. Mirosaw Adamski, "Power units and power supply systems in UAV", New Edition, Taylor and Francis Group publishers, 2014. 2. Skafidas, "Microcontroller Systems for a UAV", KTH, TRITA-FYS 2002:51 ISSN 0280-316X. 34, 2002.								
COURSE OUTCOMES								

1. Outline the Design process.
2. Configure airframe for a UAV based on requirements.
3. Propose Propulsive systems and required structural requirements for a UAV.
4. Explain the Navigation and Communication systems in UAVs.
5. Explain the testing and certification process for UAVs.