

UNMANNED AERIAL VEHICLES

I Semester: AE								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
BAEB06	Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes:45		Tutorial Classes: Nil		Practical Classes: Nil			Total Classes: 45	
COURSE OBJECTIVES:								
The course should enable the students to:								
I. Acquire the knowledge of various disciplines contributing to the design, development and deployment of UAVs.								
II. Explain the design of UAV systems and their configuration.								
III. Develop and deploy the UAV systems								
COURSE OUTCOMES (COs):								
CO 1: Understand the various applications of UAS and be able to describe the categories of UAV systems.								
CO 2: Demonstrate knowledge in the design of UAV systems								
CO 3: Demonstrate knowledge in communications and media of UAV systems.								
CO 4: Illustrate concepts in system design and development of UAVs.								
CO 5: Describe the trials and operations in UAV systems.								
COURSE LEARNING OUTCOMES (CLOs):								
1. Understand the concept of unmanned aircraft and UAV and UAS.								
2. Explain the various roles of unmanned aircraft.								
3. Emphasize the basic composition of UAV systems.								
4. Develop the basic systems in the designs of UAV systems.								
5. Describe the aerodynamics of UAV vehicles								
6. Describe the signature of UAV vehicles								
7. Illustrate the various aspects of payloads.								
8. Understand the Sensors used in UAVs								
9. Explain the Navigation systems used in UAVs								
10. Explain the Navigation systems used in UAVs								
11. Explain various navigation systems and the design for maintenance								
12. Describe the system certifications								
13. Understand the UAV sub-assemblies								
14. Explain the various aspects of the documentation of flight testing								
15. Discuss various aspects of the UAVs integration into naval carriers								
UNIT-I:	INTRODUCTION TO UNMANNED AIRCRAFT SYSTEMS						Classes: 10	
Applications of UAS, categories of UAV systems, roles of unmanned aircraft, composition of UAV system.								
UNIT-II	II DESIGN OF UAV SYSTEMS-I						Classes: 08	
Introduction to design and selection of the systems-conceptual phase, preliminary design, detailed design; Aerodynamics and airframe configurations-Lift-induced Drag, Parasitic Drag, Rotary-wing Aerodynamics, Response to Air Turbulence, Airframe Configurations; Medium-range, Tactical Aircraft, Characteristics of Aircraft Types-Long-endurance, Long-range Role Aircraft, Medium-range, Tactical Aircraft, Closerange/Battlefield Aircraft, MUAV Types, MAV and NAV Types, UCAV, Novel Hybrid Aircraft Configurations, 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, Payload Types: Nondispensable and dispensable payloads.								

UNIT-III	DESIGN OF UAV SYSTEMS-II	Classes: 08
<p>Communications-Communication Media, Radio Communication, Mid-air Collision (MAC) Avoidance, Communications Data Rate and Bandwidth Usage, Antenna Type; Control and Stability: HTOL Aircraft, Convertible Rotor Aircraft, Payload Control, Sensors, Autonomy; Navigation: NAVSTAR Global Positioning System (GPS), TACAN, LORAN C, Inertial Navigation, Radio Tracking, Way-point Navigation; Launch and Recovery.</p> <p>Design for Reliability: Determination of the Required Level of Reliability, Achieving Reliability, Reliability Data Presentation, Multiplexed Systems, Reliability by Design, Design for Ease of Maintenance; Design for Manufacture and Development</p>		
UNIT-IV	THE DEVELOPMENT OF UAV SYSTEMS:	Classes: 09
<p>System Development and Certification-System Development, Certification, Establishing Reliability; System Ground Testing: UAV Component Testing, UAV Sub- assembly and Sub-system Testing, Testing Complete UAV, Control Station Testing , Catapult Launch System Tests, Documentation; System In- flight Testing: Test Sites, Preparation for In-flight Testing, In- flight Testing, System certification.</p>		
UNIT-V	DEPLOYMENT AND FUTURE OF UAV SYSTEMS:	Classes: 08
<p>Operational trials and full certification; UAV System Deployment- Network-centric Operations (NCO), Teaming with Manned and Other Unmanned System; Naval, arm and air force roles, civilian, paramilitary and commercial roles.</p>		
Text Books:		
1. Reg Austin, Wiley, "Unmanned Aircraft Systems, UAVS Design and Deployment", 2nd Edition, 2010		
Web References:		
<ol style="list-style-type: none"> 1. http://www.tndte.com 2. http://www.scribd.com 3. http://www.sbtebihar.gov 4. http://www.rtchennai.org 		
E-Text Books:		
<ol style="list-style-type: none"> 1. Corrosion.ksc.nasa.gov/electrochem_cells.htm 2. http://www.science.uwaterloo.ca/~cchieh/cact/applychem/watertreatment.html 3. http://www.acs.org/content/acs/en/careers/college-to-career/areas-of-chemistry/polymerchemistry.html 		