GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT & ENTREPRENEURSHIP
DIRECTORATE GENERAL OF TRAINING

COMPETENCY BASED CURRICULUM

DRONE PILOT (JUNIOR)

(Duration: Six Months)

CRAFTSMEN TRAINING SCHEME (CTS)

NSQF LEVEL- 3



SECTOR – AEROSPACE & AVIATION

CENTRAL STAFF TRAINING AND RESEARCH INSTITUTE

Kolkata-700091

DRONE PILOT(JUNIOR)

(Non-Engineering Trade)

(Revised in August 2025)

Version: 3.0

CRAFTSMEN TRAINING SCHEME

(CTS) NSQF LEVEL - 3

Developed By

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1. COURSE INFORMATION

During the six months duration of Drone Pilot (Junior) Trade a candidate is trained on professional skills and professional knowledge related to job roles. In addition to this a candidate is entrusted to undertake project work and Extra-Curricular Activities to build up confidence. The broad components covered related to the trade are categorized in six months duration as below: -

The trainee begins with learning first aid, firefighting and various safety practices for working in industrial environment. Recognizes DGCA Safety Regulations & develop safety attitude while flying RPA. Identifies & selects different types of RPA & Fundamentals of Flight (Aerodynamics), ATC procedures & Radio Telephony, different regulations of DGCA, Civil Aviation Requirements, Weather and meteorology. Develops & applies knowledge on RPA system and sub systems. Identifies & selects Electronic Speed Controllers (ESC) & flight Controllers for RPAs. Recognizes application of Batteries, Chargers & Connectors, Transmitters & Receivers, Cameras, Gimbals & other payloads. Applies knowledge of Ground Control Stations & FPV. Performs Assembling, MRO & battery care of RPAS. Identifies & selects Basic operating features of a RPA Flight Simulator. Fly a RPA with instructor and then perform solo flight (Virtual reality training & live RPA flying). Carry out entire flying operations from pre-flight checks to after flight checks while flying a RPA in simulator training & live training.

Also, the trainee will learn to communicate with required clarity, understand technical English, environment regulation, productivity and enhance self-learning.

2. TRAINING SYSTEM

2.1 GENERAL

The Directorate General of Training (DGT) under Ministry of Skill Development & Entrepreneurship offers a range of vocational training courses catering to the need of different sectors of the economy/ labour market. The vocational training programs are delivered under the aegis of Directorate General of Training (DGT). Craftsman Training Scheme (CTS) and Apprenticeship Training Scheme (ATS) are two pioneer programs of DGT for propagating vocational training.

'Drone Pilot (Junior)' Trade under CTS is one of the newly designed courses. The CTS courses are delivered nationwide through network of ITIs. The course is of six months duration. It mainly consists of Domain area and Core area. The Domain area (Trade Theory and Trade Practical) imparts professional skills and knowledge, while Core area (Employability Skills) imparts requisite life skills. After passing out of the training programme, the trainee is awarded National Trade Certificate (NTC) by DGT which is recognized worldwide.

Candidates broadly need to demonstrate that they are able to:

- Read and interpret technical parameters/ documentation, executes work, identify necessary materials and tools.
- Perform tasks with due consideration to safety rules, accident prevention regulations.
- Apply professional knowledge & employability skills while performing the job and maintenance work.
- Check the circuit/ equipment/ panel as per drawing for functioning, identify and rectify faults/defects.
- Document the technical parameters related to the task undertaken.

2.2 PROGRESSION PATHWAYS

- Can join industry as Drone Pilot and will progress further as Senior Drone Pilot, Supervisor and can rise up to the level of Manager.
- Can become Entrepreneur in the related field.
- Can join Aviation industry/other sectors as drone Pilot for implementing different applications of Drone.
- Can work in a Drone service center or start own Drone Training Academy.
- Can join Apprenticeship programme in different types of industries leading to National Apprenticeship certificate (NAC).
- Can join Advanced Diploma (Vocational) courses under DGT as applicable.

2.3 COURSE STRUCTURE

Table below depicts the distribution of training hours across various course elements during a period of six months: -

S No.	Course Element	Notional Training Hours
2.	Professional Skill (Trade Practical)	420
3.	Professional Knowledge (Trade Theory)	120
4.	Employability Skills	60
	Total	**600**

2.4 ASSESSMENT & CERTIFICATION

The trainee will be tested for his/her skill, knowledge and attitude during the period of the course and at the end of the training program as notified by the DGT from time to time.

a) The Continuous Assessment (Internal) during the period of training will be done by **Formative Assessment Method** by testing for assessment criteria listed against learning outcomes. The training institute has to maintain an individual trainee portfolio as detailed in assessment guideline. The marks of internal assessment will be as per the formative assessment template provided on www.cstaricalcutta.gov.in or www.bharatskills.gov.in.

b) The final assessment will be in the form of summative assessment. The All-India Trade Test for awarding NTC will be conducted by DGT as per the guidelines. The pattern and marking structure is being notified by DGT from time to time. **The learning outcome and assessment criteria will be basis for setting question papers for final assessment. The examiner during final examination will also check** individual trainee's profile as detailed in assessment guideline before giving marks for practical examination.

2.4.1 PASS REGULATION

For the purposes of determining the overall result, weightage of 100% is applied for six months and one-year duration courses and 50% weightage is applied to each examination for two years courses. The minimum pass percentage for Trade Practical and Formative assessment are 60% & for all other subjects is 33%.

2.4.2 ASSESSMENT GUIDELINE

Appropriate arrangements should be made to ensure that there will be no artificial barriers to assessment. The nature of special needs should be taken into account while undertaking assessment. Due consideration should be given while assessing for teamwork, avoidance/reduction of scrap/wastage and disposal of scarp/wastage as per procedure, behavioral attitude, sensitivity to environment and regularity in training. The sensitivity

towards Occupational Safety, Health and Environment (OSHE) and self-learning attitude are to be considered while assessing competency.

Assessment will be evidence based comprising some of the following:

- Job carried out in labs/workshop
- Record book/ daily diary
- Answer sheet of assessment
- Viva-voce
- Progress chart
- Attendance and punctuality
- Assignment
- Project work
- Computer based multiple choice question examination
- Practical Examination

Evidences and records of internal (Formative) assessments are to be preserved until forthcoming examination for audit and verification by examination body. The following marking pattern to be adopted for formative assessment:

Marks Allotted during Assessment	Performance Level	Evidence
Marks between 60% to 75%	For performance in this grade, the candidate should produce work which demonstrates attainment of an acceptable standard of craftsmanship with occasional guidance, and due regard for safety procedures and practices.	• Demonstration of good skill in the use of hand tools, machine tools and workshop equipment. • 60-70% accuracy achieved while undertaking different work with those demanded by the component/job. • A fairly good level of neatness and consistency in the finish. • Occasional support in completing the project/job.
Marks above 75% to 90%	For this grade, a candidate should produce work which demonstrates attainment of a reasonable standard of craftsmanship, with little guidance, and regard for safety procedures and practices.	• Good skill levels in the use of hand tools, machine tools and workshop equipment. • 70-80% accuracy achieved while undertaking different work with those demanded by the component/job. • A good level of neatness and consistency in the finish. • Little support in completing the project/job.

Marks Above 90%	For performance in this grade, the candidate, with minimal or no support in organization and execution and with due regard for safety procedures and practices, has produced work which demonstrates attainment of a high standard of craftsmanship.	• High skill levels in the use of hand tools, machine tools and workshop equipment. • Above 80% accuracy achieved while undertaking different work with those demanded by the component/job. • A high level of neatness and consistency in the finish. • Minimal or no support in completing the project.

3. JOB ROLE

Brief Description of Job Roles:

Drone Pilot (Junior); remotely controls Drone/Unmanned Arial Vehicle (UAV) which is a flying robot and can fly autonomously through software-controlled flight plans in their embedded systems working in conjunction with onboard sensors and GPS.

Can take photography for Real estate, Film Making, special events, Journalism, Agriculture etc., can apply it for liquid pesticides, fertilizers, herbicides, seeding, farm land mapping & surveying, crop theft or theft by animal etc. Provides key surveying capabilities and point the way to new excavation sites for mapping archaeological remains. Inspects infrastructure from power lines to pipelines, which are often in hard-to-reach, dangerous places to mitigate hazardous, time consuming and expensive work. Obtain high-quality, detailed images of overhead utility lines to look for damage, corrosion and more. They are able to provide engineers with real-time data, images and post-inspection analysis—the benefits of which are causing a shift away from traditional utility inspection methods. Carries on commercial Inspection of Bridges, Cell & TV Towers, Wind Turbines, Power lines, Pipe Lines & even solar panels. Checks roofs, chimneys, sliding, bricks and other structures for exterior damage as Residential Home Inspection. Uses RPA for wild life Management & conservation where wildlife drones can be used in many different ways, from small multi-rotor units that can scare invasive birds away from crops, to fixed- wing aircraft that fly above rainforests to spot orangutan nests. Individual may use it for law and order and aerial surveillance in police departments for Public Service Surveillance. Applies it in E-Commerce: for a variety of purposes: to take inventory, streamline its distribution system and use for deliveries to customers. Can take part in Drone Aerobatics show & Aerial Advertising.

Aircraft Pilots and Related Associate Professionals, other; include associate professionals who control the operation of mechanical, electrical and electronic equipment, in order to navigate aircraft for transporting passengers, mail and freight and perform related pre-flight and in-flight tasks not classified elsewhere.

Reference NCO-2015:

a) 3153.9900 - Aircraft Pilots and Related Associate Professionals, Other

Reference NOS:

i) AAS/N9422
ii) AAS/N9401
iii) AAS/N9401
iv) AAS/N9428
v) AAS/N9428
vi) AAS/N9427
vii) AAS/N9403
viii) AAS/N9429
ix) AAS/N9429
x) AAS/N9404

4. GENERAL INFORMATION

Name of the Trade	**DRONE PILOT (JUNIOR)**
Trade Code	DGT/2010
NCO – 2015	3153.9900
NOS covered	AAS/N9422, AAS/N9401, AAS/N9401, AAS/N9428, AAS/N9428, AAS/N9427, AAS/N9403, AAS/N9429, AAS/N9429, AAS/N9404,
NSQF Level	Level – 3
Duration of the Trade	Six Months
Entry Qualification	Passed 10th class examination with Science and Mathematics or with vocational subject in same sector or its equivalent.
Minimum Age	18 years as on first day of academic session.
Eligibility for PwD	LD, DEAF, LC, DW, AA, LV, HH
Unit Strength (No. of Student)	24 (There is no separate provision of supernumerary seats)
Space Norms	35 Sq. m
Power Norms	3 KW
Instructors Qualification for:	
(i) Drone Pilot (Junior) Trade	B.Voc/Degree in Aeronautical engineering/ ECE/ EEE/ Mechatronics from AICTE/UGC recognized university/ college with **one year of teaching or industry experience** in piloting drones. Candidates with experience of a drone project or a project experience in Robotics are preferred. **OR** 03 years Diploma in Aeronautical engineering/ ECE/ EEE/ Mechatronics from AICTE / recognized technical board of education or relevant Advanced Diploma (Vocational) from DGT with **two year of teaching or industry experience** in piloting drones. Candidates with experience of a drone project or a project experience in Robotics are preferred. **OR** NTC/ NAC passed in "Drone Pilot (Junior)" with **three years of teaching or industry experience** in piloting drones. Candidates with experience of a drone project or a project experience in Robotics are preferred.

	<u>Essential Qualification:</u> Regular/ RPL variants of National Craft Instructor Certificate (NCIC) in Drone Pilot under DGT. ***Note:*** ***1. Out of two Instructors required for the unit of 2 (1+1), one must have at least 200 hours of flying experience in the field.*** ***2. Out of two Instructors required for the unit of 2 (1+1), one must have Degree/Diploma and other must have NTC/NAC qualifications.***
(ii) Employability Skill	MBA/ BBA / Any Graduate/ Diploma in any discipline with **Two years' of teaching or industry experience with short term ToT Course** in Employability Skills conducted by DGT institutions. (Must have studied English/ Communication Skills and Basic Computer at 12th / Diploma level and above) **OR** Existing Social Studies Instructors in ITIs with short term ToT Course in Employability Skills conducted by DGT institutions.
Minimum Age for Instructor	21 Years
List of Tools and Equipment	As per Annexure – I

5. LEARNING OUTCOME

Learning outcomes are a reflection of total competencies of a trainee and assessment will be carried out as per the assessment criteria.

5.1 LEARNING OUTCOME:

Sl. No.	NOS CODE	Learning Outcome	Duration		
			Practical	Theory	Total
1.	AAS/N9422	Interpret DGCA Safety Regulations & observe safety guidelines, ATC procedures & Radio Telephony, Weather and meteorology as a RPA Pilot in flying a RPA.	60	15	75
2.	AAS/N9401	Identify & select different types of RPA and illustrate Fundamentals of Flight (Aerodynamics) and Different Airframes in RPA flying.	35	10	45
3.	AAS/N9401	Identify & select various parts of RPA like assembling Electric motors, Batteries, Chargers, Connectors, Electronic Speed Controllers (ESC), Transmitters, Receivers, sensors and flight Controllers.	60	15	75
4.	AAS/N9428	Identify and compare the weather effects and analyze the performance of RPA.	25	5	30
5.	AAS/N9428	Perform installation, maintain and configuration of ground control station software.	45	15	60
6.	AAS/N9427	Perform preflight inspection and assembling of basic RPA parts like landing gears, propellers, antennas and any wire / electronics hanging outside.	45	15	60
7.	AAS/N9403	Carryout basic training to fly RPA in flight simulator.	45	15	60
8.	AAS/N9429	Plan and organize training to fly RPA in controlled environments.	45	15	60
9.	AAS/N9429	Perform and obtain training to fly RPA in uncontrolled airspace including VLOS and BVLOS flight.	25	5	30
10.	AAS/N9404	Apply emergency protocols to control and manage RPA flight.	35	10	45
Employability Skills				**60**	**60**
Grand Total			**420**	**120**	**540**

6. ASSESSMENT CRITERIA

LEARNING OUTCOMES	ASSESSMENT CRITERIA
1. Interpret DGCA Safety Regulations & observe safety guidelines, ATC procedures & Radio Telephony, Weather and meteorology as a RPA Pilot in flying a RPA. AAS/N6301	• Apply workshop safety norms. • Identify & select safety rules while flying a RPA. • Apply DGCA safety regulations. • Recognize Do's and Don'ts of drone flying. • Apply remote pilot, done registration and NPNT permission before flight. • Recognize issues Drone pilots encounter including airspace, traffic patterns etc. • Perform Radio telephony using Standard radio terminology and RT Phraseology. • Communicate with ATC including Position, Altitude Reporting etc. • Identify & prepare specific Flight Planning Procedures for Specific drone flights. • Take METAR from MET office/ ATC before flying.
2. Identify & select different types of RPA and illustrate Fundamentals of Flight (Aerodynamics) and Different Airframes in RPA flying. AAS/N9401	• Identify & select different types of RPA. • Identify basic components of RPA. • Recognize basic principles of flying like Bernoulli's Principle etc. • Recognize multi rotor design, various configurations, airframe Sizes and construction materials. • Identify different propeller designs.
3. Identify & select various parts of RPA like assembling Electric motors, Batteries, Chargers, Connectors, Electronic Speed Controllers (ESC), Transmitters, Receivers, sensors and flight Controllers. AAS/N9401	• Learn motor Specifications and their performance RPA. • Identify different electricity fundamentals (Wattage, voltage, • Amperage and their relationship) and soldering techniques. • Identify parallel vs. serial arrangements of batteries. • Perform charging, cell balancing and explore various connectors. • Learn ESC performance, ESC calibration and assembly procedure (both mechanical and electrical). • Recognize different sensors & their applications in RPAS. • Identify GPS applications in RPA flying. • Perform power up connections • Identify different radio control systems, controllers, transmitters and receivers, Frequency bands and programming transmitters.

4. Identify and compare the weather effects and analyze the performance of RPA. AAS/N6302	• Identify the factors that influence the performance of the RPAS. • Identify and learn measurement of atmosphere pressure, effect of obstructions on wind speed and direction. • Identify and learn measurement of temperature and humidity, Rain and solar radiation.
5. Perform installation, maintain and configuration of ground control station software. AAS/N6302	• Knowledge of GCS telemetry and Track RPA using telemetry. • Learn GCS features and possible flight plans using GCS. • Identify Flight mode operation, GUI parameters, Maps and user control operation. • Perform 3D mapping and modeling. • Perform Geographic Map along with UAV location, UAV trajectory, camera view polygon, waypoints and flight plan.
6. Perform preflight inspection and assembling of basic RPA parts like landing gears, propellers, antennas and any wire / electronics hanging outside. AAS/N6301	• List out the pre-flight inspection. • Perform any three inspection procedures. • Perform assembling & disassembling of RPA. • Perform assembly of landing gears, propellers, antennas and electronics. • Remotely-piloted aircraft system (RPAS) controls, know your remote control, safety precautions, pre-flight checks, arming and disarming. • Method of RPA inspection Charging the battery Cleaning the RPA Storage Maintenance resources and standards.
7. Carryout basic training to fly RPA in flight simulator. AAS/N9403	• Identify Basic operating features of a RPA flight simulator. • Select different aircrafts/RPAS and aerodromes. • Carry out Demo flight in RPA Flight Simulator. • Perform Pre-flight checks and start-up. • Prepare & coordinate RPA flight. • Take-off RPA and carry out flight stage. • Perform in-flight checks. • Do Approach and safe landing. • Perform post flight checks. • Identify emergency and handle it accordingly. • Tackle In flight emergencies, Loss of link, Fly-aways (Straying). • Loss of power, Control surface failures etc. • Perform Practical flying with instructor in RPA simulator. • Fly a live RPA with instructor. • Fly a live RPA without instructor/Solo.

8. Plan and organize training to fly RPA in controlled environments. AAS/N6302	• Explain the requirement of flying RPA in a controlled environment. • Operate a small RPA in a controlled environment. • Demonstrate flying the RPAS in left/right and forward/backward motion, square pattern, circle. • Demonstrate flight mode such as takeoff, loiter, alt hold. • Learn to land in GPS failsafe, radio failsafe and battery failsafe. • RPAS controls, safety precautions, pre-flight checks, takeoff, learn basic flight modes such as manual, stabilize, alt hold and land. • Learn to upgrade the autopilot / system firmware and test the machine in a controlled environment. • Explore camera options, resolution and perform operation to full camera controls Pan/Tilt & Zoom In/Out.
9. Perform and obtain training to fly RPA in uncontrolled airspace including VLOS and BVLOS flight. AAS/N6302	• Apply knowledge of VLOS (visual line of sight) and BVLOS (Beyond Visual Line Of Sight) and identify safety practices for BVLOSand VLOS. • Perform Secure Communication link between UAV and GCS. • Identify & select other pay load possibilities. • Identify different payloads including cameras like Lidar, Thermal, RGB, Hyper spectral etc. • Perform autonomous waypoint navigation (pre-defined as well as dynamically adjustable waypoints during flight). • Remotely Piloted mode for video-based navigation (RPV Mode). • Learn Geographic Map along with UAV location, UAV trajectory, camera view polygon, waypoints and flight plan. • Fly RPA for application specific including Surveillance, Agriculture and Inspection.
10. Apply emergency protocols to control and manage RPA flight. AAS/N9403	• Identify loss of aircraft control. Perform activate the aircraft's Return to Home (RTH). • Identify emergency and handle it accordingly. • Identify emergencies like Aircraft structural failure, loss of power – battery, motor, Loss of GPS and loss of lights at night. • Maintain Visual Line of Sight (VLOS) with the aircraft for as long as possible. • Learn where to fly and how to fly legally and How you fly it in uncontrolled airspace.

7. TRADE SYLLABUS

SYLLABUS FOR DRONE PILOT (JUNIOR) TRADE			
DURATION: SIX MONTHS			
Duration	**Reference Learning outcome**	**Professional Skills (Trade Practical)**	**Professional Knowledge (Trade Theory)**
Professional Skill 60 Hrs.; Professional Knowledge 15 Hrs.	1. Interpret DGCA Safety Regulations & observe safety guidelines, ATC procedures & Radio Telephony, Weather and meteorology as a RPA Pilot in flying a RPA.	1. Visit to various sections of the institute and identify location of various installations. 2. Identify safety signs for danger, warning, caution & personal safety message. 3. Practice Use of Personal Protective Equipment (PPE). 4. Practice elementary first aid. 5. Practice Preventive measures for electrical accidents & steps to be taken in such accidents. 6. Practice Use of Fire extinguishers. 7. Practice workshop safety norms. 8. Identify safety rules while flying a RPA. 9. Practice DGCA safety regulations, Do's and Don'ts. 10. Recognize issues RPA pilots encounter including airspace, traffic patterns etc. 11. Practice Radio telephony using Standard radio terminology and RT Phraseology. 12. Communicate with virtual ATC including Position, Altitude Reporting etc. 13. Identify specific Flight Planning Procedures for specific RPA flights.	Familiarization with the working of Industrial Training Institute system. Importance of safety and precautions to be taken in the industry/ shop floor. Introduction to PPEs. Introduction to First Aid. Importance of housekeeping & good shop floor practices. Occupational Safety & Health: Health, Safety and Environment guidelines, legislations & regulations as applicable. Importance of adopting a “safety attitude” when is flying a RPA. Workshop safety norms and outdoor flying safety regulations. Regulations of DGCA, Civil Aviation Requirements: Classification, Basic Air Regulations, Salient points, Do's and Don'ts. Issues aircraft pilots encounter including airspace, traffic patterns, and safe attitudes. Understanding ATC operations Airspace Structure and Airspace Restrictions with knowledge of No RPA Zones

		14. Recognize importance of Weather and meteorology in RPA flight. 15. Take METAR from mini weather station and MET office/ ATC before flying.	Communicating with ATC including Position and Altitude Reporting Flight Planning Procedures Collision Avoidance Radio Telephony (RT) techniques Standard radio terminology and RT Phraseology Practice Session in Radio Communication. Weather and meteorology: The standard atmosphere, Measuring air pressure, Heat and temperature, Wind, Moisture, cloud formation Met Terminal Aviation Routine Weather Report (METAR).
Professional Skill 35 Hrs; Professional Knowledge 10 Hrs	2. Identify & select different types of RPA and illustrate Fundamentals of Flight (Aerodynamics) and Different Airframes in RPA flying.	16. Identify Different types of RPAS i.e single rotor, multi rotor and hybrid. 17. Select basic components and RPAS. 18. Fundamentals of flight aerodynamics 19. Recognize basic principles of flying like Bernoulli's Principle etc. 20. Apply principles of flight to RPAS.	Different types of RPAS, Nomenclatures, and History of aerial RPAS, reputation, airframe, configurations, basic components, and current/future uses of RPAS. Introduction to aerodynamics, history of Flight, Newton's Laws of Motion, Bernoulli's Principle, four forces of Fight, three axes of Fight how they apply to RPA Flight.
Professional Skill 60 Hrs; Professional Knowledge 15 Hrs	3. Identify & select various parts of RPA like assembling Electric motors, Batteries, Chargers, Connectors, Electronic Speed Controllers (ESC), Transmitters, Receivers, sensors and flight	21. Identify each component in RPAS. 22. Perform assembling & disassembling of RPAS. 23. Recognize single & multi rotor design, various configurations, airframe sizes and construction materials. 24. Identify different propeller designs and choose appropriate propeller. 25. Electricity fundamentals (Wattage, voltage, Amperage and their relationship) and soldering techniques. 26. Calculate motor ratings for	History of helicopter design, early multi rotor design, various Configurations, airframe sizes and construction materials. History of propeller design, fixed-pitch and constant speed blades, airfoil design, size, pitch, and blade-count including balancing tips and construction materials. History of batteries, various makeup's, reactions and chemistry, parallel vs. serial arrangements, rechargeable batteries, Li-Po battery characteristics, charging, cell

	Controllers.	load capabilities for a RPA build. 27. Identify parallel vs. serial arrangements of batteries. 28. Practice charging, cell balancing and explore various connectors. 29. Identify different role of FCs and ESCs. And its calibration 30. Recognize different sensors & their applications in RPAS. 31. Identify GPS applications in RPA flying. 32. Identify different radio control systems, controllers, transmitters and receivers, Frequency bands and.	balancing and various connectors. AC/DC motor differences, amperage and voltage ratings, history of electric motors, brushed vs. brushless motors, Kv ratings, and calculations of motor capabilities for a RPA build. Introduction to the history radio control systems, controllers, transmitters and receivers, Frequency bands and programming transmitters. Introduction to role of ESCs, how they work, PWM, PPM, ESC calibration, Simon KVs. BLHeli firmware options and BEC, OPTO, and UBEC. Introduction to role of flight controllers, how they work, Introduction to sensors, Sense-and-avoid technology, GPS, open source vs. closed source programming, and comparison of current FCs on the market.
Professional Skill 25 Hrs; Professional Knowledge 05 Hrs	4. Identify and compare the weather effects and analyze the performance of RPA.	33. Identify the factors that influence the performance of the RPAS. 34. Identify and learn measurement of atmosphere pressure, effect of obstructions on wind speed and direction. 35. Identify and learn measurement of temperature and humidity, Rain.	Introduction to measurement systems and sensors. To develop a basic understanding of the principle involved in measurements. To introduce the state-of-the-art sensors for various engineering applications. Different types of sensors operate in very different ways. Data on the weather qualities of each specific sensor must be obtained prior to implementation. Sensors and platforms; To enable the students to interface the sensors with RPA platforms.
Professional Skill 45 Hrs;	5. Perform installation, maintain and	36. Knowledge of GCS telemetry and Track RPA using telemetry.	Introduction to telemetry, data tracking, mission planning, and 3D mapping

Professional Knowledge 15 Hrs	configuration of ground control station software.	37. Learn GCS features and possible flight plans using GCS. 38. Identify Flight mode operation, GUI parameters, Maps and user control operation. 39. Autonomous Waypoint Navigation and Dynamic flight plan adjustment. 40. Perform 3D mapping and modeling. 41. Perform Geographic Map along with UAV location, UAV trajectory, camera view polygon, waypoints and flight plan. 42. Collect and explore Flight data, Sensor data, Flight planning data, Airspace and weather data. 43. Platform Analytics: including performance figures on orders, missions, inspections, flights, pilots, and data. 44. Data Mapping and Navigation: with a graphical user interface to navigate across 2D/3D models, visualize on maps, and click through images.	and modeling. First-person-view (FPV) flying, safety and drone racing options. Introduction to ground control station software and its features. What is RPA Data? What Types of data are there? How to analyze and report on RPA Data, RPA Imaging Data? Data & Analytics: How to Report on Missions. The data collected from these RPA images can then be measured, analyzed, tracked, and compared over time.
Professional Skill 45 Hrs; Professional Knowledge 15 Hrs	6. Perform preflight inspection and assembling of basic RPA parts like landing gears, propellers, antennas and any wire / electronics hanging outside.	45. Learn all three inspections (pre-flight, post-flight & mid-flight) procedures. 46. Prepare the checklist immediately before piloting a RPA to ensure best practice for mission success. 47. Perform assembly of landing gears, propellers, antennas and electronics. 48. Remotely-piloted aircraft system (RPAS) controls, know your remote control, safety precautions, pre-flight checks, arming and disarming. 49. Method of RPA inspection	Introduction to inspection procedures. History of propeller design, fixed-pitch and constant speed blades, airfoil design, size, pitch, and blade-count including balancing tips and construction materials. Knowledge about remote control, safety precautions, pre-flight checks, arming and disarming. Procedures of Charging the battery, importance of

		charging the battery Cleaning the RPA Storage Maintenance resources and standards. 50. Perform assembly of Gimble, camera and base station hardware and software setup.	Cleaning the RPA Storage Maintenance resources and standards.
Professional Skill 45 Hrs; Professional Knowledge 15 Hrs	7. Carryout basic training to fly RPA in flight simulator.	51. Identify Basic operating features of a RPA flight simulator. 52. Select different aircrafts/RPAS i.e. multi rotor, single rotor, fixed wing, hybrid and aerodromes. 53. Carry out Demo flight in RPA Flight Simulator with Pre-flight checks, start-up, Take-off RPA and carry out flight stage. 54. Do Approach and safe landing, perform post flight checks and identify emergency, Loss of link, Loss of power, Control surface failures etc. 55. Perform Practical flying with and without instructor in RPA simulator. 56. Fly RPA in Simulator. 57. Carry out entire flying operations from pre-flight checks to after flight checks while flying RPA with instructor and solo flying RPA. 58. Demonstrate Handling in flight emergencies, fail safe mechanisms.	Basic operating features of a RPA flight simulator, how to select different aircrafts/RPAS i.e. multi rotor, single rotor, fixed wing, hybrid and aerodromes, knowledge of Demo flight. Introduction to demonstrate solo flight training and Live RPA flying, Flight Operation, Flying a RPA in simulator training. Introduction to photogrammetry for stitching and analysis of RPA pictures.
Professional Skill 45 Hrs; Professional Knowledge 15 Hrs	8. Plan and organize training to fly RPA in controlled environments.	59. Carry out First-person-view (FPV) flying. 60. Use the requirement of flying RPA in a controlled environment. 61. RPAS controls, safety precautions, pre-flight checks, takeoff, learn basic	Introduction to demonstrate RPA flying operation, Flying a RPA in controlled environment with different modes of operation. Overview of the main quad copter parts, choosing a place to learn how to fly an RPA,

		flight modes such as manual, stabilize, alt hold and land. 62. Practice flying the RPAS in left/right and forward/backward motion, square pattern, circle. 63. Practice flight mode such as takeoff, loiter, alt hold. 64. Learn to land in GPS failsafe, radio failsafe and battery failsafe. 65. Learn to upgrade the autopilot / system firmware and test the machine in a controlled environment. 66. Explore camera options, resolution and perform operation to full camera controls Pan/Tilt & Zoom In/Out. 67. Plan & estimate payload considerations, camera options, resolution etc. &other pay load possibilities. 68. Identify different payloads including cameras like Lidar, Thermal, RGB, multi spectral sensors etc.	how to get your RPA off the ground, flying your quad copter left/right and forwards/backwards, Beginner and Advanced RPA flying techniques. Introduction to Payload considerations, camera options, resolution, still photography, video photography, GPS modes, vibration and Jello effect, exposure settings, camera lenses, video Frame rate, image files, camera payloads, and other payload possibilities.
Professional Skill 25 Hrs; Professional Knowledge 05 Hrs	9. Perform and obtain training to fly RPA in uncontrolled airspace including flight.	69. Perform Secure Communication link between UAV and GCS. 70. Identify & select other payload possibilities. 71. Identify different payloads including cameras like Lidar, Thermal, RGB, Hyper spectral etc. 72. Perform autonomous waypoint navigation (pre-defined as well as dynamically adjustable waypoints during flight). 73. Remotely Piloted mode for video-based navigation (RPV Mode). 74. Learn Geographic Map along with UAV location,	What are VLOS, BVLOS, IFR, and VFR? Why do they affect RPA operations? What rules and restrictions apply to flights performed in 'visual line of sight' (VLOS) and 'beyond visual line of sight' (BVLOS)? Introduction of different payload like cameras, thermal cameras, Lidar sensor, RGB and Hyper spectral cameras. Payload connection and its operation procedure to for RPA Flight in a uncontrolled environment. How to choose a RPA based on the application different sectors like agriculture,

		UAV trajectory, camera view polygon, waypoints and flight plan. 75. Fly RPA for application specific including Surveillance, Agriculture and Inspection using single rotor, multi rotor & hybrid. (Under OJT)	inspection and etc.
Professional Skill 35 Hrs; Professional Knowledge 10 Hrs	10. Apply emergency protocols to control and manage RPA flight.	76. Identify emergency and handle it accordingly. 77. Learn instrument flying rules using manual/ semi-autonomous flight modes. 78. Identify emergencies like Aircraft structural failure, loss of power – battery, motor, Loss of GPS and loss of lights at night. 79. Maintain Visual Line of Sight (VLOS) with the aircraft for as long as possible. 80. Learn where to fly and how to fly legally and how you fly it in uncontrolled airspace. 81. Practice the Drone operation with obstacles at indoor and outdoor.	Introduction to the safety risks Guidelines to fly RPA, UAV Regulations in India, Personal Safety, UAV Operations & Safety, Regulatory and regulations, Emergency identification and handling, In flight emergencies Loss of link, Fly-away(Straying), Loss of power, Control surface failures.
		*Refer to *Annexure-I (A) for Specific Course content in detail as per DGCA Guidelines. (36 hrs)*	

SYLLABUS FOR CORE SKILLS
1. Employability Skills (Common for all CTS trades) (60 Hrs)

Learning outcomes, assessment criteria, syllabus and Tool List of Employability Skills is provided separately in www.cstaricalcutta.gov.in / www.bharatskills.gov.in / www.dgt.gov.in.

ANNEXURE-I

List of Tools & Equipment			
Drone Pilot (Junior) (For batch of 24 Candidates)			
S No.	**Name of the Tools and Equipment**	**Specification**	**Quantity**
A. GENERAL TOOLS			
1.	Nose Pliers	4”	12 Nos.
2.	Soldering Station	70 W temperature controlled with multiple tips & heating element integrated inside tips	12 Nos.
3.	Multi Meter		12 Nos.
4.	Tweezers		12 Nos.
5.	Binoculars		12 Nos.
6.	Anemometer (temp, Humidity, wind speed, wind direction)		12 Nos.
7.	Magnifier		06 Nos.
8.	Tachometer		06 Nos.
9.	Cutting Pliers set		06 Nos.
10.	Allen key set		06 Nos.
11.	Screw driver Set (magnetic)		06 Nos.
12.	Tool Box – entire set		06 Nos.
13.	Tool Trolley		03 Nos.
14.	Wrenches		02 Nos.
15.	Bench Vice		02 Nos.
16.	Drilling machine with Drill bits (set)		02 Nos.
17.	IR Temperature Gun		06 Nos.
B. CONSUMABLES			
18.	Assorted Set of Tapes (Masking, Duct, Scotch, Double Sided, Cloth Tapes etc.		As required
19.	Assorted Sets of Wires	12 To 24 AWG Wires	As required
20.	Assorted Set of Sleevs	2 mm To 20 mm Sleevs	As required
21.	Assorted Sets of Ties (Zip Ties, Bunching Sleevs)		As required
22.	Assorted Sets of Epoxy	Quick Fix, Gorilla Glue, 5mins Epoxy, 24 Hrs Epoxy, Hot Glue etc.	As required
23.	Assorted Set of Screws, Nuts and Bolts	(M2 To M6)	As required
24.	First Aid Kit		As required

25.	safety hazard jacket	Reflective Safety Vest	As required
26.	Assorted size Set of Propellers	CW & CCW	As required
27.	Assorted size Set of Arms for quadcopters		As required
28.	Assorted Set of Connector.	XT-60, XT-90, Bullet & Dean connectors	As required
29.	Assorted Set of Heat Shrink tube.		As required
30.	Assorted Set of Propeller nut caps		As required
31.	Assorted Set of Soldering Wire.		As required
32.	Assorted Set of Soldering Paste		As required
33.	Rubber mats or Tables	Suitable size	As required
34.	Safety Cones (Outdoor sight)	Suitable size	As required
35.	Helipads	Suitable size	as required
36.	Safety goggles		As required
37.	Filter Mask		As required
38.	ESD mat		As required
39.	ESD Apron		As required
40.	Head cap		As required
41.	ESD shoes		As required
42.	ESD Bins		As required
43.	Lipo safe bag		As required
C. Drone kit (Consumables)			
44.	Flight Controller	Processor: Cortex-M4F / STM 32 H7 168MHz / 252MIPS 14 PWM / Servo outputs (8 with failsafe and manual override, 6 auxiliaries, high-power compatible)	12+1 Nos.
45.	BLDC Motor	Motor Brushless, 920/1200/1000 RPM/V or KV	50 Nos.
46.	Propellers	Length: 10” Pitch: 4.5” Weight: 14 gm Shaft Diameter: 6 mm Total length: 10 inch / 254 mm	100 Nos.
47.	ESC	Constant Current: 30A (Max 40A < 10 sec). BEC: 5V 2A.	100 Nos.
48.	Frame	Wheelbase: 450mm	12+1 Nos.
49.	Frame	Wheelbase: F550	12+1 Nos.
50.	FPV live video transmitting HD camera, goggles and required accessories	Memory: SD Card supports up to 64GB (MJPEG, 30fps, AVI) Receiver: 5.8G 48CH steady view receiver	02 Nos.

		Languages: Chinese and English Screen: 16:9 and 4:3 switchable FOV: Up to 29° IPD range: 59~69mm Connection: HDMI in Wide voltage support: 2S-6S	
51.	Transmitter & Receiver	Frequency range - 2.405 GHz- 2.475 GHz Bandwidth – 400 KHz Number 135, USB-C port Transmitting Power: <20dbm	20 Nos.
52.	GPS	Tracking sensitivity: 161 d Bm. Capture sensitivity: 148 d Bm. cold start time: 38s average Warm start time: 35s average hot start time: 1s average Capture time: 0.1s Average	12 Nos.
53.	Lipo Battery	5200 mAH 3S/4S	15 Nos.
54.	Battery charger	AC 100~240v or 12V DC input	05 Nos.
55.	Power Module	Compatible with flight controller (No. 45)	12+1 Nos.
56.	LiDAR Sensors		12+1 Nos.
57.	Optical Flow Sensor		12+1 Nos.
58.	Landing Gear	Material: ABS Plastic The span of the bottom: 330mm Height: 190mm Compatibility: F450 and F550 Frames Weight: 230	12+1 Nos.
59.	Heat shrink sleeves set		As required
60.	Wire	10 to 12 awg and 18 to 24 awg	As required
61.	Connector	DF-13 mini Connector cable 4,5,6 Pin, JST -GH, XT 30,60, 90, dupont	As required
62.	Rechargeable Batteries (AA)	AA Ni-MH Pre-Charged Rechargeable Batteries, 4-Battery Pack 2000mah	As required
63.	Drone frames (ABS)	F450	As required
64.	Drone Propellers	1045	As required
65.	Soldering wire		As required
66.	Velcro Tape		As required
67.	Soldering flux		As required
68.	Power Extension boards		As required
D. Teaching Aid and Furniture			
69.	Desktop Computer	Intel i5 or higher with 12/13thGeneration, 2.4 Ghz base speed, 16GB RAM | Storage 1 TB SSD, 4GB dedicated graphic card, Pre-	12+1 Nos.

		loaded Windows 11with Display: 15.6-inch screen with full HD display, 4 GB or higher graphic card	
70.	Laptop	Intel i5 or higher with - 12/13thGeneration, 2.4 Ghz base speed -16GB RAM | Storage 1 TB SSD, 4GB dedicated graphic cardPre-loaded Windows 11 Display: 15.6-inch screen with full HD display, Battery life: 2 hrs.	01 No.
71.	Interactive Board (panel) for simulation classroom	(66 inches) 4K Ultra HD Certified Android LED with OPS for simulation purposes.	01 No.
72.	Simulator to teach drone flying (drone simulator with RC)	Drone simulator (latest version)	12+1 license
73.	HDMI cables	(3 Meter/9 feet) HDMI Cable	04 Nos.
74.	Extension boards	Power Plate 6 with 4 USB Port + 5 Power Sockets Extension Board, 2500W Power Converter, Cord Length 3Mtr for basic system and chargers wiring.	10 Nos.
75.	Student tables	2 – 3 seaters	12 Nos.
76.	Student Non-revolving Chair		24 Nos.
77.	Faculty Table		01 No.
78.	Faculty revolving Chair		01 No.
79.	Pegboard Organizer Wall Control 4 ft		02 Nos.
80.	Drawers Tool Trolley	6- 8 drawers	02 Nos.
81.	Air Blower	Suitable for usage	01 No.
82.	Hot Air guns		02 Nos.
83.	Rivet Gun		02 Nos.
84.	Air Conditioner	1.5 T	02 Nos.
E. DRONE ACCESSORIES/PAYLOADS			
85.	Camera/action camera	1280x720,5X Optical Zoom Video Resolution	05 Nos.
86.	Handheld Radio or walkie Talkie	Min 1KM(channel-12)	02 Nos.
87.	High Precision Wattmeter & power Analyzer Module for Drones	150A	02 Nos.
88.	Servo tester		06 Nos.
89.	Universal Battery Eliminator Circuit	Variable voltage	06 Nos.
90.	Thrust measurement meter		02 Nos.
91.	RPA and spare parts kit		As required
92.	UAV inbuilt suitable for Mapping application with DGCA approved	Category of UAS: Rotorcraft Sub-category of UAS: RPAS	02 Nos.

	Type certification	Class of UAS: Small Structure: Quad or Hexa Copter Flight Modes: Manual, Semi-autonomous and fully autonomous Battery Fly Time: 40 min. Smart Battery fails safe: RTH With 3rd party Insurance	
93.	Drone for Surveillance applications (DGCA approved)	Automatic flight Payload or camera control Up to 3 -5 kg payload Up 1- 10 km Flight time up to 40 minutes Endurance/ Flight time (upto 1000m AMSL) - 20-25 minutes Range for live transmission (Radius) - 2 km Typical Cruise Speed - 7 m/s Operating altitude (AGL) - 200m AGL (Above Ground Level) Maximum launch altitude (AMSL) - 3000m Auto fly home and landing Camera angle control Camera shutter and zoom Multiple camera switching Video Capture Format: MP4, MOV Sensor1" CMOS; Effective pixels: 20 M Autofocus at 1 m – ∞ ISO RangeVideo:100-3200(Auto) Photo:100-3200(Auto) Failsafe features - Return to Home on communication failure - Return to Home/Land on low battery or battery issues - Return to home on high winds - Multiple GPS on-board for GPS failure redundancy Autonomy Fully autonomous from Take-off to Landing without using any R/C controller	As required
94.	Drone – Agriculture Spraying (DGCA approved)	Type Multirotor: Quad copter or Hexacopter Payload Capacity: 5- 30 Kg / 10 -15 Litre	01 No.

		Flight Time 20 -40 minutes Battery Charging Time Min 60 minutes Flight Mode Options Manual / Autonomous Wind Resistance Level 5 as per Beaufort Scale Flight Speed: upto 10 -30 m/s All up weight (with 10kg payload) 30 Kg Frame material 3 K carbon fibre Other features GPS and Radar for uniform, efficient &precision spraying Continuous Operation Data Monitoring	
95.	Indoor and Outdoor net facility	15 x 20 Meter	(optional/may be practiced under OJT)
Note: - 1. Internet facility is desired to be provided in the classroom.			

SPECIFIC COURSE CONTENT AS PER DGCA GUIDELINES - 5 DAY COURSE		
No. Subjects	**Theory Classes**	**No. of Classes**
1.	Regulations of DGCA	01
2.	Basic Principles of Flight	01
3.	ATC Procedures & Radio Telephony	01
4.	Fixed wing Operations/Aerodynamics	01
5.	Multi rotor Operations/Aerodynamics	01
6.	Weather & Meteorology	01
7.	Drone equipment and maintenance	01
8.	Emergency Identification & handling	01
9.	Payload installation & utilization	01
10.	Image/video interpretation	01
11.	Final Test Theory	01
Total No. of Theory Classes		**11**
No. Subjects	**Practical Training**	**No. of Classes**
1.	Flight Simulator training	08
2.	Practical lessons in Lab	01
3.	Practical flying lessons	15
Total No. of Practical Classes		**24**
Total Training		**35**

DETAILED CURRICULUM FOR SPECIFIC COURSE CONTENT AS PER DGCA GUIDELINES		
No. of Day	**Topics of Training**	**Description of Training**
Day 01:	Regulations of DGCA, Civil Aviation Requirements (01 Class)	- Classification - Basic Air Regulations - Salient points - Do's and Don'ts
	Basic principles of flight (01 Class)	- Fundamentals off light - Aerodynamics - Take-off, flight, and landing - Man oeuvres, turns and circuit pattern
	ATC procedures & Radio Telephony (01 Class)	- Understanding ATC operations - Airspace Structure and Airspace Restrictions with knowledge of No Drone Zones - Communicating with ATC including Position and Altitude Reporting - Flight Planning Procedures - Collision avoidance - Radio Telephony (RT)techniques - Standard radio terminology and RT Phraseology - Practice Session in Radio Communication
	Fixed wing operations and aerodynamics (01 Class)	- Types of fixed wing drones, make, parts and terminology - Operation and man oeuvres of fixed wing drones - Applications and operations - Advantages/disadvantages over multi rotor drones
	Multi rotor introduction (01 Class)	- Basic drone terminology - Types of drones, material used and size of drones

		- Motors and propellers - Electronic Speed Controller (ESC), flight controllers - Operation and Applications of drones - Advantages/disadvantages over multi rotor drones
	Weather and meteorology (01 Class)	- The standard atmosphere - Measuring air pressure - Heat and temperature - Wind - Moisture, cloud formation - Met Terminal Aviation Routine Weather Report(METAR)
	Drone equipment maintenance (01 Class)	- Maintenance of drone, flight control box, ground station - Maintenance of ground equipment, batteries and payloads - Scheduled servicing - Repair of equipment - Fault finding and rectification
Day 02:	Emergency identification and handling (01 Class)	- In flight emergencies - Loss of link - Fly-aways(Straying) - Loss of power - Control surface failures
	Payload, installation and utilization (01 class)	- Types of payloads - Parts of payloads - Installation - Features of payloads - Utilization
	Image and video interpretation (01 Class)	- Principles of observation - Interpretation of image/video - Analysis
	Final test - Theory (40 min)	-
	Introduction to flight simulator (01 Class)	- Basic operating features of simulator - How to select different aircrafts and aerodromes

		- Demo flight
	Flight simulator training (02 Classes)	- Pre-flight checks and start-up - Preparation cum coordination for flight - Take-off and flight stage - Approach and landing - After flight checks
Day 03:	Flight simulator training (05 Classes)	- Pre-flight checks and start-up - Preparation cum coordination for flight - Take-off and flight stage - Approach and landing - After flight checks
	Practical lessons in Lab (01 Class)	- Assembling of drone - De-assembling - Integration of sub-sections/modules - Integration of engine/propulsion system - Fault finding and rectification - Repair maintenance and documentation
	Practical flying (01 Class)	- with instructor
Day 04:	Practical flying	- Full day flying with instructor
Day 05:	Solo flying	- Full day flying without instructor

Annexure – II

The DGT sincerely acknowledges contributions of the Industries, State Directorates, Trade Experts, Domain Experts, trainers of ITIs, NSTIs, faculties from universities and all others who contributed in revising the curriculum.

Special acknowledgement is extended by DGT to the following expert members who had contributed immensely in this curriculum.

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ABBREVIATIONS	
CTS	Craftsmen Training Scheme
ATS	Apprenticeship Training Scheme
CITS	Craft Instructor Training Scheme
DGT	Directorate General of Training
MSDE	Ministry of Skill Development and Entrepreneurship
NTC	National Trade Certificate
NAC	National Apprenticeship Certificate
NCIC	National Craft Instructor Certificate
LD	Locomotor Disability
CP	Cerebral Palsy
MD	Multiple Disabilities
LV	Low Vision
HH	Hard of Hearing
ID	Intellectual Disabilities
LC	Leprosy Cured
SLD	Specific Learning Disabilities
DW	Dwarfism
MI	Mental Illness
AA	Acid Attack
PwD	Person with disabilities


कौशलं बलम्