

Syllabus for Certification Course on “Training and Certification in Drone Designing and Piloting”

Mode: Regular

Duration of the course: 5 weeks with 6 hrs. a day in Regular mode

Eligibility: 2nd years onwards Engineering, Diploma and Science Graduates.

Prerequisite:

Mathematics Prerequisite: Students taking this course are expected to have some familiarity with linear algebra, single variable calculus, and differential equation

Programming prerequisites: Some programming logical skills are recommended.

Syllabus

Unit 1: Overview and Background:

Definitions & Basics, History of UAVs, Classifications of UAVs: Scale, Lift Generation Method; Contemporary Applications: Military, Government Civil (primary and secondary use cases), Societal Impact and Future Outlook; Operational Considerations- Liability / Legal Issues, Insurance, Ethical Implications, Human Factors, LOS / BLOS. *Unmanned Aerial System (UAS) Components:* Platforms: Configurations, Characteristics; Applications, Propulsion: Internal Combustion Engines, Turbine Engine, Electric Systems, On-Board Flight Control; Payloads and attachment methods: Sensing / Surveillance, Weaponized UAV, Delivery; Communications: Command/Control, Telemetry Launch / Recovery Systems, Ground Control Stations

Practical: Components Design using Solidwork Computational Software, Physical Electrical Connections handling, Crimping tools Know-hows, Preparing cables for drone assembling, On- Board flight control demonstration.

Unit 2: Concepts of flight, Regulatory and Regulations, and Basic Electronics

Introduction to Aerodynamics: Lift, Weight, Thrust, Drag; Flight Performance: Climbing Vs. Gliding Flight, Range / Endurance, Stability; Control: Flight Axes, Flight Controls, Autopilots *Regulatory And Regulations:* Homeland Regulatory: DGCA; Foreign Regulatory, Regulations: FCC Compliance, Suas Registration, Federal Aircraft Regulations (Fars), Licensure, Safety Considerations. *Basic Electronics:* Basics electronics Components overview, Safety Considerations

Practical: Simulation of drone flight, Soldering and De-soldering Exercises

Unit 3: Assembly of Drones

Identification of Parts/Spares: Github type, Grabcad, Version control, RC Transmitter, Multi Rotor Frame, Motors/ Speed Controller, Flight Controller, Battery And Charge, Battery Alarm, Flight Controller Add-Ons: IMU, CAN port, Landing sensors, Optical flow sensors, Camera Gimbal, Telemetry, Wireless Video. *Practical-Drone Assembly:* Drone Designs, Selecting Appropriate Parameters And Hardware, Building A Drone Chassis With CF Rods And Plates, Attaching Payloads And Batteries, Connecting Motors, Speed Controllers, Powers Board, Connecting Autopilot And RC Control, Connecting Sensors: GPS, Compass, Accelerometer /Gyro, Connecting Videos And Data Telemetry, Pre-Flight Testing, PID Tuning Of The Drone

Unit 4: Drone Flight Control

Flight Training without Payload (Manual and autonomous), Pre-Flight Checks, First Flight, Fine Tuning Drone Parameters, Setting Up Software On GCS, Manual Flying, Semi-Auto Flight, Full Auto Flight, Return To Home / Land, Indoor Flying

Practical: Video System Integration/Flight Training with Payload, Video System Introduction, Video System Integration, Flight Training With Video System

Unit 5: Application of Drone

Geo- Referencing, Agriculture Applications: Crop Stress, Crop Yield, and Crop Area Estimations, Flood Damage Assessment, Heap volume and volumetric Assessments.

Practical: Introduction to data processing of 2-3 villages, Introduction to Geo referencing (Orthomosaic, GCP, Polygon overlay over GPS). Advanced Pilot Training For Industrial Applications/Piloting Evaluation Tests

Text Books

[1] Paul G Fahlstrom & Thomas J. Gleason, Introduction to UAV Systems, Willey Publications

Reference Books:

[1] John D. Anderson, Fundamental of Aerodynamics, McGraw-Hill Series in Aeronautical and Aerospace Engineering

[2] Mohammad H. Sadraey, Unmanned Aircraft Design A review of fundamentals, Morgan & Claypool Publications

[3] Gundlach J., Designing Unmanned Aircraft Systems: A comprehensive Approach, AIAA Publication