

MODELLING, CONTROL AND POWER OPTIMIZATION OF UNMANNED AERIAL VEHICLE

UNIT – 1: INTRODUCTION TO UNMANNED AERIAL VEHICLE

Classifications of UAVs – DGCA regulations – Design Consideration of UAV– Environment– Airframe Design & Payload – Basic Mechanics Dynamics and 1-D Linear Control – Agility and Maneuverability – Effects of Size.

UNIT – 2 : QUADROTOR KINEMATICS AND DYNAMICS

Transformations – Rotations – Euler Angles – Axis/Angle Representations for Rotations – Angular Velocity – Formulation – Newton-Euler Equations – Principal Axes and Principal Moments of Inertia – Quadrotor Equations of Motion. Introduction to MATLAB – Modelling Discrete Systems and Continuous Systems – Transient and steady state response of system. Simulation of model using MATLAB

UNIT – 3 : QUADROTOR MISSION PLANNING, NONLINEAR CONTROL AND ESTIMATION

2-D Quadrotor Control – 3-D Quadrotor Control – Time, Motion and Trajectories – Motion Planning for Quadrotors. Minimum Velocity Trajectories from the Euler-Lagrange Equations – Solving for Coefficient of Minimum Jerk Trajectories – Minimum Velocity Trajectories – Linearization of Quadrotor Equations of Motion. Nonlinear Control – Gaussian Model Learning: Color Learning and Target Detection – Bayesian Estimation – Target Tracking – Mapping. PID and other Model based controller like MPC, RTDA design for UAV system.

UNIT – 4 : PROGRAMMING AND INTERFACING OF SENSORS AND ACTUATORS

Interfacing on various GP boards – Ultrasonic Sensor – Airspeed Sensor – 3-Axis Gyros – 3-Axis Accelerometer – 3-Axis Magnetometer – Atmospheric Pressure Sensor & Temperature – BLDC Motor – Servo Motor – Magnetic Relays.

UNIT – 5 : SOLAR ENERGY OPTIMIZATION AND PERFORMANCE ANALYSIS

Solar energy system optimization – Application - Analysis and design of solar thermal and photovoltaic systems – Performance analysis of various solar thermal systems – PV system and evaluation of solar thermal energy storage system – selection of components and materials.

Reference Book/Journal:

1. Valavanis, K and George J. Vachtsevanos., 'Handbook of Unmanned Aerial Vehicles ', Springer Netherlands, New Delhi, 2015.
2. Mark Smith, 'Quadcopters and Drones', CreateSpace Independent Publishing Platform, New Delhi, 2015.
3. Jizhong Zhu., 'Optimization of Power System Operation', John Wiley and Sons, New York, 2009.
4. Kalogirou S.A., "Solar Energy Engineering: Processes and Systems", Academic Press, 2009.
5. M.Rida Mokhtari, Brahim Cherki, Amal Choukchou Braham., "Disturbance observer based hierarchical control of coaxial-rotor UAV", In Press, Corrected Proof, Available online 28 January 2017
6. Liang Sun, Wei Huo, Zongxia Jiao., " Adaptive nonlinear robust relative pose control of spacecraft autonomous rendezvous and proximity operations" In Press, Corrected Proof, Available online 15 December 2016

K. Srinivasan
6/2/2018
PDR. K. SRINIVASAN

senate
rus

86