



# Model Curriculum

**QP Name: Kisan Drone Operator**

**QP Code: AGR/Q1006**

**Version: 1.0**

**NSQF Level: 4**

**Model Curriculum Version: 1.0**

Agriculture Skill Council of India || Agriculture Skill Council of India (ASCI), 6th Floor, GNG Tower, Plot No. 10, Sector - 44

## Table of Contents

Training Parameters.....	3
Program Overview .....	4
Training Outcomes.....	4
Compulsory Modules.....	4
Module 1: Introduction to the role of Kisan Drone Operator .....	8
Module 2: Rules and regulations related to drone operation.....	9
Module 3: Basic drone operation dynamics and principles.....	10
Module 4: ATC procedures & Radiotelephony (non-FRTOL).....	11
Module 5: Operation of Fixed-wing, Rotorcraft & Hybrid UAVs .....	12
Module 6: Role of Weather and Meteorology in drone operations.....	13
Module 7: Basic Maintenance of drone equipment.....	14
Module 8: Analysis and Assessment of Risk .....	15
Module 9: Carryout installation and utilization of Payload.....	16
Module 10: Data Analysis and report preparation .....	17
Module 11: Carryout Flight Simulator Training & Practice Flying .....	18
Module 12: Application of pesticides and nutrients with drones .....	20
Module 13: Safety and emergency procedures before and after pesticide spraying through drone operation.....	24
Module 14: Carrying out multispectral mapping for various agriculture and allied activities using drone.....	26
Module 15: Basic entrepreneurial activities for drone operators.....	27
Module 16: Hygiene and cleanliness.....	29
Module 17: Safety and emergency procedures.....	30
Module 18: On the Job Training.....	31
Annexure.....	32
Trainer Requirements .....	32
Assessor Requirements.....	33
Assessment Strategy.....	35
References .....	40
Glossary.....	40
Acronyms and Abbreviations.....	41

## Training Parameters

<b>Sector</b>	Agriculture
<b>Sub-Sector</b>	Agriculture Crop Production
<b>Occupation</b>	Precision Farming
<b>Country</b>	India
<b>NSQF Level</b>	4
<b>Aligned to NCO/ISCO/ISIC Code</b>	NCO-2015/NIL
<b>Minimum Educational Qualification and Experience</b>	10th Class Pass with 2 years of relevant experience OR 10th Class Pass + ITI (1 year after Class 10th) with 1 year of relevant experience OR 10th Class Pass + ITI (2 years after Class 10th) OR 10th Class Pass and pursuing continuous regular schooling
<b>Pre-Requisite License or Training</b>	NA
<b>Minimum Job Entry Age</b>	18 Years
<b>Last Reviewed On</b>	31/03/2022
<b>Next Review Date</b>	31/03/2025
<b>NSQC Approval Date</b>	31/03/2022
<b>QP Version</b>	1.0
<b>Model Curriculum Creation Date</b>	14/01/2022
<b>Model Curriculum Valid Up to Date</b>	31/03/2025
<b>Model Curriculum Version</b>	1.0
<b>Minimum Duration of the Course</b>	390 Hours
<b>Maximum Duration of the Course</b>	390 Hours

## Program Overview

This section summarizes the end objectives of the program along with its duration.

### Training Outcomes

At the end of the program, the learner should have acquired the listed knowledge and skills to:

- Identify the job role of Kisan Drone Operator
- Plan appropriate route for drone operation.
- Set up the drone for operation.
- Demonstrate the ATC procedures and Radiotelephony
- Compare Fixed-wing, Rotorcraft & Hybrid UAVs
- Identify appropriate conditions for drone operations.
- Identify & select different types of Drones and illustrate Fundamentals of Flight (Aerodynamics).
- Interpret DGCA Safety Regulations & observe safety guidelines, ATC procedures & Radio Telephony, Weather and meteorology as a Drone Pilot in flying a Drone.
- Identify & select different Airframes & Propellers in drone flying.
- Explain & apply knowledge of Power systems viz. Electric motors, Batteries, chargers, Connectors etc. in drone flying
- Identify basic operating features of a drone flight simulator and fly a Drone in simulator training & live training for various applications first with instructor & then solo
- Demonstrate the process of post operation drone maintenance
- Demonstrate the process of collecting, and analysing required data
- Prepare reports based on the analyzed data
- Demonstrate basic assembly and disassembly procedures for drones
- Demonstrate the procedure for flight simulation
- Demonstrate various flying techniques
- Demonstrate measures for storage of pesticides/crop nutrients
- Plan the agricultural enterprise/ business.
- identify employability opportunities
- Describe the process of managing the entrepreneurial activities.
- Describe how to comply with rules and regulations
- Adhere precautionary measures before, during and post-operation for drone-based pesticide application
- Determine soil fertility using drone sensors
- Discuss how to adhere to personal hygiene practices.
- Demonstrate ways to ensure cleanliness around the workplace

### Compulsory Modules

The table lists the modules and their duration corresponding to the Compulsory NOS of the QP.

NOS and Module Details	Theory Duration	Practical Duration	On-the-Job Training Duration (Mandatory)	On-the-Job Training Duration (Recommended)	Total Duration
Bridge Module	04:00	00:00	0:00	0:00	04:00

Module 1: Introduction to the role of Kisan Drone Operator	04:00	0:00	0:00	0:00	04:00
<b>AGR/N1022: Comprehend Stakeholders &amp; their laws (Basic) as per Drone Rules 2021 and Drone (Amendment) Rules, 2022 notified by Ministry of Civil Aviation</b> <b>NOS Version- 1.0</b> <b>NSQF Level- 4</b>	<b>02:00</b>	<b>1:00</b>	<b>0:00</b>	<b>1:00</b>	<b>4:00</b>
Module 2: Rules and regulations related to drone operation	02:00	1:00	0:00	1:00	4:00
<b>AGR/N1023: Follow basic flight principles while operating a drone</b> <b>NOS Version- 1.0</b> <b>NSQF Level- 4</b>	<b>02:00</b>	<b>02:00</b>	<b>0:00</b>	<b>1:00</b>	<b>5:00</b>
Module 3: Basic drone operation dynamics and principles	02:00	02:00	0:00	1:00	5:00
<b>AGR/N1024: Follow ATC procedures &amp; Radio Telephony (non FRTOL) techniques</b> <b>NOS Version- 1.0</b> <b>NSQF Level- 4</b>	<b>02:00</b>	<b>02:00</b>	<b>0:00</b>	<b>02:00</b>	<b>06:00</b>
Module 4: ATC procedures & Radiotelephony (non-FRTOL)	02:00	02:00	0:00	02:00	06:00
<b>AGR/N1025: Comprehend Fixed-wing, Rotorcraft &amp; Hybrid operations and Aerodynamics</b> <b>NOS Version- 1.0</b> <b>NSQF Level- 4</b>	<b>04:00</b>	<b>05:00</b>	<b>0:00</b>	<b>02:00</b>	<b>11:00</b>
Module 5: Operation of Fixed-wing, Rotorcraft & Hybrid UAVs	04:00	05:00	0:00	02:00	11:00
<b>AGR/N1026: Comprehend effects of weather and meteorology in drone operations and undertake necessary measures for</b>	<b>02:00</b>	<b>02:00</b>	<b>0:00</b>	<b>02:00</b>	<b>06:00</b>

<b>hazardous weather avoidance</b> <b>NOS Version- 3.0</b> <b>NSQF Level-4</b>					
Module 6: Role of Weather and Meteorology in drone operations	02:00	02:00	0:00	02:00	06:00
<b>AGR/N1027: Carry out drone equipment maintenance and basic assembly</b> <b>NOS Version- 1.0</b> <b>NSQF Level- 4</b>	<b>04:00</b>	<b>05:00</b>	<b>0:00</b>	<b>02:00</b>	<b>11:00</b>
Module 7: Basic Maintenance of drone equipment	04:00	05:00	0:00	02:00	11:00
<b>AGR/N1028: Carry out risk assessment &amp; analysis - Safety Management / TEM</b> <b>NOS Version- 1.0</b> <b>NSQF Level- 4</b>	<b>03:00</b>	<b>02:00</b>	<b>0:00</b>	<b>02:00</b>	<b>07:00</b>
Module 8: Analysis and Assessment of Risk	03:00	02:00	0:00	02:00	07:00
<b>AGR/N1029: Carry out installation and utilization of payload</b> <b>NOS Version- 1.0</b> <b>NSQF Level- 4</b>	<b>02:00</b>	<b>04:00</b>	<b>0:00</b>	<b>02:00</b>	<b>08:00</b>
Module 9: Carryout installation and utilization of Payload	02:00	04:00	0:00	02:00	08:00
<b>AGR/N1031: Analyze relevant drone collected data</b> <b>NOS Version- 1.0</b> <b>NSQF Level- 4</b>	<b>02:00</b>	<b>02:00</b>	<b>0:00</b>	<b>01:00</b>	<b>05:00</b>
Module 10: Data Analysis and report preparation	02:00	02:00	0:00	01:00	05:00
<b>AGR/N1032: Undertake Flight Simulator Training &amp; Practical Flying</b> <b>NOS Version- 1.0</b> <b>NSQF Level- 4</b>	<b>03:00</b>	<b>10:00</b>	<b>0:00</b>	<b>04:00</b>	<b>17:00</b>
Module 11: Carryout Flight Simulator Training & Practice Flying	03:00	10:00	0:00	04:00	17:00

<b>AGR/N1030: Carry out drone based pesticide and crop nutrient application</b> <b>NOS Version- 1.0</b> <b>NSQF Level- 4</b>	<b>25:00</b>	<b>30:00</b>	<b>0:00</b>	<b>45:00</b>	<b>100:00</b>
Module 12: Application of pesticides and nutrients with drones	25:00	30:00	0:00	45:00	100:00
<b>AGR/N1020: Ensure adherence of precautionary measures before, during and post-operation for drone based pesticide application</b> <b>NOS Version- 1.0</b> <b>NSQF Level- 4</b>	<b>10:00</b>	<b>25:00</b>	<b>0:00</b>	<b>10:00</b>	<b>45:00</b>
Module 13: Safety and emergency procedures before and after pesticide spraying through drone operation	10:00	25:00	0:00	10:00	45:00
<b>AGR/N1021 Use a drone to carry out multispectral mapping for various agriculture and allied activities</b> <b>NOS Version- 1.0</b> <b>NSQF Level- 4</b>	<b>15:00</b>	<b>28:00</b>	<b>0:00</b>	<b>28:00</b>	<b>71:00</b>
Module 14: Carrying out multispectral mapping for various agriculture and allied activities using drone	15:00	28:00	0:00	28:00	71:00
<b>AGR/N1018: Identify relevant employability and entrepreneurship opportunities in drone Operations</b> <b>NOS Version- 1.0</b> <b>NSQF Level- 4</b>	<b>30:00</b>	<b>22:00</b>	<b>0:00</b>	<b>08:00</b>	<b>60:00</b>
Module 15: Basic entrepreneurial activities for drone operators	30:00	22:00	0:00	08:00	60:00
<b>AGR/N9903: Maintain health and safety at the workplace</b> <b>NOS Version- 1.0</b> <b>NSQF Level- 4</b>	<b>10:00</b>	<b>10:00</b>	<b>0:00</b>	<b>10:00</b>	<b>30:00</b>
Module 16: Hygiene and cleanliness	3:00	3:00	0:00	2:00	8:00
Module 17: Safety and emergency procedures	7:00	07:00	0:00	8:00	22:00
<b>Total Duration</b>	<b>120:00</b>	<b>150:00</b>	<b>0:00</b>	<b>120:00</b>	<b>390:00</b>

## Module 1: Introduction to the role of Kisan Drone Operator

### Bridge Module

#### Terminal Outcomes:

- Discuss the job role of Kisan Drone Operator
- Explain Scope and Avenues of Kisan Drones
- Identify the employment opportunities as Kisan drone operator

<b>Duration: 04:00</b>	<b>Duration: 0:00</b>
<b>Theory – Key Learning Outcomes</b>	<b>Practical – Key Learning Outcomes</b>
<ul style="list-style-type: none"> <li>• Describe the scope of Drones in agriculture industry</li> <li>• Discuss the role and responsibilities of an Kisan Drone Operator</li> <li>• Identify various employment opportunities for a Kisan Drone Operator</li> <li>• Discuss about RPTO</li> <li>• Discuss about Cat-1[VLOS] remote Pilate certifications</li> <li>• Discuss about UAS types, categorization and their limits</li> <li>• Explain DigitalSky and how does it work</li> <li>• Discuss UIN and DAN</li> </ul>	
<b>Classroom Aids</b>	
Training Kit - Trainer Gguide, Power Point Presentation, White board, Marker, Projector, Laptop, Videos etc.	
<b>Tools, Equipment and Other Requirements</b>	
NA	



## Module 2: Rules and regulations related to drone operation

### Mapped to AGR/N1022 v1.0

#### Terminal Outcomes:

- Explain various international laws and SOP for drone operation
- Explain the process of registration for Drone certificate and UIN
- Explain the process for registration, sale of drones
- Explain DGCA safety rules and regulations

<b>Duration: 02:00</b>	<b>Duration: 01:00</b>
<b>Theory – Key Learning Outcomes</b>	<b>Practical – Key Learning Outcomes</b>
<ul style="list-style-type: none"> <li>• Explain Various international rules, regulations, standards &amp; practices</li> <li>• Explain Civil aviation requirements, AIPs, NOTAM</li> <li>• Explain Various type of certifications of drone</li> <li>• Discuss about Registration, sale &amp; de-registration of drones</li> <li>• Explain Operations of various types of drones</li> <li>• Explain Dos and don'ts while carrying out drone operation</li> <li>• Explain the significance of Remote pilot certificate</li> <li>• Explain about drone insurance</li> <li>• Explain the importance of Unique Identification Number (UIN)</li> <li>• Discuss Drone (Amendment) Rules, 2022 notified by Ministry of Civil Aviation</li> </ul>	<ul style="list-style-type: none"> <li>• Classify and categorize drones based on weight, size etc.</li> <li>• Demonstrate the procedure to apply drone certification and Unique Identification number (UIN) from DGCA</li> <li>• Demonstrate the procedure for Registration, Sale &amp; De-Registration of Drones</li> <li>• Demonstrate procedure for operating drone</li> <li>• Recognize DGCA safety regulations, Do's and Don'ts</li> </ul>
<b>Classroom Aids</b>	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Pprojector, Laptop	
<b>Tools, Equipment and Other Requirements</b>	
Drone, software, spares and accessories, nozzle system	

## Module 3: Basic drone operation dynamics and principles

### Mapped to ARG/N1023 v1.0

#### Terminal Outcomes:

- Explain basic principles of flight operation
- Demonstrate various flying techniques
- Explain restrictions for drone operation
- Explain various scientific laws and theories in drone operation

<b>Duration: 02:00</b>	<b>Duration: 02:00</b>
<b>Theory – Key Learning Outcomes</b>	<b>Practical – Key Learning Outcomes</b>
<ul style="list-style-type: none"> <li>• Explain fundamentals of flight</li> <li>• Explain introduction to aerodynamics of flight</li> <li>• Explain how to How to Take-off, flight, and landing</li> <li>• Explain about Maneuvers, turns and circuit pattern</li> <li>• List drone forbidden areas</li> <li>• Explain about Longitude/ Latitude</li> <li>• Discuss about Different types of Drones and their Nomenclatures</li> <li>• Describe current/future uses of drones</li> <li>• Explain about Newton's Laws of Motion, Bernoulli's Principle, four forces of Flight, three axes of Flight</li> <li>• Explain about various laws, principles and forces applies to drone Flight</li> <li>• Explain why drone should not be operated over public events, stadiums etc.</li> </ul>	<ul style="list-style-type: none"> <li>• Identify different types of drones</li> <li>• Select basic components</li> <li>• Demonstrate Take-off, flight, and landing</li> <li>• Recognise basic principles of flying like Bernoulli's Principle etc.</li> <li>• Demonstrate Take-off, flight, and landing</li> <li>• Demonstrate flying techniques such as pull, roll and yaw to operate flight</li> <li>• Demonstrate Maneuvers, turns and circuit pattern</li> </ul>
<b>Classroom Aids</b>	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
<b>Tools, Equipment and Other Requirements</b>	
Drone, drone's remote control, batteries	

## Module 4: ATC procedures & Radiotelephony (non-FRTOL)

*Mapped to AGR/N10124 v1.0*

### Terminal Outcomes:

- Demonstrate the ATC procedures and Radiotelephony
- Explain zones in airspace and its regulations and restrictions
- Explain general issues encountered by drone pilots and their measures

<b>Duration: 02:00</b>	<b>Duration: 02:00</b>
<b>Theory – Key Learning Outcomes</b>	<b>Practical – Key Learning Outcomes</b>
<ul style="list-style-type: none"> <li>• Define Radiotelephony</li> <li>• Explain about ATC Procedures of operation</li> <li>• Discuss about Airspace structure and Airspace</li> <li>• Explain Rules and regulations for no drone zones</li> <li>• Explain about Various zones for drone flight such as green, yellow and red and their parameters</li> <li>• Explain Various restrictions of no drone Zone</li> <li>• Explain Flight regulations and procedures in Yellow Zone</li> <li>• Explain about how to communicate with ATC &amp; RT Phraseology including Position and Altitude Reporting</li> <li>• Explain procedures for flight planning including Altimeter setting</li> <li>• Explain techniques/ measures for collision avoidance</li> <li>• Explain techniques for Radio Telephony (RT)</li> <li>• Explain the importance of adopting a safety attitude when flying a drone</li> <li>• Describe about issues aircraft pilots encounter including airspace, traffic patterns, and safe attitudes</li> </ul>	<ul style="list-style-type: none"> <li>• Demonstrate ATC operations</li> <li>• Demonstrate Flight regulations and procedures in Yellow Zone</li> <li>• Show how to communication with ATC &amp; RT Phraseology including Position and Altitude Reporting</li> <li>• Identify specific Flight Planning Procedures for specific drone flights including Altimeter setting procedures</li> <li>• Demonstrate measures of collision avoidance</li> <li>• Recognise issues Drone pilots encounter including airspace, traffic patterns etc.</li> </ul>
<b>Classroom Aids</b>	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
<b>Tools, Equipment and Other Requirements</b>	
Drone, drone accessories, remote control	

## Module 5: Operation of Fixed-wing, Rotorcraft & Hybrid UAVs

### Mapped to ARG/N1025 v1.0

#### Terminal Outcomes:

- Differentiate between Fixed-wing, Rotorcraft & Hybrid UAVs
- Describe the appropriate conditions for drone operations.
- Explain pros and cons of Fixed-wing, Rotorcraft & Hybrid UAVs
- Explain various types of Fixed-wing, Rotorcraft & Hybrid UAVs
- Identify various types of drones, parts and terminology

<b>Duration: 04:00</b>	<b>Duration: 05:00</b>
<b>Theory – Key Learning Outcomes</b>	<b>Practical – Key Learning Outcomes</b>
<ul style="list-style-type: none"> <li>• Compare fixed-wing, rotorcraft and hybrid UAVs</li> <li>• Explain Types of fixed wing drones, make, parts, terminology</li> <li>• Explain about how to Operation and maneuver fixed wing drones, Flight Performance</li> <li>• Discuss Applications of fixed-wing, Multirotor, Hybrid UAVs</li> <li>• Explain Pros and Cons of Fixed Wing, Rotorcraft Drones</li> <li>• Discuss basic drone terminology &amp; parts of Rotorcraft</li> <li>• Explain Types of Rotorcraft drones, material used and size of drones</li> <li>• Discuss about Rotorcraft Drone Anatomy: Different parts of drones</li> <li>• Explain the importance of Avionics &amp; C2 Link</li> <li>• Explain about Introduction to Mission Planning, Instrument Flying &amp; Navigation (GCS) of Fixed wing, Rotorcraft &amp; Hybrid</li> <li>• State Principles of Aerodynamics</li> <li>• Explain types of Hybrid Drones &amp; Parts</li> <li>• Compare rotorcraft &amp; Aeroplane</li> </ul>	<ul style="list-style-type: none"> <li>• Identify various Types of fixed wing drones, make, parts, terminology</li> <li>• Demonstrate Operation and maneuvers of fixed wing drones,</li> <li>• Demonstrate Mission Planning, Instrument Flying &amp; Navigation (GCS)</li> <li>• Demonstrate the use of fixed-wing, Multirotor, Hybrid UAVs</li> <li>• Demonstrate how to use Avionics &amp; C2 Link</li> </ul>
<b>Classroom Aids</b>	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
<b>Tools, Equipment and Other Requirements</b>	
Drone, drone's remote control, batteries	

## Module 6: Role of Weather and Meteorology in drone operations

### Mapped to ARG/N1026 v1.0

#### Terminal Outcomes:

- Explain various atmospheric components
- Describe the appropriate conditions for drone operations.
- Demonstrate measuring various atmospheric components

<b>Duration: 02:00</b>	<b>Duration: 02:00</b>
<b>Theory – Key Learning Outcomes</b>	<b>Practical – Key Learning Outcomes</b>
<ul style="list-style-type: none"> <li>• Explain about the standard atmosphere, Measuring air pressure, Heat and temperature Wind Moisture, cloud formation etc.</li> <li>• Discuss about Terminal Aviation Routine Weather Report (METAR)</li> <li>• Explain the effects of atmospheric components such as air pressure, heat, wind, moisture, cloud formation, icing etc.</li> <li>• Explain about Favourable conditions for drone operation</li> <li>• Explain about the Emergency procedures during sudden shift in weather conditions</li> <li>• Explain the effect of atmosphere on RPAS operation &amp; hazardous weather avoidance</li> <li>• Explain how to measure air pressure, heat, temperature and wind speed</li> <li>• List tools and equipment required to measure components of atmosphere</li> </ul>	<ul style="list-style-type: none"> <li>• Recognize optimal Weather and meteorology in drone flight</li> <li>• Demonstrate drone operations in standard atmospheric conditions</li> <li>• Demonstrate the procedure for measuring air pressure, temperature, Wind speed, moisture</li> <li>• Estimate effect of atmosphere on RPAS operation</li> <li>• Demonstrate measures for hazardous weather avoidance</li> <li>• Demonstrate the use of various tools and equipment to measure components of atmosphere</li> <li>• Set the tools and equipment in correct manner to avoid errors</li> <li>• Demonstrate the maintenance procedures for tools and equipment post usage of measuring atmospheric components</li> </ul>
<b>Classroom Aids</b>	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
<b>Tools, Equipment and Other Requirements</b>	
Drone, drone's remote control, batteries	

## Module 7: Basic Maintenance of drone equipment

### Mapped to ARG/N1027 v1.0

#### Terminal Outcomes:

- Demonstrate the basic maintenance practices of drone equipment
- Identify faults and implement rectification measures
- Demonstrate basic assembly and disassembly procedures for drones
- Demonstrate integration of various modules and sub sections
- Demonstrate documentation of various maintenance activities

<b>Duration: 04:00</b>	<b>Duration: 05:00</b>
<b>Theory – Key Learning Outcomes</b>	<b>Practical – Key Learning Outcomes</b>
<ul style="list-style-type: none"> <li>• Explain about Servicing schedule</li> <li>• Explain how to repair drone equipment</li> <li>• Discuss about General faults and their measures after drone operation</li> <li>• Explain the Components of flight control box and ground station</li> <li>• Explain about emergency procedures in case of breakdown of the drone during operation</li> <li>• Discuss the uses of various sensors of the drone</li> <li>• Explain the procedure for Assembling &amp; disassembling of the drone equipment</li> <li>• Explain how to carry out maintenance repair and overhaul of the drone</li> <li>• Explain safety measures safety when using batteries including proper charging methods, discharging, handing, and disposal</li> <li>• Explain the procedure to integrate sub-sections/ modules, propulsion system of drones</li> <li>• Explain the importance of documentation of drone activities</li> </ul>	<ul style="list-style-type: none"> <li>• Demonstrate the maintenance activities of drone, flight control box, ground station</li> <li>• Demonstrate the maintenance activities of ground equipment, batteries and payloads</li> <li>• Demonstrate the procedures for minor repair of the equipment and contact the manufacturer for major repair</li> <li>• Detect faults and implement necessary measures for their rectification</li> <li>• Demonstrate the emergency procedures in case of breakdown of the drone during operation</li> <li>• Inspect the drone for any damages before and after the drone operation</li> <li>• Check the drone sensors are working properly</li> <li>• Demonstrate the assembling &amp; disassembling of drones</li> <li>• Demonstrate the Integration of sub-sections/ modules</li> <li>• Demonstrate safety precautions while handling batteries</li> <li>• Demonstrate documentation of drone and its peripherals repair</li> </ul>
<b>Classroom Aids</b>	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
<b>Tools, Equipment and Other Requirements</b>	
Drone, drone's remote control, batteries	

## Module 8: Analysis and Assessment of Risk

### Mapped to ARG/N1028 v1.0

#### Terminal Outcomes:

- Demonstrate the risk management procedures
- Describe various emergency procedures of drone operation.
- Discuss ways to promote diversity and inclusion at the workplace.
- Demonstrate different safety management practices for drone operations

<b>Duration: 03:00</b>	<b>Duration: 02:00</b>
<b>Theory – Key Learning Outcomes</b>	<b>Practical – Key Learning Outcomes</b>
<ul style="list-style-type: none"> <li>• Discuss about Drone emergency and handling</li> <li>• Explain about emergency procedures during loss of C2-link</li> <li>• Discuss the Consequences of loss of power</li> <li>• Explain Emergency procedures during fly aways (straying)</li> <li>• Explain about Control surface failures</li> <li>• Explain about Human Performance &amp; Pilot Incapacitation</li> <li>• Discuss about Fail safe features of drone</li> <li>• Explain DGCA Safety Regulations &amp; safety guidelines</li> <li>• Explain the importance of buffer zones to avoid contaminating non target crops</li> </ul>	<ul style="list-style-type: none"> <li>• Demonstrate appropriate handling procedures in case of emergencies</li> <li>• Demonstrate necessary procedures during loss of C2-link</li> <li>• Demonstrate procedure to recover drone in case of fly aways</li> <li>• Demonstrate emergency measures during loss of power, control surface failures, flight emergencies, fail safe mechanisms</li> <li>• Assess factors affecting human Performance &amp; Pilot Incapacitation</li> <li>• Assess the risk of contaminating waterbodies, affecting non-target crops</li> <li>• Plan the best possible flight route ensuring safety and minimizing risk</li> <li>• Interpret DGCA Safety Regulations &amp; observe safety guidelines, ATC procedures &amp; Radio Telephony, Weather and meteorology while operating a Drone</li> </ul>
<b>Classroom Aids</b>	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
<b>Tools, Equipment and Other Requirements</b>	
Drone, drone’s remote control, batteries	

## Module 9: Carryout installation and utilization of Payload

### Mapped to ARG/N1029 v1.0

#### Terminal Outcomes:

- Demonstrate the process of setting up the drone for agriculture and allied operation.
- Demonstrate the mounting and demounting procedures of payload on drone.
- Demonstrate various safety measures for handling payload
- Estimate payload requirements for agriculture operations

<b>Duration: 02:00</b>	<b>Duration: 04:00</b>
<b>Theory – Key Learning Outcomes</b>	<b>Practical – Key Learning Outcomes</b>
<ul style="list-style-type: none"> <li>• Explain Various Types of payloads - What to carry, what not to carry</li> <li>• Explain Parts of payloads</li> <li>• Explain the procedure for Mounting/installation of payloads on the drone</li> <li>• Explain Features of payloads</li> <li>• Explain the use of drone for various agricultural and allied operations</li> <li>• Explain capacities of various drones for handling payloads</li> <li>• Explain the effects of leakage in the payload (chemical)</li> </ul>	<ul style="list-style-type: none"> <li>• Plan &amp; estimate payload considerations, camera options, resolution etc. &amp; other pay load possibilities</li> <li>• Identify types of payloads - What to carry, what not to carry</li> <li>• Identify Parts of payloads</li> <li>• Show how to consider features of payloads suitable for carrying out assigned task</li> <li>• Demonstrate Installation/ mounting of the payload on the drone as per the manufacturer’s guidelines</li> <li>• Demonstrate the use of different payloads in drone flying/ maintenance</li> <li>• Estimate the payload capacity of the drone and install accordingly based on specific operation</li> <li>• Examine the payload for any faults and rectify the same</li> <li>• Demonstrate the procedure to operate the drone for specified activities as per the route map</li> </ul>
<b>Classroom Aids</b>	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
<b>Tools, Equipment and Other Requirements</b>	
Drone, drone’s remote control, batteries, accessories, various payloads for demonstration	



## Module 10: Data Analysis and report preparation

### Mapped to ARG/N1031 v1.0

#### Terminal Outcomes:

- Identify relevant images and data videos
- Demonstrate procedure to collect relevant data
- Explain process of data analysis

<b>Duration: 02:00</b>	<b>Duration: 02:00</b>
<b>Theory – Key Learning Outcomes</b>	<b>Practical – Key Learning Outcomes</b>
<ul style="list-style-type: none"> <li>• Explain Principles of Observation</li> <li>• Explain the procedure to interpret elements of image &amp; video</li> <li>• Explain the basic principles of Photogrammetry</li> <li>• Explain Various Types of Image &amp; Video Data</li> <li>• Explain process of data analysis and their interpretation</li> </ul>	<ul style="list-style-type: none"> <li>• Demonstrate the procedure to analyze the collected data such as images and videos and interpret their various elements</li> <li>• Identify various types of image and video data</li> <li>• Show how to collect the data relevant to the specified operation</li> <li>• Demonstrate the procedure for Photogrammetry</li> </ul>
<b>Classroom Aids</b>	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
<b>Tools, Equipment and Other Requirements</b>	
Drone, drone's remote control, batteries	

## Module 11: Carryout Flight Simulator Training & Practice Flying

### Mapped to ARG/N1032 v1.0

#### Terminal Outcomes:

- Demonstrate the procedure for flight simulation.
- Describe various terminology in flight simulation
- Demonstrate practical flying and safe landing
- Demonstrate various safety check pre and post operation
- Demonstrate various flying techniques

<b>Duration: 03:00</b>	<b>Duration: 10:00</b>
<b>Theory – Key Learning Outcomes</b>	<b>Practical – Key Learning Outcomes</b>
<ul style="list-style-type: none"> <li>• Explain about flight simulation</li> <li>• Explain how to check controls and sim familiarization</li> <li>• Explain about Pre-flight checks, Take off, Cruise</li> <li>• Explain about Flying techniques such as approach, Go-around &amp; Landing, Post-Flight Checks</li> <li>• Discuss terminology such as Cruise and Turns, Climbing and Climbing turns, Descend &amp; Descending turns</li> <li>• Explain Consequences of disorientation and measures to recover the path</li> <li>• Explain Various flying techniques such as Circuit Flying - Rectangle/ Square/ Circle / Orbit</li> <li>• Explain about Gimbal controls</li> <li>• Explain how to fly at night</li> <li>• Explain Abnormal / Emergency Procedures</li> <li>• Explain introduction to Digital Sky Platform</li> <li>• Explain Safety measures and RPAS familiarization</li> <li>• Explain about Take-off, Climbing, descending and maintaining height</li> <li>• Explain about basic Controls: Pitch, Roll and Yaw</li> <li>• Explain about Mission Planning &amp; Instrument Flying</li> <li>• Explain about Auto Mission &amp; Flight</li> <li>• Explain how to fly Left and right square circuits patterns</li> <li>• Explain how to Level turns in both directions</li> <li>• Explain about Progress Check –</li> </ul>	<ul style="list-style-type: none"> <li>• Identify Basic operating features of a drone flight simulator</li> <li>• Show how to check controls related to drone operation</li> <li>• Select different drones and aerodromes</li> <li>• Demonstrate demo of Flight simulation</li> <li>• Demonstrate Pre-flight checks and start-up</li> <li>• Show how to coordinate drone flight</li> <li>• Demonstrate Take-off drone and carry out flight stage</li> <li>• Demonstrate safe landing of drone</li> <li>• Demonstrate post-flight checks</li> <li>• Demonstrate Practical flying viz. go-around, cruise and turns, climbing, climbing turns, descend &amp; descending turns etc.</li> <li>• Show how to recover disoriented/ straying drone back to path</li> <li>• Demonstrate the circuit flying- Rectangle/Square/Circle/Orbit/Flying</li> <li>• Demonstrate handling gimbal controls (Pan, tilt &amp; zoom) appropriately as per requirements</li> <li>• Demonstrate night flying of drone</li> <li>• Identify emergency and handle it accordingly</li> <li>• Show how to Tackle flight emergencies or abnormal conditions viz. Loss of link, Fly-aways (Straying), Loss of power, Control surface failures etc.</li> <li>• Demonstrate the practical flying with instructor in drone simulator</li> <li>• Identify components of Digital Sky</li> </ul>

<p><b>Multicopter</b></p> <ul style="list-style-type: none"> <li>• Explain about GCS monitoring and its uses</li> <li>• Explain about FPV flying</li> </ul>	<p><b>Platform</b></p> <ul style="list-style-type: none"> <li>• Demonstrate safety measures during flying</li> <li>• Demonstrate how to operate Remotely piloted aircraft system (RPAS)</li> <li>• Demonstrate how to handle sensitivity of controls to learn the orientation of RPA</li> <li>• Demonstrate basic Controls: Pitch, Roll and Yaw</li> <li>• Show how to maintain levelled turns in both directions to stabilize the drone</li> <li>• Set auto mission &amp; flight</li> </ul>
<p><b>Classroom Aids</b></p>	
<p>Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop</p>	
<p><b>Tools, Equipment and Other Requirements</b></p>	
<p>Drone, drone's remote control, batteries</p>	

## Module 12: Application of pesticides and nutrients with drones

### Mapped to ARG/N1030 v1.0

#### Terminal Outcomes:

- Describe how to prepare the drone for application of pesticides and fertilizers
- Demonstrate application of pesticides and fertilizers using the drone
- Determine soil fertility using various sensors of drone
- Describe the ways to safeguard non-targeted areas during drone operation
- Demonstrate measures for storage of pesticides/crop nutrients
- Demonstrate general maintenance practices post drone operation

Duration: 25:00	Duration: 30:00
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
<ul style="list-style-type: none"> <li>• Explain Principles of pesticide Applications-Basic Principles, Drone Sop and Policy issues</li> <li>• Explain about type of drone, parts of Agri drone, battery and their replacement, spray tank and balancing, Nozzle replacement etc.</li> <li>• Explain about obstacles in the area of operation for necessary mapping software adjustments</li> <li>• Explain Critical parameter in Spraying viz drone parameter, Agrochemical parameter, environmental issues, operational Parameter, Non Target applications etc.</li> <li>• Discuss about Nozzles and their use, type of nozzles, their classification, droplet measures, calibration of nozzle</li> <li>• Explain the the process of using drones to apply fertilisers, herbicides, pesticides and insecticides uniformly at the identified sites in the field</li> <li>• Explain about formulations and their types, various compatibility issues, formulation management and efficacy evaluation, dosage requirements etc.</li> <li>• Explain about Various types of spray equipment viz. High/Low/Ultra Low volume application equipment</li> <li>• Explain about various documentation</li> </ul>	<ul style="list-style-type: none"> <li>• select appropriate drones which can carry suitably sized reservoirs, which can be filled with fertilizers, herbicides, or pesticides for crop spraying</li> <li>• identify appropriate software and technology with reference to different farming practices for drone utilization in various agriculture activities</li> <li>• Show how to attach the nozzle system in an efficient manner for continuity in spray swath during spray from minimum permitted height above the uniformly distributed crop</li> <li>• Set the drone software to self-adjust its altitude and speed for spraying on desired height above the crop</li> <li>• Track the fields and fix the coordinates appropriately</li> <li>• Demonstrate the use of GPS and map accuracy of the drone to demarcate the target area boundary and safety/buffer margins</li> <li>• plan the appropriate route for the drone operation</li> <li>• demonstrate how to check obstacle presence in the area of operation and make necessary mapping and adjustments in software or peripherals</li> <li>• Demonstrate the procedure to adjust row spacing, row number, borders indentation, obstacle boundary distance, route type with available</li> </ul>

<p>requirements of the organization</p> <ul style="list-style-type: none"> <li>• Explain the process of obtaining the necessary regulatory approvals to use a drone for agricultural operations</li> <li>• Explain spray dynamics, spray volume, droplet size, concentration, drift mechanism, specific nozzles, delivery mechanism and pressure</li> <li>• Explain how to load pesticide/fertilizer on the drone according to its payload capacity</li> <li>• Explain how to use a drone to apply pesticides and fertilizers uniformly over an agricultural field</li> <li>• List approved agrochemicals by Central Insecticides Board and Committee (CIB&amp;RC)</li> <li>• Explain recommended dose of agrochemical for the crops and their droplet size for bio efficacy</li> <li>• Explain agrochemical(liquid/solid) compatibility with the drone spray system and their dilution requirements</li> <li>• Explain CIB&amp;RC specified guidelines for mixing of agrochemicals</li> <li>• Explain about active ingredients dosage/ha and PHI interval</li> <li>• Compare drone sprayers with other sprayers</li> <li>• Explain how to attach the nozzle system in an efficient manner for continuity in spray swath during spray</li> <li>• Explain how to make appropriate setting in drone software to self-adjust its altitude and speed for spraying on desired height above the crop</li> <li>• Explain How to ensure GPS and map accuracy of the drone to demarcate the target area boundary and safety/buffer margins</li> <li>• Explain general principle of calibration</li> </ul>	<p>software</p> <ul style="list-style-type: none"> <li>• Inspect the drone for leakage of pesticides/agrochemicals</li> <li>• calibrate the drone spray system to ensure recommended accuracy on amount of input to be sprayed</li> <li>• Inspect the field to know the extent of pest/disease/weeds infestation</li> <li>• select /use the agrochemicals duly approved by Central Insecticide Board and Registration committee</li> <li>• plan the chemical spraying as per the spraying schedule at various / critical crop growth and infestation stages as per crop protection guidelines</li> <li>• demonstrate the dilution of agrochemical in clean water as per recommendations by the manufacturing company using appropriate PPE</li> <li>• Demonstrate the crop spraying in safer and cost-effective way by its autonomous and pre-programmed on specific schedules and routes.</li> <li>• Demonstrate the operation of drone to apply soil/crop nutrients in the form/concentration of the nutrients being sprayed/ broadcasted using sensors/ spraying systems installed</li> <li>• Ensure efficient fertigation use of water using drone (depending on the sprayer system of the drone)</li> <li>• Demonstrate the use different kinds of sprayer nozzles depending on the form and concentration of the nutrients to be applied</li> <li>• Evaluate residue and bio efficacy effects</li> <li>• Demonstrate the use of available advance feature of the software for accurate movement of drone and its control as per manifested various parameters like battery discharge or low voltage in the area operation</li> <li>• identify and resolve common error messages and corrections by debugging of Software appropriately</li> </ul>
--	---

<ul style="list-style-type: none"> <li>• Explain how to Calibrate handheld/vehicle mounted sprayer and drone spray system</li> <li>• Explain agrochemical safety guidelines prescribed by the manufacturer for their safe handling</li> <li>• Explain recommended agro-chemical doses for specific crops</li> <li>• Explain recommended spray schedule at various/ critical crop growth and infestation stages as per crop protection guidelines and phytotoxic assessment</li> <li>• Explain dilution methods of the agrochemical as per recommendations</li> <li>• Explain how to perform crop spraying in safer and cost-effective way</li> <li>• Explain troubleshooting for common malfunctions as per the manufacturer's instructions</li> <li>• Explain ways to minimize spray drift in non-target field</li> <li>• Explain the hazardous effect of agri Inputs/chemicals</li> <li>• Explain Critical operational parameters for drift management</li> <li>• Explain Importance of emergency eyewash and emergency drench showers and absorbent spill kits within or near storage areas</li> <li>• Explain how to dispose excess/ obsolete materials and chemicals in accordance with manufacturers recommendation and state law</li> <li>• Explain the use of multispectral and hyperspectral imaging sensors to determine soil fertility in the field</li> <li>• Explain about spares and accessories, maintenance of battery</li> <li>• Explain different type of nozzles, their functions and maintenance</li> <li>• Differentiate between Recommended dose of fertilizer (RDF) protocol and real-time</li> </ul>	<ul style="list-style-type: none"> <li>• demonstrate how to set the drone to home position post completion of task</li> <li>• Demonstrate the measures to Safeguard the non-target while pesticide application</li> <li>• Demonstrate the safety practices while spraying agrochemicals such as avoid windward direction, no human or animal movement within or in the close proximity of the farm during and immediately after the spray operations.</li> <li>• Demonstrate the use of GPS and GIS-based sensors, along with drones and satellite imagery to get a 3- Dimensional (3D) analysis of the field and the composition of soil in the cultivated region</li> <li>• Demonstrate drone operation with appropriate sensors to capture high resolution pictures which can be directly sent to the cloud/ software facilitating precise corrective measures in the form of prescription maps</li> <li>• Demonstrate the use of multispectral and Hyper Spectral/ LiDAR sensor to capture the data of soil fertility before sowing or planting</li> <li>• Demonstrate the use of recommended Dose of Fertilizer (RDF) Protocol to assess the soil nutrient status and post-process the data to generate the GPS tagged precision nutrient requirements map of the field as an input logic to the nutrient spraying drone with the help of soil indices</li> <li>• Demonstrate the use of real-time operation protocol to live process the data from multispectral camera for spraying the nutrients simultaneously</li> <li>• Demonstrate the use of electrostatic nozzle to avoid drift during the operation</li> <li>• Demonstrate the preparation of the relevant reports in graphical or tabular form as per client requirement</li> <li>• Demonstrate labelling of all the materials appropriately</li> </ul>
--	---

<p>operation protocol</p> <ul style="list-style-type: none"> <li>• Explain how to prepare report in graphical or tabular form as per client requirement</li> <li>• Explain various ICT-driven tools and technologies in agriculture and allied sector</li> <li>• Explain how to maintain necessary data and carry out documentation</li> <li>• Explain about Spray Monitoring form and its components</li> <li>• Read labels carefully to understand safety guidance</li> <li>• Explain provisions of Insecticides Rule 1971</li> </ul>	<ul style="list-style-type: none"> <li>• Demonstrate the SOP to store crop nutrients, herbicides, pesticides are separately stored in a secured building with absorbent spill kits in all liquid storage areas and regularly inspect</li> <li>• Demonstrate the use of emergency eyewash and emergency drench showers within or near the storage area, and dispose the excess or obsolete materials or chemicals in accordance with rules and regulations of manufacturer and state law</li> <li>• examine the drone, their peripherals and relevant attachments post completion of operation for signs of wear and tear or damage</li> <li>• Demonstrate the maintenance of the drone as per the respective manufacturer's instructions using appropriate and recommended tools and equipment</li> <li>• schedule periodic maintenance of drone, their peripherals and relevant attachments as per the maintenance schedule suggested by their respective manufacturers</li> <li>• Show how to fill the spray monitoring form</li> </ul>
<p><b>Classroom Aids</b></p>	
<p>Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop</p>	
<p><b>Tools, Equipment and Other Requirements</b></p>	
<p>Drone, drone's remote control, batteries</p>	

## Module 13: Safety and emergency procedures before and after pesticide spraying through drone operation

*Mapped to NOS AGR/N1020 v1.0*

### Terminal Outcomes:

- Describe pre and post-application precautionary measures.
- Describe precautionary measures during application

<b>Duration: 10:00</b>	<b>Duration: 25:00</b>
<b>Theory – Key Learning Outcomes</b>	<b>Practical – Key Learning Outcomes</b>
<ul style="list-style-type: none"> <li>• Explain the importance of restricting drone operation in the drone-forbidden area (airport or electronic station)</li> <li>• Explain the local aviation laws and regulations in area of operation</li> <li>• Explain about working and leak proof condition of the drone spraying system</li> <li>• Explain health and safety guidelines</li> <li>• Explain do and don't while solution preparation and carrying out spraying operation</li> <li>• Explain how to fix flying route to minimize turn around and select flying height as per target crop</li> <li>• State appropriate weather conditions and timing for agro-chemical spray</li> <li>• Explain how to</li> <li>• Explain the risk in entering contaminated area affected by drifting spray</li> <li>• Explain the importance of product label requirements and effective measures to avoid any associated risks</li> <li>• Explain the use of anti-drift nozzle to decrease/avoid drift to human, environment, non-target organisms, crops etc.</li> <li>• Explain about evacuation timing and transfer to fresh air post completion of the pesticide spray operation</li> <li>• Explain about the insecticide rule</li> </ul>	<ul style="list-style-type: none"> <li>• Examine the drone for any damages or leakages</li> <li>• Select the place for take-off and landing, tank mix operations etc.</li> <li>• Identify and mark the obstacles (wall, trees) around the field for safe operation</li> <li>• Show how to set up at least buffer zone (as specified by DGCA) between drone treatment and the non-target crop</li> <li>• Identify water sources and do not spray pesticides near water sources (less than 100 m) to avoid polluting water sources</li> <li>• Select nature of plant protection chemicals, especially herbicides</li> <li>• Demonstrate how to perform dilution of agro-chemical as per recommendation</li> <li>• Show how to rinse the empty container to avoid any contamination for next operation</li> <li>• Demonstrate the safe disposal of the hazardous waste/ spills at appropriate place in correct manner as per the legal regulations and law</li> <li>• Show how to store the plant protection products</li> <li>• select a flying route to minimize turn around</li> <li>• Demonstrate spraying with pure water first to test operation for at least 5 min</li> <li>• Demonstrate two step dilutions to fully dissolve the pesticide</li> <li>• Show how to adopt proper pressure</li> </ul>



<p>1971</p> <ul style="list-style-type: none"> <li>• Explain about various warning signs to be setup in the spray area for people awareness</li> <li>• Explain preventative measure during transport for leakage of remaining plant protection products</li> <li>• Explain about the maintenance prescription given by the manufacturer of drone and their peripherals</li> <li>• Explain the importance of operation team to stay at the downwind end of the field and backlightdirection</li> <li>• Explain the risk of burning or burying hazardous waste</li> <li>• Explain about post spraying care such as shower and wearing clean clothes</li> </ul>	<p>for optimized droplet spectrum (&gt;100pm).</p> <ul style="list-style-type: none"> <li>• Demonstrate proper storage of unused chemicals during transport</li> </ul>
<p><b>Classroom Aids:</b></p>	
<p>Computer, Projection Equipment, PowerPoint Presentation and Software, Facilitator’s Guide, Participant Handbook.</p>	
<p><b>Tools, Equipment and Other Requirements</b></p>	
<p>Drone, water, recommended samples of pesticides/ fertilizers, Personal Protective Equipment, First Aid Kit, Equipment used in Medical Emergencies.</p>	

## Module 14: Carrying out multispectral mapping for various agriculture and allied activities using drone

*Mapped to NOS AGR/N1021 v1.0*

### Terminal Outcomes:

- Describe the process of preparing the drone for carrying out farm mapping.
- Demonstrate crop surveillance and crop health monitoring using a drone

<b>Duration: 15:00</b>	<b>Duration: 28:00</b>
<b>Theory – Key Learning Outcomes</b>	<b>Practical – Key Learning Outcomes</b>
<ul style="list-style-type: none"> <li>• Explain various uses of drones, such as monitoring the effects of weather, crop growth and yield, weed and pest/ insect infestation, etc.</li> <li>• Explain how to use the software to plan a route</li> <li>• Explain the use of GPS and GIS-based sensors</li> <li>• Explain how to do analysis of the field and the soil in the target region</li> <li>• Explain about moisture deficit and irrigation water requirements</li> <li>• Explain concept of INM, IPM, IWM etc. for the respective crops and measuring of their indices</li> <li>• Explain how to determine the most effective patterns for planting, managing crops, soil, and other required field operations</li> <li>• Explain how to regulate the nutrient level in the soil based on the data captured by electrochemical sensors</li> </ul>	<ul style="list-style-type: none"> <li>• Demonstrate how to set the drone appropriately ensure it takes the required images and capture required data for intended operation</li> <li>• Demonstrate how to use the software to plan a route</li> <li>• Demonstrate the usage of GPS and GIS-based sensors, along with drones and satellite imagery to get a 3- Dimensional (3D) analysis of the field and the composition of soil in the cultivated region</li> <li>• Identify with help of drones loaded with sensors moisture deficits parts of fields using multispectral indices</li> <li>• Demonstrate how to set up the drone appropriately for capturing the required images and data for intended operation</li> <li>• Demonstrate how to use the feature of crop surveillance and crop health assessment for facilitating agricultural insurance and for cross verifying farmers' insurance claims</li> <li>• Demonstrate how to obtain 3D images /maps of existing soil to monitor potential soil health indicators</li> </ul>
<b>Classroom Aids:</b>	
Computer, Projection Equipment, PowerPoint Presentation and Software, Facilitator's Guide, Participant's Handbook.	
<b>Tools, Equipment and Other Requirements</b>	
Drone, applicable peripherals and sensors, Personal Protective Equipment, First Aid Kit, Equipment used in Medical Emergencies.	

## Module 15: Basic entrepreneurial activities for drone operators

### Mapped to AGR/N1018 v1.0

- Plan the enterprise in drone operations.
- Describe the ways to identify employability opportunities
- Describe the process of managing the entrepreneurial activities.
- Describe how to comply with rules and regulations

<b>Duration: 30:00</b>	<b>Duration: 22:00</b>
<b>Theory – Key Learning Outcomes</b>	<b>Practical – Key Learning Outcomes</b>
<ul style="list-style-type: none"> <li>• Explain the scope of work and area of operation</li> <li>• Explain about relevant government schemes and programs available</li> <li>• Explain about compliance with the government structural reforms and framework along with the applicable rules and regulation, legislations and approvals from authorised body while setting up the agricultural drone operation enterprise</li> <li>• State the recommended practices for efficient input resource management</li> <li>• Explain the relevant tax laws to ensure timely payment of relevant taxes and filing of IncomeTax Return (ITR) / GST, where applicable</li> <li>• Explain how to ensure effective team building at work</li> <li>• State the recommended practices for a stable enterprise by managing the relevant risks and fund investment</li> <li>• Explain digital methods for remittance of funds</li> <li>• List manufactures for purchase of suitable drone</li> <li>• Explain the needs and expectations with respect to the quality and price of the service for target customers</li> <li>• Explain the importance of service provider and customer hiring centres in the selected region</li> <li>• Explain about business risk management and insurance</li> </ul>	<ul style="list-style-type: none"> <li>• Identify the entrepreneurship/employability opportunities by coordinating with agri input companies, drone companies and public entities</li> <li>• Demonstrate the skills and competencies expected by the relevant organization</li> <li>• Select and arrange the necessary resources for the business operations</li> <li>• Identify the manufactures for purchase of suitable drone</li> <li>• Identify the target customers and assess their needs and expectations with respect to the quality and price of the service</li> <li>• Identify the service provider and customer hiring centres in the selected region</li> <li>• Prepare basic business plan for the agricultural entrepreneurship/business activities</li> <li>• identify appropriate sources of funding for entrepreneurship/business development</li> <li>• Demonstrate the usage of relevant and efficient technologies as per planning and availability of funds</li> <li>• Demonstrate how to coordinate with the various stakeholders for efficient and sustainable agri-business growth and development</li> <li>• Demonstrate the usage of relevant digital services such as e-commerce, e-payments, electronic</li> </ul>

<p>services</p> <ul style="list-style-type: none"> <li>• Explain different type of bank accounts and their uses</li> </ul>	<p>recordkeeping, etc.</p> <ul style="list-style-type: none"> <li>• Demonstrate the process of carrying out outreach programs to expand business</li> <li>• Demonstrate setting up of bank account with the required facilities to conduct business transactions</li> <li>• Demonstrate the process of maintaining book of accounts</li> <li>• Demonstrate the process of reviewing the business account regularly to ensure the profitability of the business</li> <li>• Demonstrate the internal and external audit of funds</li> </ul>
<p><b>Classroom Aids</b></p>	
<p>Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop</p>	
<p><b>Tools, Equipment and Other Requirements</b></p>	
<p>NA</p>	

## Module 16: Hygiene and cleanliness

### Mapped to NOS AGR/N9903 v3.0

#### Terminal Outcomes:

- Discuss how to adhere to personal hygiene practices.
- Demonstrate ways to ensure cleanliness around the workplace.

<b>Duration: 03:00</b>	<b>Duration: 07:00</b>
<b>Theory – Key Learning Outcomes</b>	<b>Practical – Key Learning Outcomes</b>
<ul style="list-style-type: none"> <li>• Explain the requirements of personal health, hygiene and fitness at work.</li> <li>• Describe common health-related guidelines laid down by the organizations/ Government at the workplace.</li> <li>• Explain the importance of good housekeeping at the workplace.</li> <li>• Explain the importance of informing the designated authority on personal health issues related to injuries and infectious diseases.</li> </ul>	<ul style="list-style-type: none"> <li>• Demonstrate personal hygiene practices to be followed at the workplace.</li> <li>• Demonstrate the correct way of washing hands using soap and water, and alcohol-based hand rubs.</li> <li>• Demonstrate the steps to follow to put on and take off a mask safely.</li> <li>• Show how to sanitize and disinfect one's work area regularly.</li> <li>• Demonstrate adherence to the workplace sanitization norms.</li> </ul>
<b>Classroom Aids:</b>	
Computer, Projection Equipment, PowerPoint Presentation and Software, Facilitator's Guide, Participant's Handbook.	
<b>Tools, Equipment and Other Requirements</b>	
Personal Protective Equipment, Cleaning Equipment and Materials, Sanitizer, Soap, Mask etc.	

## Module 17: Safety and emergency procedures

*Mapped to NOS AGR/N9903 v3.0*

### Terminal Outcomes:

- Describe how to adhere to safety guidelines.
- Show how to administer appropriate emergency procedures.

<b>Duration: 03:00</b>	<b>Duration: 07:00</b>
<b>Theory – Key Learning Outcomes</b>	<b>Practical – Key Learning Outcomes</b>
<ul style="list-style-type: none"> <li>• List the Personal Protective Equipment (PPE) required at the workplace.</li> <li>• Describe the common hazards and those caused due to chemicals/ pesticides/ fumigants at work place</li> <li>• Describe the basic safety checks to be done before the operation of any equipment</li> <li>• Describe the common first aid procedures to be followed in case of emergencies.</li> <li>• Explain the importance of reporting details of first aid administered, to the reporting officer/ doctor, in accordance with workplace procedures.</li> </ul>	<ul style="list-style-type: none"> <li>• Check various areas of the workplace for leakages, water-logging, pests, fire, etc.</li> <li>• Demonstrate how to safely use the PPE and implements it as applicable to the workplace.</li> <li>• Display the correct way of donning, doffing and discarding PPE such as face masks, hand gloves, face shields, PPE suits, etc.</li> <li>• Sanitize the tools, equipment and machinery properly.</li> <li>• Demonstrate the safe disposal of waste.</li> <li>• Demonstrate first aid procedures for dealing with accidents, fires and emergencies.</li> <li>• .</li> <li>• Demonstrate the use of emergency equipment in accordance with manufacturers' specifications and workplace requirements.</li> <li>• Prepare a list of relevant hotline/ emergency numbers.</li> </ul>
<b>Classroom Aids:</b>	
Computer, Projection Equipment, PowerPoint Presentation and Software, Facilitator's Guide, Participant's Handbook.	
<b>Tools, Equipment and Other Requirements</b>	
Personal Protective Equipment, First Aid Kit, Equipment used in Medical Emergencies.	

## Module 18: On-the-Job Training

*Mapped to QP- AGR/Q1006: Kisan Drone Operator*

**Recommended Duration: 120:00**

**Location: On Site**

### Terminal Outcomes

- Comprehend Stakeholders & their laws (Basic) as per Drone Rules 2021
- Basic flight principles in drone operation
- Prepare for the drone operation
- Procedures related to ATC & Radio telephony
- Fixed-wing Operations and Aerodynamics
- Rotorcraft Operations and Aerodynamics
- Hybrid Operations and Aerodynamics
- Weather and Meteorology
- Undertake drone equipment maintenance
- Perform Basic Assembly and Maintenance of drone
- Risk Assessment & Analysis
- Install and utilize payload
- Collection of Drone data & Analysis
- Flight Simulator Training
- Practice drone flying with Instructor/ Solo Flying
- Prepare the drone for application of pesticides and fertilizers
- Apply pesticides and fertilizers using the drone
- Safeguard the non-target while pesticide application
- Drone, sensors data processing software and soil nutrient spraying system
- Precautions for storage of crop nutrients/ pesticides
- Undertake post operation drone maintenance
- Undertake pre-application precautionary measures
- Follow precautionary measures during application
- Adhere to post application precautionary measures
- Identify employability opportunities
- Identify and plan for entrepreneurship opportunities in drone operations
- Follow the entrepreneurial practices
- Practice inclusive practices at workplace related to gender and PwD sensitization
- Communicate effectively at the workplace
- Maintain personal hygiene
- Maintain clean and safe workplace
- Administer appropriate emergency procedures

## Annexure

### Trainer Requirements

Trainer Prerequisites						
Minimum Educational Qualification	Specialization	Relevant Industry Experience		Training Experience		Remarks
		Years	Specialization	Years	Specialization	
BE/BTech	Aeronautical Engineering	0	UAV/Drone flight Operations	0		Certificate course in drone flight operations from DGCA recognized organization
Graduate	Agriculture/ Horticulture/ Agriculture Engineering	0.5	UAV/Drone flight Operations	0		Certificate course in drone flight operations from DGCA recognized organization
Graduate	In Any stream except Agriculture/ Horticulture/ Agriculture Engineering/ Aeronautical Engineering	0.5	UAV/Drone flight Operations	0		Certificate course in drone flight operations from DGCA recognized organization

Trainer Certification	
Domain Certification	Platform Certification
Certified for Job Role “ <b>Kisan Drone Operator</b> ”, mapped to QP: “AGR/Q1006, v1.0”, Minimum accepted score is 80%	Recommended that the Trainer is certified for the Job Role: “Trainer”, mapped to the Qualification Pack: “MEP/Q2601, v1.0”. The minimum accepted score as per MEPS guidelines is 80%.



## Assessor Requirements

Assessor Prerequisites						
Minimum Educational Qualification	Specialization	Relevant Industry Experience		Training/Assessment Experience		Remarks
		Years	Specialization	Years	Specialization	
12 <sup>th</sup> /H.sc	Any stream	4	UAV /Drone operations			For Ex-military. Certificate course in drone flight operations from DGCA recognized organization
B. E	Aeronautical engineering	3	UAV/ Drone operations			Certificate course in drone flight operations from DGCA recognized organization
B. Tech	Aerospace engineering/Aeronautical engineering/CSE/Electronics/Automobile/Mechanical/Agriculture/Agriculture Engineering	3	UAV/ Drone /Agriculture drone operations			Certificate course in drone flight operations from DGCA recognized organization
B.sc	Agriculture	3	Agriculture UAV/ Drone operations			Certificate course in drone flight operations from DGCA recognized organization
M. Tech	Aerospace/Avionics/Aeronautics/Robotics/Engineering/CSE/Electronics/Automobile/Mechanical/Agriculture/Agriculture Engineering	2	UAV/ Drone /Agriculture drone operations			Certificate course in drone flight operations from DGCA recognized organization

M. Sc	Agriculture	2	Agriculture UAV/ Drone operations			Certificate course in drone flight operations from DGCA recognized organization
PhD	Aerospace/Avionics/Aeronautics/ Robotics/Engineering/CSE  /Electronics/Automobile/Mechanical/Agriculture	1	UAV/ Drone /Agriculture drone operations			Certificate course in drone flight operations from DGCA recognized organization

Assessor Certification	
Domain Certification	Platform Certification
Certified for Job Role “ <b>Kisan Drone Operator</b> ”, mapped to QP: “AGR/Q1006, v1.0”, Minimum accepted score is 80%	Certified for the Job Role: “Assessor”, mapped to the Qualification Pack: “MEP/Q2701, v1.0”, with a minimum score of 80%.

## Assessment Strategy

### Assessment System Overview

In Agriculture Sector it is of ultimate importance that individuals dealing with crop production or livestock have the requisite knowledge and competencies to undertake the task. Based on the Assessment Criteria, SSC in association with empaneled AAs, define the test structure for the given job roles to cover the required skills and competencies. Assessment strategy consists of the following:

1. Multiple Choice Questions: To assess basic knowledge (Objective/Subjective)
2. Viva: To assess awareness on processes (Oral and/or written questioning)
3. Practical: To evaluate skills and identify competencies. (Observation)

Assessments for knowledge and awareness on processes may be conducted through 'real-time' internet-based evaluation or by conducting the same 'offline' through TABs. Skills and competencies are to be assessed by conducting 'practical' on the ground through qualified and ToA certified assessors.

An individual must have adequate knowledge and skills to perform a specific task, weightage for different aspects of the assessment is given as follows:

- Multiple Choice Questions: 20%-30%, depending on the specific QP
- Viva: 20%
- Practical: 50% - 60% (Involves demonstrations of applications and presentations of procedures/tasks and other components)
- Assessment will be carried out by certified assessors through empaneled assessment partners. Based on the results of the assessment; ASCI will certify the learners/candidates

### Testing Environment

Assessments are conducted on laptops, Mobiles and android tablets via both offline and online mode depending on the internet connectivity at the assessment location.

In remote locations/villages, assessments get delivered through tablets without the requirement of the Internet.

- Multilingual assessments (ASCI is conducting the assessments in 13 + languages pan India)
- Rubric driven assessments in Practical/Viva sections and responses recorded accordingly
- All responses, data, records and feedback are stored digitally on the cloud
- Advanced auto-proctoring features – photographs, time-stamp, geographic-tagging, toggle- screen/copy-paste disabled, etc.
- Android-based monitoring system
- End to end process from allocation of a batch to final result upload, there is no manual intervention

- Assessment will normally be fixed for a day after the end date of the training / within 7 days of completion of training.
- Assessment will be conducted at the training venue
- The room where assessment is conducted will be set with proper seating arrangements with enough space to curb copying or other unethical activities
- Question bank of theory and practice will be prepared by ASCI /assessment agency and approved ASCI. Only from approved Question Bank assessment agency will prepare the question paper. Theory testing will include multiple-choice questions, pictorial questions, etc. which will test the trainee on his theoretical knowledge of the subject.
- The theory, practical and viva assessments will be carried out on the same day. In case of a greater number of candidates, the number of assessors and venue facilitation be increased and facilitated

<b>Assessment</b>			
<b>Assessment</b>	<b>Formative or Summative</b>	<b>Strategies</b>	<b>Examples</b>
Theory	Summative	MCQ/Written exam	Knowledge of facts related to the job role and functions. Understanding of principles and concepts related to the job role and functions
Practical	Summative	Structured tasks/Demonstration	Practical application /Demonstration /Application tasks
Viva	Summative	Questioning and Probing	Mock interviews on the usability of job roles/advantages /importance of adherence to procedures. Viva will be used to gauge trainee's confidence and correct knowledge in handling the job situation

The question paper is pre-loaded in the computer /Tablet and it will be in the language as requested by the training partner.

## Assessment Quality Assurance framework

### Assessment Framework and Design:

Based on the Assessment Criteria, SSC in association with AAs will define the test structure for the given roles to cover the required skills and competencies. ASCI offer a bouquet of tools for multi-dimensional evaluation of candidates covering language, cognitive skills, behavioral traits and domain knowledge.

**Theoretical Knowledge** - Item constructs and types are determined by a theoretical understanding of the testing objectives and published research about the item types and constructs that have shown statistical validity towards measuring the construct. Test item types that have been reported to be coachable are not included. Based on these, items are developed by domain experts. They are provided with comprehensive guidelines of the testing objectives of each question and other quality measures.

**Type** – Questions based on Knowledge Required, Case-based practical scenario questions and automated simulation-based questions.

**Practical Skills** - The practical assessments are developed taking into consideration two aspects: what practical tasks is the candidate expected to perform on the job and what aspects of the job cannot be judged through theoretical assessments. The candidates shall be asked to perform either an entire task or a set of subtasks depending on the nature of the job role

**Type** – Standardized rubrics for evaluation against a set of tasks in a demo/practical task

**Viva Voce** - Those practical tasks which cannot be performed due to time or resource constraints are evaluated through the viva mode. Practical tasks are backed up with Viva for thorough assessment and complete evaluation

**Type** – Procedural questions, dos and don'ts, subjective questions to check the understanding of practical tasks.

The assessor has to go through an orientation program organized by the Assessment Agency. The training would give an overview to the assessors on the overall framework of QP evaluation. The assessor shall be given a NOS and PC level overview of each QP as applicable. The overall structure of assessment and objectivity of the marking scheme will be explained to them. The giving of marks will be driven by an objective framework that will maintain the standardization of the marking scheme.

### Type of Evidence and Evidence Gathering Protocol:

During the assessment the evidence collected by AAs and ASCI are:

- GeoTagging to track ongoing assessment
- AA's coordinator emails the list of documents and evidence (photos and videos) to the assessor one day before the assessment. The list is mentioned below:
  - Signed Attendance sheet
  - Assessor feedback sheet
  - Candidate feedback sheet

- Assessment checklist for assessor
  - Candidate Aadhar/ID card verification
  - Pictures of the classroom, labs to check the availability of adequate equipment's and tools to conduct the training and assessment
  - Pictures and videos of Assessment, training feedback and infrastructure.
- Apart from the Assessor, a Technical assistant is popularly known as Proctor also ensures the proper documentation and they verify each other's tasks.
  - To validate their work on the day of the assessment, regular calls and video calls are done.
  - On-boarding and training of the assessor and proctor are done on a timely basis to ensure that the quality of the assessment should be maintained.
  - Training covers the understanding of QP, NSQF level, NOS and assessment structure

### **Methods of Validation**

- Morning Check (Pre-Assessment): Backend team of AA calls and confirms assessor/technical SPOC event status. Assessor/Technical SPOC are instructed to reach the centre on time by 9:30 AM / as decided with TC and delay should be highlighted to the Training Partner in advance.
- Video Calls: Random video calls are made to the technical SPOC/assessor so as to keep a check on assessment quality and ensure assessment is carried out in a fair and transparent manner
- Aadhar verification of candidates
- Evening Check (Post Assessment): Calls are made to the ground team to ensure the event is over by what time and the documentation is done properly or not.
- TP Calling: To keep a check on malpractices, an independent audit team calls the TP on a recorded line to take confirmation if there was any malpractice activity observed in the assessment on part of the AA/SSC team. If calls are not connected, an email is sent to TP SPOC for taking their confirmation
- Video and Picture Evidence: Backend team collects video and pictures for assessment on a real-time basis and highlights any issue such as students sitting idle/ trainer helping the candidates during the assessment.
- Surprise Visit: Time to time SSC/AA Audit team can visit the assessment location and conduct a surprise audit for the assessment carried out by the ground team.
- Geo Tagging: On the day of the assessment, each technical SPOC is required to login into our internal app which is Geotagged. Any deviation with the centre address needs to be highlighted to the assessment team on a real-time basis.

### **Method for assessment documentation, archiving, and Access:**

- ASCI have a fully automated result generation process in association with multiple AAs
- Theory, Practical and Viva marks form the basis of the results and encrypted files generated to avoid data manipulation. All responses were captured and stored in the System with Time-Stamps at the end of AAs and SSC. NOS-wise and PC-wise scores can

be generated.

- Maker Checker concept: One person prepares the results and another audit result which is internally approved by AA at first and then gets vetted at the end of SSC
- All softcopies of documents are received from the on-ground tech team over email. The same is downloaded by our internal backend team and saved in Repository. The repository consists of scheme-wise folders. These scheme-wise folders have two job role-specific folders. These specific folders have Year wise and Month wise folders where all documents are saved in Batch specific folders. All Hard copies are filed and stored in the storeroom.

#### ***Result Review & Recheck Mechanism –***

- Time-stamped assessment logs
- Answer/Endorsement sheets for each candidate
- Attendance Sheet
- Feedback Forms: Assessor feedback form, Candidate feedback form, TP feedback form
- The results for each of the candidates shall be stored and available for review (retained for 5 years/ till the conclusion of the project or scheme)

# References

## Glossary

Term	Description
<b>Declarative Knowledge</b>	Declarative knowledge refers to facts, concepts and principles that need to be known and/or understood in order to accomplish a task or to solve a problem.
<b>Key Learning Outcome</b>	The key learning outcome is the statement of what a learner needs to know, understand and be able to do in order to achieve the terminal outcomes. A set of key learning outcomes will make up the training outcomes. Training outcome is specified in terms of knowledge, understanding (theory) and skills (practical application).
<b>OJT (M)</b>	On-the-job training (Mandatory); trainees are mandated to complete specified hours of training on-site
<b>OJT (R)</b>	On-the-job training (Recommended); trainees are recommended the specified hours of training on-site
<b>Procedural Knowledge</b>	Procedural knowledge addresses how to do something, or how to perform a task. It is the ability to work or produce a tangible work output by applying cognitive, affective or psychomotor skills.
<b>Training Outcome</b>	Training outcome is a statement of what a learner will know, understand and be able to do upon the completion of the training.
<b>Terminal Outcome</b>	The terminal outcome is a statement of what a learner will know, understand and be able to do upon the completion of a module. A set of terminal outcomes help to achieve the training outcome.



## Acronyms and Abbreviations

Term	Description
AGR	Agriculture
UA	Unmanned Aircraft
RPA	Remotely Piloted Aircraft
UAVS	Unmanned Aircraft Vehicle System
FRTOL	Flight Radio Telephony Operator License
NOS	National Occupational Standard (s)
NSQF	National Skills Qualifications Framework
OJT	On-the-job Training
QP	Qualifications Pack
DGCA	Directorate General of Civil Aviation
RPTO	Remote Pilot Training organization
PwD	People with Disability
PPE	Personal Protective Equipment
ATC	Air Traffic Control
METAR	Met Terminal Aviation Routine Weather Report