

DRONE CURRICULUM for 3 months certificate course

Course name: Drone Operation & maintenance

L - T - P : 3-1-0

Credits - 4

Course Objectives:

Introduction to drone technology, basic concepts of flight of drones, rules and regulations, radio frequency, components used in drones, assembly, employ-ability and entrepreneurship skill development.

Module 1: Conditions required before flying (3L)

DGCA Civil Aviation Requirement - UIN number - UAOP - RPAS Do's and Don'ts - Airspace structure and airspace restrictions with the knowledge of No fly zones - ATC Radio telephony and phraseology - Understanding ATC operations - Collision avoidance - Weather and Meteorology - Standard atmosphere, measuring air pressure, heat & temperature, cloud formation - Met Terminal Aviation Routine Weather Report (METAR)

Module 2: Basic aerodynamics and Introduction to drone technology (14L)

Introduction to aerodynamics - Fundamental principles of flying like Newton's third law, Bernoulli's principle - Forces of flight - axes of flight - drone nomenclature - types of drones - fixed wing - multicopters - Current/Future uses of drones - components used in drones - Air frame - airframe sizes and construction materials - Propeller - different propeller design - blade count and balancing tips - material used - Radio Frequency - Transmitter and Receiver - Frequency bands - Unlicensed Frequency - programming transmitters

Module 3: Principles of electricity and related components used in drones (15L)

Electricity fundamentals - wattage, voltage, amperage and their relationship - soldering techniques - motors - AC & DC differences - amperage and voltage ratings - brushed vs brushless motors - BLDC - Kv ratings - calculation of motor capability in drone build - Batteries - series and parallel connection - rechargeable batteries - Li-PO battery characteristics - Charging & cell balancing - various connectors - Electronic Speed Controller (ESC) - roles of ESC - PWM, PPM, ESC calibration - mounting of ESC - Flight controller - role of flight controllers - compare current FCs in the market - sensors - recognize different sensors and their application in drones - sense and avoid technology - GNSS application

Module 4: Payloads, GCS, Applications and Preventive measures (10L)

Payloads-plan and estimate payload consideration – camera options: lens, exposure settings – video frame rate – image files - resolution – LiDAR. Thermal, RGB, Hyper spectral– other payload possibilities – vibration and jello effect – Ground Control Station (GCS) – Introduction to Telemetry – data tracking – mission planning – First-Person-View flying – safety and drone racing options - commercial applications of drone - 3D mapping - introduction to GIS softwares - accident avoidance - checklists - first aid in case of electrical accidents

Module 5: Communication and Entrepreneurship skill development (6L)

Communication skills- English literacy – reading –writing – construction of simple sentences – speaking–listening skills – basic computer knowledge – hardware and peripherals - word processing application – basic operation – creating/editing documents – common shortcuts –use of simple formulas in excel – printing – accessing internet – downloading and printing web pages – opening email account and usage of email - entrepreneurship concept – source of business ideas – process of setting up a business – Institutions support – role of various schemes and institutes for self-employment–productivity – definition – necessity – finance management – banking – safety and health – occupational hazards – labour welfare – quality tools – basic tools with example

Course name : Drone pilot Practicals

L - T - P : 0-0-2

Credits - 1

Course Objectives:

Simulator training - Identify and select drone components - assembly – Li-PO battery charging - drone flying

Activities: (24P)

1. Practise ICAO phraseology
2. Choose respective drone components
3. Charge Li-Po battery safely
4. Assembly of drones
5. Fly various drones in a simulator
6. Solo Take-off, flying and landing of a drone

Course Outcomes:

Students will be familiar with

- DGCA regulations and no fly zones
- Drone technology and how drones function
- Components to build and assemble a multi-rotor drone
- Various payloads and their application
- Basic communication and IT skills
- Drone flying without any assistance

Career Prospects:

- Certified drone pilot
- UAV Pilot
- Entrepreneurship
 - Drone service provider
 - Drone training provider

References :

1. DGCA CAR regulations
2. Airframe handbook by FAA-15A
3. Helicopter theory of flight
4. Robotshop website
5. Droneomega website
6. Employability skill by Arihant publications approved by NSDC