

## Details

**Duration** : September 05 - October 01, 2022

**Number of students** : UHS, Bagalkot - 24

**Others** - 02

**Permanent faculty** : 04

**IDP-supporting staff** : 05

**Conducted by** : Multiplex Drone Private Limited, Bengaluru

Under consultancy service hired by NAHEP-IDP project, UHS, Bagalkot:

Drone pilot training and establishing drone laboratory IDP Cell UHS Bagalkot-  
IN-UHS-BAGALKOTE-249955-CSINDV

**Multiplex team** : Master trainers - 03

**Pilots** : 05



Captured by drone MAVIC Mini

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## Syllabus

Day	Topic	
1	Basic principles of flight ATC Procedures and Radio Telephony Weather and Meteorology	(Theory)
2	Introduction to Flight simulator DGCA Rules and Regulations	(Theory and Practical) (Theory)
3	Drone Equipment Maintenance	(Theory and Practical)
4	Micro Category Drone Flying Demonstration Practical flying of Micro Category Drone with Instructor Supervision	(Practical)
5	Demonstration of Advanced Flight Maneuvers	(Practical)
6	Practical Flying at Different Aircraft Modes	(Practical)
7	Demonstration of Autonomous Flight	(Practical)
8	Individual Flying of Autonomous Agri-drone spraying under Supervision of Instructors	(Practical)
9	Introduction to Crop Protection Agri-drone	(Theory and Practical)
10	Principles of pesticide application Introduction to Ground Control System	(Theory and Practical)
11	Critical parameters in spraying	(Theory and Practical)
12	Nozzles and their use during spraying through drone	(Theory and Practical)
13	Formulations and their management	(Theory and Practical)
14	Types of Spray Equipment	(Theory and Practical)
15	Drone Spraying	(Theory and Practical)
16	Residue and bio efficacy effects	(Theory and Practical)
17	Drift and non-target application	(Theory and Practical)
18	Calibration of spraying	(Theory and Practical)
19	Safety regulations	(Theory and Practical)
20	Drone Care and maintenance	(Theory and Practical)
21	Field practical trials	(Theory and Practical)
22	Fault Identification and Rectification of Agricultural Drone	(Practical)
23	Crop Health Monitoring and Data Process and analysis	(Practical)
24	Exam (include Written, Viva and Flying Practical Exam)	100 marks

## Approach

Time	Major Subject	Topics
Week 1	Drone Fundamentals Simulation Lab	<ol style="list-style-type: none"> <li>1. Introduction to Multirotor Drone</li> <li>2. Basic principles of flight</li> <li>3. ATC Procedures and Radio Telephony</li> <li>4. Weather and Metrology</li> <li>5. Flight Simulator</li> </ol>
Week 2	DGCA Rules and Regulations Drone Maintenance	<ol style="list-style-type: none"> <li>1. DGCA Rules and Regulations</li> <li>2. Drone Equipment Maintenance</li> </ol>
Week 3	Drone Flying Fundamentals	<ol style="list-style-type: none"> <li>1. Micro Category Drone Flying Demo</li> <li>2. Small Category, Agricultural Drone Flying</li> <li>3. Practical flying of Micro Category Drone with Instructor Supervision</li> <li>4. Demonstration of Advanced Flight Maneuvers (Practical)</li> <li>5. Practical Flying at Different Aircraft Modes (Practical)</li> <li>6. Demonstration of Autonomous Flight (Demonstration)</li> </ol>
Week 4	Agricultural Drones	<ol style="list-style-type: none"> <li>1. Introduction to Crop Protection Agri drone,</li> <li>2. Principles of pesticide application</li> <li>3. Critical parameters in spraying, drift, Nozzles, Formulations, residue and Bio efficacy, maintenance, fault identification</li> <li>4. Crop Health Monitoring and Data Process and analysis.</li> </ol>

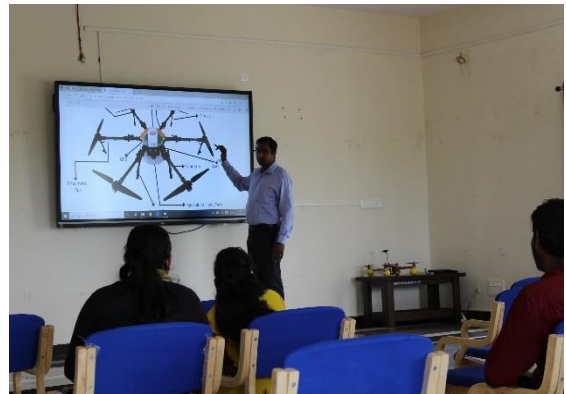
## Highlights of the course

- a. Latest DGCA Rules and Regulations
- b. Detailed insight about Drones and their professional Applications
- c. Available Jobs in different fields
- d. 100% assistance in Job placement
- e. Application/Industry specific Drone Training
- f. Advance Drone Flying and Mission Planning
- g. Simulator Training
- h. Drone Assembly and Maintenance Training
- i. Future Opportunities for Drone Pilots in various Industries

**1. Fundamentals of flight  
Aerodynamics**

1. Introduction to Flight simulator (Theory and Practical)
2. Advantages/ Disadvantages over multi-rotor Drones
3. Fixed Wing Drone and Aerodynamics
4. Hybrid VTOL Operation and Aerodynamics
5. Multi-rotor Operation and Aerodynamics
6. ATC Procedures and Radio Telephony
7. Weather and Meteorology

1<sup>st</sup> theory class was on introduction to drones, advantages of drones, applications of drone, types of drones based on aerial platform used, types of drones based on size, types of drones based on size: drone based on endurance and range, quadcopter anatomy, circuit diagram, different types of multi-rotors, parts of drones: motors Propeller, electronic speed controller, flight controller, airframe, battery, payload, landing struts, working of drone, different modes and movements.



## Day 2

1. Introduction to Flight simulator (Theory and Practical)
2. DGCA Rules and Regulations (Theory)

Flight simulator: computer-based software was used to train the students and individual was assigned a system to have learn the skills in controlling the drone movements. Basic operating features of simulator, selecting different aircrafts and aerodromes, demo flight, pre-flight checks and start-up, preparation cum coordination for flight, approach for landing after stimulator introduction and hands on session theory class on DGCA regulations category of RPA, air regulations of drones, requirement for, drone equipment, acquisition of RPAS, eligibility to become drone pilot was done, classification on drones, civil aviation, requirements (CAR), dos and don'ts.

After each theory and practical class interaction session was scheduled with students.



## Day 3

### 1. Drone Equipment Maintenance (Theory and Practical)

Theory class was on maintenance of drone: storage, safe place, free from dirt, cleaning, fire hazard. precautions for storing drone batteries, maintenance of drone batteries, storage, balance charge, discharge, transportation, balance connectors, power connectors and connectors classification XT, as, Lipo battery puffed, Lipo battery cell layout, RPAS maintenance, unmanned aircraft system traffic management (UTM) was explained. maintenance of ground station equipment: software update, features.





## Day 4

### 1. Micro Category Drone Flying Demonstration (Practical)

basics settings and installation of drone’s parts before flight was explained like installation of propellers and batteries, connecting with ground control system (GCS), practical flying demonstration was shown.



### 2. Practical flying of Micro Category Drone with Instructor Supervision

basic maneuvers like take off landing, pitch forward/ backward, roll right/left, yaw right/left were thought.



## Day 5

### 1. Demonstration of Advanced Flight Maneuvers (Practical)



## Day 6

### 1. Practical Flying at Different Aircraft Modes (Practical)

## Day 7

### 1. Demonstration of Autonomous Flight (Practical)



## Day 8

### 1. Individual Flying of Autonomous Agri-drone spraying under Supervision of Instructors (Practical)

Second week focused more on practical sessions to have hands on control of drones and transmitter after stimulator.

## Day 9

### 1. Introduction to Crop Protection

#### Agri drone (Theory and Practical)

Major part to be focused under this training was agri drones this class covered introduction to types of agri drones, parts of agri drone, battery and its replacement, spray tank and its balancing, nozzle replacement, types of nozzles and its different application in agriculture was discussed.



## Day 10

### 1. Principles of pesticide application

#### (Theory and Practical)

Basic principles of pesticide spraying, drone SOP to be followed before and after flight and package of practices, and SOP policy issued by department of agriculture, Government of India was discussed and precautions to be considered while flying in open field



### 2. Introduction to Ground Control System

Basic parameter settings medicine dosage setting, pre-checks



## Day 11

### 1. Critical parameters in spraying

(Theory and Practical)

drone parameters, agrochemical parameters, environmental parameters, operational parameters, non-target applications were discussed.



## Day 12

### 1. Nozzles and their use during spraying through drone

(Theory and Practical)

types of nozzles, classifications, droplet measurement, calibration of nozzles, maintenance of nozzles, field trials were explained.



## Day 13

### 1. Formulations and their management

(Theory and Practical)

understanding formulations, types and classifications of pesticides, fungicides, insecticides, micro-nutrients compatibility issues, new formulations, efficacy evaluation, dosage requirements for spraying agrochemicals was studied.



## Day 14

### 1. Types of Spray Equipment (Theory and Practical)

high/low and ultra-low volume application equipment and avoidance of waste of chemicals and water was shown practically, field trials with different categories of spray equipment was done.



## Day 15

### 1. Drone Spraying (Theory and Practical)

flying modes of agricultural drone, preparation of spray volume, dos and don'ts in application of pesticides and fertilizers, critical parameters while applying-field study, manual spraying (controlled through joystick, auto piloting, tracking the field and fixing coordinates, on-field trials



## Day 16

### 1. Residue and bio-efficacy effects

(Theory and Practical)

understanding residue issues, ai dosage/ha and interval of spraying, comparison of drone spraying with other sprayers was studied.

## Day 17

### 1. Drift and non-target application

(Theory and Practical)

understanding drift, effect of drift on crops, height and speed of application to minimize drift where were discussed to avoid wastage of fertilizer and pesticides and weather parameters to be considered while spraying.



## Day 18

### 1. Calibration of spraying (Theory and Practical)

general calibration principles, calibration of hand-held/vehicle mounted sprayers, calibration of drone sprayer was taught.



## Day 19

### 1. Safety regulations (Theory and Practical)

safe application standards, use of PPE kits, do's and don'ts while spraying pesticides and plant nutrients were explained



## Day 20

### 1. Drone Care and maintenance (Theory and Practical)

basic maintenance issues, field practical on care and maintenance, tank maintenance, structural maintenance, do's and don'ts



## Hands on training to Faculty of UHSB and NAHEP-IDP team



## Day 21

### 1. Field practical trials (Theory and Practical)

on-field spraying trials with expert, manual mode with agricultural drone, autonomous mode with agricultural drone, ab mode with agricultural drone, troubleshooting, geo-fencing techniques - indentation and obstacles marking.

Individual flying of all modes of agri drone in front of supervisor was done by each student to have practical knowledge on spraying at field level and use of agricultural drone.

Plot used: Nerium experiment plot near Center of excellence for Pomegranate.

Pesticide used: SAF

Hands on training for field spray was done using drone



## Day 22

### 1. Fault Identification and Rectification of Agricultural Drone (Practical)

Technical errors and their rectification like motor fault, magnetic field interference, flowmeter error, transmitter calibrations error, standard drone maintenance and checklist to check at regular inspection, emergency landing situations and getting the control of drones in such situation was explained to students with demonstrations.

## Day 23

### 1. Crop Health Monitoring and Data Process and analysis.

Use of drone in crop health monitoring using multispectral was initiated with introduction to multispectral drone, uses of multispectral drone, case studies on different crops, introduction to wavelength were covered.

### 2. Vegetation Indices and electromagnetic radiation

analysing the data captured and reading the different indices like the visible atmospherically resistant index (VARI), normalized difference vegetation index (NDVI), green normalized difference vegetation index (GNDVI), optimized soil adjusted vegetation index (OSAVI), normalized difference red edge index (NDRE) was studied and PIXD4 software was introduced.

## Day 24

### 1. Exam (Written, Viva and Flying Practical Exam) -100 marks







## Valedictory

Valedictory was on 01 October, 2022 at 10:30am in E-studio of UHSB. Dr. Venkateshalu welcomed all the guests, Multiplex Drone team, NAHEP-IDP team and students. Later course report was submitted by Shivakumar H. G. Trainees expressed their feedback about the training, appreciated and thanked the university for offering this vocational course and few expressed to take up the drone service to farmers as entrepreneurship. Prohram was addressed by the DR. T. B. Alloli and Dr. S. I Athani appreciated the NAHEP-IDP team for conducting the course and thanked world bank and ICAR-NAHEP-IDP for sanctioning this project to UHSB. Certificates were distributed to the participants by dignitaries. DR. N. K. Hegde gave presidential remarks and vote of thanks was given by Dr. Noorulla Haveri. Program ended with group photo session with all faculty and participants.



## Feedback from students



## Photo Session

## Participants list

Sl.No	Name	ID Number	College
1.	Pamanji Priyadarshini	UHS19UG5040	CoH, Bagalkot
2.	Ajay	UHS18UG4126	CoH, Bidar
3.	Md Saqlian	UHS18UG4154	CoH, Bidar
4.	Raghuvardhanrao R	UHS19UG4953	CoH, Mysuru
5.	Tilak S R	UHS19UG4967	CoH, Mysuru
6.	Purushottama M R	UHS19UG4951	CoH, Mysuru
7.	A Tushar Aiyappa	UHS19UG4909	CoH, Mysuru
8.	Tushar Joshi	UHS19UG4977	CoH, Mysuru
9.	Mahmadyaseen M Hawaldar	UHS19UG4936	CoH, Mysuru
10.	Manoj S	UHS19UG4938	CoH, Mysuru
11.	Theerthesha N R	UHS19UG4975	CoH, Mysuru
12.	Nithin H G	UHS19UG4942	CoH, Mysuru
13.	Sudeep Guggari	UHS19UG4971	CoH, Mysuru
14.	Shahin Ronad	UHS19UG5040	CoH, Sirsi
15.	Diwakar. S. Banakar	UHS19UG4998	CoH, Sirsi
16.	Shubham Jayappa Korabu	UHS19UG4749	CoH, Bidar
17.	Goutam Hosamani	UHS19UG4853	CoH, Munirabad
18.	Vamshi Krishna	UHS19UG4903	CoH, Munirabad
19.	Srinidhi K P	UHS19UG5048	CoH, Sirsi
20.	Sri Harsha H R	UHS19UG5046	CoH, Sirsi
21.	Pavan Kumar Patil	UHS19UG4489	KRCCH, Arabhavi
22.	Praveen. B. Bhajantri	UHS19UG4493	KRCCH, Arabhavi
23.	Khizer Ahmed A Rozindar	UHS19UG4479	KRCCH, Arabhavi
24.	Naveen Kumar Naregal	UHS19UG4486	KRCCH, Arabhavi
25.	T Vanitha	UHS19UG4609	CoH, Bagalkot