ShortvSyllabus

BCSE428L Autonomous Drones (2-0-0-2)

Introduction to Autonomous Drones - History – Types – Components; Design Fundamentals - Flight Controllers; Drone Basics - Flight Basics – Preflight Checks – Flight Modes – Key Skills – Simulators - Autopilot; Modelling and Control With MATLAB/Simulink Implementation - Quadcopter Project; Stability and control – Static stability, Dynamic stability; Applications - Expanding Drones Abilities.

Course code	Course Title	L	T	P	C
BCSE428L	Autonomous Drones	2	0	0	2
Pre-requisite	NIL	Syllabus version			
		1.0			

Course Objectives

1. To know the principles of flight and how they apply to robotic drones
2. To know different kinds of airframes and how to assemble a drone.
3. To know the basics of drone design and how to choose the right components.

Course Outcomes

1. Understand the evolution and classification of Drones / Unmanned aerial Vehicle (UAVs)
2. Gain knowledge on UAVs technology side of things (i.e. sensors, platforms, navigation, power source, communication, range, altitude and speed)
3. Illustrate the commercial applications used by various types of drones such as aerial photography, law enforcement surveillance, and border enforcement.
4. Discuss Indian government airspace policy, regulations, and a comparison of other international regulations, and risk factors
5. Realize the emerging technologies being integrated into the drone market including semi-autonomous and autonomous systems for various applications.

Module:1	**Introduction to Autonomous Drones**	**4 hours**
History of Drones – Types of drones – Airframe – Batteries – Motors – ESC: Electronic Speed Controller – Propellers.		
Module:2	**Design Fundamentals**	**3 hours**
Flight Controllers – RC Transmitters – FPV Systems – Telemetry – Timing Gates.		
Module:3	**Drone Basics**	**5 hours**
Flight Basics – Preflight Checks – Flight Modes – The Maiden Flight – Roll, Pitch, Throttle & Yaw – Key Skills – Simulators – Manual Mode – GPS Autopilot – Intelligent Flight Modes		
Module:4	**Modelling and Control With MATLAB/Simulink Implementation**	**5 hours**
Quadcopter Project: Quadcopter Physical Characteristics, Vehicle Dynamic, Components, Simulink Modelling.		
Module:5	**Stability and control**	**5 hours**
Static stability, Dynamic stability, static stability and control, Longitudinal control, stick forces, directional stability and control, roll stability and control.		
Module:6	**Applications**	**3 hours**
Beneficial Drones, Aerial Photography, Mapping and Surveying, Precision Agriculture, Search and Rescue, Infrastructure Inspection, Conservation		
Module:7	**Expanding Drones Abilities**	**3 hours**
Add a camera and FPV, Collect more data with other sensors, Altering Speed and Increasing flight times. Building a Quadcopter		
Module:8	**Contemporary Issues**	**2 hours**
	Total Lecture hours:	**30 Hours**

Text Book(s)

1. Adam Juniper, “The Complete Guide to Drones”, 2nd Edition, ilex.
2. John Baichtal “Building your own Drones A beginners Guide to Drones, UAVs and ROVs”, Que Publishing 2016
3. Terry Kilby and Belinda Kilby, Make: Getting Started with Drones, First Edition, Maker Media Inc, San Francisco CA, 2016

4.	Robert C.Nelson, “Flight Stability and Automatic control”, McGraw-Hill.		
5.	https://in.mathworks.com/help/aeroblks/quadcopter-project.html		
Reference Books			
1.	A. R. Jha, “Theory, Design, and Applications of Unmanned Aerial Vehicles”, First Edition, CRC Press, 2020		
Mode of Evaluation: Continuous Assessment Test –I (CAT-I), Continuous Assessment Test –II (CAT-II), Digital Assignments/ Quiz / Completion of MOOC, Final Assessment Test (FAT).			
Recommended by Board of Studies	13-05-2022		
Approved by Academic Council	No. 66	Date	16-06-2022