



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

COMPETENCY BASED CURRICULUM

REMOTELY PILOTED AIRCRAFT (RPA)/DRONE PILOT

(Duration: Six Months)

CRAFTSMEN TRAINING SCHEME (CTS)

NSQF LEVEL- 4



SECTOR –AEROSPACE & AVIATION



Directorate General of Training

REMOTELY PILOTED AIRCRAFT (RPA)/DRONE PILOT

(Non-Engineering Trade)

(Designed in 2019)

Version: 1.2

CRAFTSMEN TRAINING SCHEME (CTS)

NSQF LEVEL - 4

Developed By

Ministry of Skill Development and Entrepreneurship

Directorate General of Training

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During the six months duration of Remotely Piloted Aircraft (RPA)/ Drone Pilot Trade a candidate is trained on professional skills and professional knowledge related to job role. 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, fire fighting and various safety practices for working in industrial environment. Recognizes DGCA Safety Regulations & develop safety attitude while flying Drones. Identifies & selects different types of Drones & Fundamentals of Flight (Aerodynamics), ATC procedures & Radio Telephony, different regulations of DGCA, Civil Aviation Requirements, Weather and meteorology. Develops & applies knowledge of Airframes, Electric motors & Propellers. Identifies & selects Electronic Speed Controllers (ESC) & flight Controllers for Drones. 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 Drones. Identifies & selects Basic operating features of a Drone Flight Simulator. Fly a Drone with instructor and then perform solo flight (Virtual reality training & live Drone flying). Carry out entire flying operations from pre-flight checks to after flight checks while flying a drone 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.

2.1 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.

'Remotely Piloted Aircraft (RPA)/ Drone Pilot' 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 Technician and will progress further as Senior Technician, 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 centre or start own Drone Training Academy.
- 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
1.	Professional Skill (Trade Practical)	580
2.	Professional Knowledge (Trade Theory)	140
3.	Employability Skills	80
	Total	800

2.4 ASSESSMENT & CERTIFICATION

The trainee will be tested for his 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.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 Controller of examinations, 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 percent for Trade Practical and Formative assessment is 60% & for all other subjects is 33%. There will be no Grace marks.

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 the assessment. Due consideration should be given while assessing for teamwork, avoidance/reduction of scrap/ wastage and disposal of scrap/ waste as per procedure, behavioural attitude, sensitivity to the environment and regularity in training. The sensitivity towards OSHE and self-learning attitude are to be considered while assessing competency.

Assessment will be evidence based comprising 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

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 while assessing:

Performance Level	Evidence
(a) Weightage in the range of 60%-75% to be allotted during assessment	
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	<ul style="list-style-type: none"> • Demonstration of good skills and accuracy in the field of work/ assignments. • A fairly good level of neatness and consistency to accomplish job activities. • Occasional support in completing the task/ job.
(b)Weightage in the range of 75%-90% to be allotted during assessment	
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	<ul style="list-style-type: none"> • Good skill levels and accuracy in the field of work/ assignments. • A good level of neatness and consistency to accomplish job activities. • Little support in completing the task/job.

Remotely Piloted Aircraft (RPA)/ Drone Pilot

(c) Weightage in the range of more than 90% to be allotted during assessment	
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.	<ul style="list-style-type: none">• High skill levels and accuracy in the field of work/ assignments.• A high level of neatness and consistency to accomplish job activities.• Minimal or no support in completing the task/ job.

Remotely Piloted Aircraft (RPA)/ Drone Pilot; remotely controls Drone/Unmanned Aerial 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. Not only are they cutting costs, reducing time and decreasing injuries, but with drones, Individual can also 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 drones 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. Provides more precise data than traditional ground-based techniques when it comes to monitoring seabird colonies. 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. Medical drones are the future of disaster relief, providing much-needed help to isolated areas. Can take part in Drone Aerobatics show & Aerial Advertising.

Reference NCO: Not available

Name of the Trade	REMOTELY PILOTED AIRCRAFT (RPA)/ DRONE PILOT
Trade Code	DGT/2010
NCO - 2015	Not available
NSQF Level	Level - 4
Duration of Craftsmen Training	Six Months (800 Hours)
Entry Qualification	Passed 10 th Class Examination with Science and Mathematics of 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) Remotely Piloted Aircraft (RPA)/ Drone Pilot Trade	<p>B.Voc/Degree in Aeronautical engineering/ ECE/ EEE/ Mechatronics from AICTE/UGC recognized university/ college with one year experience in building & piloting drones and good at teaching. Candidates with experience of a drone project or a project experience in Robotics are preferred.</p> <p style="text-align: center;">OR</p> <p>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 experience in building & piloting drones and good at teaching. Candidates with experience of a drone project or a project experience in Robotics are preferred.</p> <p style="text-align: center;">OR</p> <p>NTC/ NAC passed in “Remotely Piloted Aircraft (RPA)/Drone Pilot” with three years experience in building & piloting drones and good at teaching. Candidates with experience of a drone project or a project experience in Robotics are preferred.</p>

Remotely Piloted Aircraft (RPA)/ Drone Pilot

	<p><u>Essential Qualification:</u> Relevant National Craft Instructor Certificate (NCIC) in any of the variants under DGT.</p> <p>Note: Out of two Instructors required for the unit of 2 (1+1), one must have Degree/Diploma and other must have NTC/NAC qualifications. However both of them must possess NCIC in any of its variants.</p>		
(ii) Employability Skill	<p>MBA/ BBA / Any Graduate/ Diploma in any discipline with Two years' experience with short term ToT Course in Employability Skills from DGT institutes. (Must have studied English/ Communication Skills and Basic Computer at 12th / Diploma level and above)</p> <p style="text-align: center;">OR</p> <p>Existing Social Studies Instructors in ITIs with short term ToT Course in Employability Skills from DGT institutes.</p>		
(iii) Minimum Age for Instructor	21 Years		
List of Tools and Equipment	As per Annexure – I		
Distribution of training on hourly basis: (Indicative only)			
Total hours / week	Trade practical	Trade theory	Employability Skill
40 Hours	29 Hours	7 Hours	4 Hours

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

5.1 SPECIFIC LEARNING OUTCOME

1. Identify & select different types of Drones and illustrate Fundamentals of Flight (Aerodynamics).
2. Identify & select different Airframes & Propellers in drone flying.
3. Interpret DGCA Safety Regulations & observe safety guidelines, ATC procedures & Radio Telephony, Weather and meteorology as a Drone Pilot in flying a Drone.
4. Explain & apply knowledge of Power systems viz. Electric motors, Batteries, Chargers, Connectors etc. in drone flying.
5. Identify & select various Controllers like Electronic Speed Controllers (ESC), Transmitters, Receivers & flight Controllers for Drones.
6. Plan & estimate different payload considerations like Cameras, Gimbals & other payloads and make use of them in drone flying/maintenance.
7. Apply knowledge of Ground Control Stations & FPV.
8. Perform Assembling, MRO & battery care of Drones.
9. 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 (70% of flying practice in simulator and rest 30% in live flying).

6. ASSESSMENT CRITERIA

LEARNING OUTCOMES	ASSESSMENT CRITERIA
1. Identify & select different types of Drones and illustrate Fundamentals of Flight (Aerodynamics).	Identify & select different types of Drones.
	Identify basic components of Drones.
	Recognise basic principles of flying like Bernoulli's Principle etc.
	Apply principles of flight to Drones.
	Identify Longitude/Latitude etc.
2. Interpret DGCA Safety Regulations & observe safety guidelines, ATC procedures & Radio Telephony, Weather and meteorology as a Drone Pilot in flying a Drone.	Apply workshop safety norms.
	Identify & select safety rules while flying a drone.
	Apply DGCA safety regulations.
	Recognize Do's and Don'ts of drone flying.
	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.	
3. Identify & select different Airframes & Propellers in drone flying.	Recognize multi rotor design, various configurations, airframe sizes and construction materials.
	Identify different propeller designs.
4. Explain & apply knowledge of Power systems viz. Electric motors, Batteries, Chargers, Connectors etc. in drone flying.	Calculate motor ratings for load capabilities for a drone build.
	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.
5. Identify & select various Controllers like Electronic Speed Controllers (ESC), Transmitters, Receivers & flight Controllers for Drones.	Identify different role of ESCs.
	Calibrate and mount ESCs..
	Recognize different sensors & their applications in drones.
	Apply sense-and-avoid technology
	Identify GPS applications in drone flying.
	Distinguish GPS open source vs. closed source programming.

Remotely Piloted Aircraft (RPA)/ Drone Pilot

	Compare current FCs on the market.
	Identify different radio control systems, controllers, transmitters and receivers, Frequency bands and programming transmitters.
6. Plan & estimate different payload considerations like Cameras, Gimbals & other payloads and make use of them in drone flying / maintenance.	Plan & estimate payload considerations.
	Explore camera options, resolution etc.
	Identify & select other pay load possibilities.
	Identify different payloads including cameras like Lidar, Thermal, RGB, Hyper spectral etc.
	Use different payloads in drone flying/maintenance.
7. Apply knowledge of Ground Control Stations & FPV.	Track data using telemetry.
	Plan Drone missions.
	Perform 3D mapping and modeling.
	Carry out First-person-view (FPV) flying& drone racing.
8. Perform Assembling, MRO & battery care of Drones.	Perform assembling & de assembling of drones.
	Carry out Maintenance Repair and Overhaul (MRO)of the drone.
	Apply safety precautions while handling LiPo batteries.
9. 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 (70% of flying practice in simulator and rest 30% in live flying).	Identify Basic operating features of a drone flight simulator.
	Select different aircrafts/drones and aerodromes.
	Carry out Demo flight in Drone Flight Simulator.
	Perform Pre-flight checks and start-up.
	Prepare & coordinate drone flight.
	Take-off drone and carry out flight stage.
	Do Approach and safe landing.
	Perform after 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 drone simulator.
	Perform Practical flying without instructor in drone simulator.
Fly a live drone with instructor.	
Fly a live drone without instructor/Solo.	

SYLLABUS FOR REMOTELY PILOTED AIRCRAFT(RPA)/DRONE PILOT TRADE			
DURATION: SIX MONTHS			
Duration	Reference Learning outcome	Professional Skills (Trade Practical) With Indicative Hours	Professional Knowledge (Trade Theory)
Professional Skill 87 Hrs; Professional Knowledge 21 Hrs	Identify & select different types of Drones and illustrate Fundamentals of Flight (Aerodynamics).	<ol style="list-style-type: none"> 1. Visit to various sections of the institute and identify location of various installations. (02 hrs.) 2. Identify safety signs for danger, warning, caution & personal safety message. (05 hrs.) 3. Practice Use of Personal Protective Equipment (PPE). (04 hrs.) 4. Practice elementary first aid. (05 hrs.) 5. Practice Preventive measures for electrical accidents & steps to be taken in such accidents. (07hrs.) 6. Practice Use of Fire extinguishers. (06 hrs.) 	<p>Familiarization with the working of Industrial Training Institute system.</p> <p>Importance of safety and precautions to be taken in the industry/ shop floor.</p> <p>Introduction to PPEs.</p> <p>Introduction to First Aid.</p> <p>Importance of housekeeping & good shop floor practices.</p> <p>Occupational Safety & Health: Health, Safety and Environment guidelines, legislations & regulations as applicable. (07 hrs.)</p>
		<ol style="list-style-type: none"> 7. Identify Different types of Drones. (07hrs.) 8. Select basic components. (10hrs.) 9. Recognise basic principles of flying like Bernoulli's Principle etc. (17hrs.) 10. Apply principles of flight to Drones. (17hrs.) 11. Understand 	<p>Different types of Drones, Nomenclatures, History of aerial drones, reputation, airframe, configurations, basic components, current/future uses of drones. Introduction to aerodynamics, history of Flight, Newton's Laws of Motion, Bernoulli's Principle, four forces of Flight, three axes of Flight,</p>

Remotely Piloted Aircraft (RPA)/ Drone Pilot

		Longitude/Latitude. (07hrs.)	how they apply to drone Flight. (14 hrs.)
Professional Skill 87Hrs; Professional Knowledge 21 Hrs	Interpret DGCA Safety Regulations & observe safety guidelines, ATC procedures & Radio Telephony, Weather and meteorology as a Drone Pilot in flying a Drone.	<p>12. Practice workshop safety norms. (07hrs.)</p> <p>13. Identify safety rules while flying a drone. (09hrs.)</p> <p>14. Practice DGCA safety regulations, Do's and Don'ts. (09hrs.)</p> <p>15. Recognise issues Drone pilots encounter including airspace, traffic patterns etc. (11hrs.)</p> <p>16. Practice Radio telephony using Standard radio terminology and RT Phraseology. (10hrs.)</p> <p>17. Communicate with virtual ATC including Position, Altitude Reporting etc. (12hrs.)</p> <p>18. Identify specific Flight Planning Procedures for specific drone flights. (09hrs.)</p> <p>19. Recognise importance of Weather and meteorology in drone flight. (09hrs.)</p> <p>20. Take METAR from MET office/ ATC before flying. (11hrs.)</p>	<p>Importance of adopting a “safety attitude” when flying a drone. Workshop safety norms and outdoor flying safety regulations.</p> <p>Regulations of DGCA, Civil Aviation Requirements: Classification, Basic Air Regulations, Salient points, Do's and Don'ts.</p> <p>Issues aircraft pilots encounter including airspace, traffic patterns, and safe attitudes.</p> <p>Understanding ATC operations</p> <p>Airspace Structure and Airspace Restrictions with knowledge of No Drone Zones</p> <p>Communicating with ATC including Position and Altitude Reporting</p> <p>Flight Planning Procedures</p> <p>Collision avoidance</p> <p>Radio Telephony (RT) techniques</p> <p>Standard radio terminology and RT Phraseology</p> <p>Practice Session in Radio Communication.</p> <p>Weather and meteorology : The standard atmosphere ,Measuring air pressure, Heat and temperature</p> <p>Wind Moisture, cloud formation</p> <p>Met Terminal Aviation Routine Weather Report (METAR). (21</p>

Remotely Piloted Aircraft (RPA)/ Drone Pilot

			hrs.)
Professional Skill 58 Hrs; Professional Knowledge 14Hrs	Identify & select different Airframes & Propellers in drone flying.	21. Recognize multi rotor design, various configurations, airframe sizes and construction materials. (29hrs.) 22. Identify different propeller designs and choose appropriate propeller. (29hrs.)	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. (14 hrs.)
Professional Skill 58 Hrs; Professional Knowledge 14 Hrs	Explain & apply knowledge of Power systems viz. Electric motors, Batteries, Chargers, Connectors, etc. in drone flying.	23. Electricity fundamentals (Wattage, voltage, Amperage and their relationship) and soldering techniques. (14hrs.) 24. Calculate motor ratings for load capabilities for a drone build. (15hrs.) 25. Identify parallel vs. serial arrangements of batteries. (14hrs.) 26. Practice charging, cell balancing and explore various connectors. (15hrs.)	History of batteries, various makeup's, reactions and chemistry, parallel vs. serial arrangements, rechargeable batteries, LiPo battery characteristics, charging, cell 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 drone build. (14 hrs)
Professional Skill 58 Hrs; Professional Knowledge 14 Hrs	Identify & select various Controllers like Electronic Speed Controllers (ESC), Transmitters, Receivers& flight Controllers for Drones.	27. Identify different role of ESCs. (6hrs.) 28. Calibrate and mount ESCs. (8hrs.) 29. Recognise different sensors & their applications in drones.(6hrs.) 30. Apply sense-and-avoid technology. (06hrs.) 31. Identify GPS applications in drone flying. (08hrs.)	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

Remotely Piloted Aircraft (RPA)/ Drone Pilot

		<p>32. Distinguish open source vs. closed source programming. (08hrs.)</p> <p>33. Compare current FCs on the market. (06hrs.)</p> <p>34. Identify different radio control systems, controllers, transmitters and receivers, Frequency bands and programming transmitters.(10hrs.)</p>	<p>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. (14 hrs)</p>
<p>Professional Skill 58 Hrs;</p> <p>Professional Knowledge 14 Hrs</p>	<p>Plan & estimate different payload considerations like Cameras, Gimbals & other payloads and make use of them in drone flying/ maintenance.</p>	<p>35. Plan & estimate payload considerations, camera options, resolution etc. & other pay load possibilities. (29hrs.)</p> <p>36. Identify different payloads including cameras like Lidar, Thermal, RGB, Hyperspectral etc. (29hrs.)</p>	<p>Payload considerations, camera options, resolution, still photography, video photography, vibration and Jello effect, exposure settings, camera lenses, video Frame rate, image files, delivery payloads, and other pay load possibilities. (14 hrs)</p>
<p>Professional Skill 29 Hrs;</p> <p>Professional Knowledge 07 Hrs</p>	<p>Apply knowledge of Ground Control Stations & FPV.</p>	<p>37. Track data using telemetry. (5hrs.)</p> <p>38. Plan Drone missions. (5hrs.)</p> <p>39. Perform 3D mapping and modelling. (08hrs.)</p> <p>40. Carry out First-person-view (FPV) flying. (11hrs.)</p>	<p>Introduction to telemetry, data tracking, mission planning, and 3D mapping and modelling. First-person-view(FPV) flying, safety and drone racing options. (07 hrs)</p>
<p>Professional Skill 29 Hrs;</p> <p>Professional Knowledge 07 Hrs</p>	<p>Perform Assembling, MRO & battery care of Drones.</p>	<p>41. Perform assembling & disassembling of drones. (10hrs.)</p> <p>42. Carry out Maintenance Repair and Overhaul (MRO) of the drone. (10hrs.)</p> <p>43. Apply safety precautions while handling LiPo batteries. (09hrs.)</p>	<p>Assembling & disassembling of the drone equipments & Maintenance Repair and Overhaul (MRO) of the drone. safety when using LiPo batteries including proper charging methods, discharging, handling, and disposal. (07 Hrs)</p>
<p>Professional Skill 116Hrs;</p>	<p>Identify basic operating features</p>	<p>44. Identify Basic operating features of a drone flight</p>	<p>Basic operating features of a drone flight simulator, How to</p>

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<p>Professional Knowledge 28Hrs</p>	<p>of a drone flight simulator and fly a Drone in simulator training & live training for various applications first with instructor & then solo (70% of flying practice in simulator and rest 30% in live flying).</p>	<p>simulator. (5hrs.) 45. Select different aircrafts/drones and aerodromes. (5hrs.) Simulator training & live training: 46. Fly a Drone with instructor and then perform solo flight (Virtual reality training & live Drone flying). (30 hrs) 47. Carry out entire flying operations from pre-flight checks to after flight checks while flying a drone in simulator training & live training. (30 Hrs) 48. Demonstrate Handling Inflight emergencies, fail safe mechanisms. (17 Hrs)</p>	<p>select different aircrafts/drones and aerodromes, knowledge of Demo flight. (04Hrs) Introduction to demonstrate solo flight training and Live Drone flying, Flight Operation, Flying a Drone in simulator training. (04Hrs) Application of drones in different domains and how different cameras can be used for different surveys. (07Hrs) Introduction to Photogrammetry for stitching and analysis of drone pictures.(06Hrs)</p>
<p>*Refer to <i>Annexure-I (A)</i> for Specific Course content in detail as per <i>DGCA Guidelines</i>.(36 hrs)</p>			

SYLLABUS FOR CORE SKILLS

1. Employability Skills(Common for all CTS trades) (160Hrs)

Learning outcomes, assessment criteria, syllabus and Tool List of Core Skills subjects which is common for a group of trades, provided separately in www.bharatskills.gov.in.

List of Tools & Equipment			
REMOTELY PILOTED AIRCRAFT(RPA)/DRONE PILOT(For batch of 24 Candidates)			
S No.	Name of the Tools and Equipment	Specification	Quantity
A. GENERAL TOOLS			
1.	Pliers		7 Nos.
2.	Soldering Station		7 Nos.
3.	Multi meter		7 Nos.
4.	Tweezer		7 Nos.
5.	Binoculars		7 Nos.
6.	Anemometer		7 Nos.
7.	Magnifier		7 Nos.
B. Drone kit			
8.	GPS Module		1 x 6 Nos.
9.	Propellers		4 x 6 Nos.
10.	BLDC Motors -		4 x 6 Nos.
11.	ESC(Electronic Speed controllers)		4 x 6 Nos.
12.	FCB (Flight Controller Board)/Auto pilot		1 x 6 Nos.
13.	Lipo Battery		1 x 6 Nos.
14.	Lipo Battery Charger		6 Nos.
15.	Transmitter		1 x 6 Nos.
16.	Drone base		1 x 6 Nos.
17.	Receiver cables		As required
18.	Real Flight Simulator		4 No.
19.	Thrust measurement meter		2 Nos.
20.	Balance Charger		2 Nos.
21.	Power distribution board		6 Nos.
22.	Simulator to teach drone assembly		6 Nos.
Note: -			
1. Internet facility is desired to be provided in the class room.			

ANNEXURE-I (A)

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)	<ul style="list-style-type: none"> - Classification - Basic Air Regulations - Salient points - Do's and Don'ts
	Basic principles of flight (01 Class)	<ul style="list-style-type: none"> - Fundamentals of flight - Aerodynamics - Take-off, flight, and landing - Manoeuvres, turns and circuit pattern
	ATC procedures & Radio Telephony (01 Class)	<ul style="list-style-type: none"> - 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)	<ul style="list-style-type: none"> - Types of fixed wing drones, make, parts and terminology - Operation and manoeuvres of fixed wing drones - Applications and operations - Advantages/disadvantages over multi rotor drones
	Multi rotor introduction (01 Class)	<ul style="list-style-type: none"> - Basic drone terminology - Types of drones, material used and size of drones

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		<ul style="list-style-type: none"> - 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)	<ul style="list-style-type: none"> - 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)	<ul style="list-style-type: none"> - 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)	<ul style="list-style-type: none"> - In flight emergencies - Loss of link - Fly-aways(Straying) - Loss of power - Control surface failures
	Payload, installation and utilization (01 class)	<ul style="list-style-type: none"> - Types of payloads - Parts of payloads - Installation - Features of payloads - Utilization
	Image and video interpretation (01 Class)	<ul style="list-style-type: none"> - Principles of observation - Interpretation of image/video - Analysis
	Final test - Theory (40 min)	-
	Introduction to flight simulator (01 Class)	<ul style="list-style-type: none"> - Basic operating features of simulator - How to select different aircrafts and aerodromes

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		- Demo flight
	Flight simulator training (02 Classes)	<ul style="list-style-type: none"> - 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)	<ul style="list-style-type: none"> - 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)	<ul style="list-style-type: none"> - 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

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.

List of member attended the Trade/Expert committee meeting to finalize the syllabus of Remotely Piloted Aircraft (RPA)/ Drone Pilot held at NSTI (V) -Hyderabad on 24.09.2018.			
S No.	Name & Designation Sh./Mr./Ms	Organization	Remarks
1.	B.V.S. Sessa Chari, Director	CSTARI, Kolkata	Chairman
2.	Nirmalya Nath, ADT	CSTARI, Kolkata	Co-ordinator cum Member
3.	Raveendra Reddy Alla,	AP Drones Corporation, Vijaywada – A.P.	Member
4.	Siva Kumar Jadala,	Director General of Civil Aviation, O/O Ddas, Hyderabad	Member
5.	Sanjay Nath, Founder Chairman, TWT Academy of aviation and management	TWT Academy of Aviation of Management, Kolkata	Member
6.	S. Biswas	TWT Academy of Aviation of Management, Kolkata	Member
7.	GP Capt. Yashpal Dhariwal, IAF-Retired	UAV Instructor Pilot	Member
8.	Pranav Kumar B Chitte	PBC's Aero Hub, Pune	Member
9.	Sai Pattabiram,	Sree Sai Aerotech Innovations, Chennai	Member
10.	RLVR Murthy	Value Thought IT Solution Pvt. Ltd., Hyderabad	Member
11.	G.P. Vijaya Krishna, ADT	NSTI(V), Hyderabad	Member
12.	T. Ragulan, DDT	NSTI (R), Hyderabad	Member
13.	TVLN Rao, Director	NSTI(V), Hyderabad	Member
14.	V.V. Satish Reddy, T.O.	NSTI, Hyderabad- Vidyanagar	Member

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15.	C. Harsha Vardhan	MLR Institute of Technology	Member
16.	T. Pavan Kalyan,	MLR Institute of Technology	Member
17.	A. Harish,	Thanos Technologies Pvt. Ltd.	Member
18.	KVS Narayana, TO	CSTARI, Kolkata	Member
19.	Biswanath Khan, Jr. Consultant	CSTARI, Kolkata	Expert

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

