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

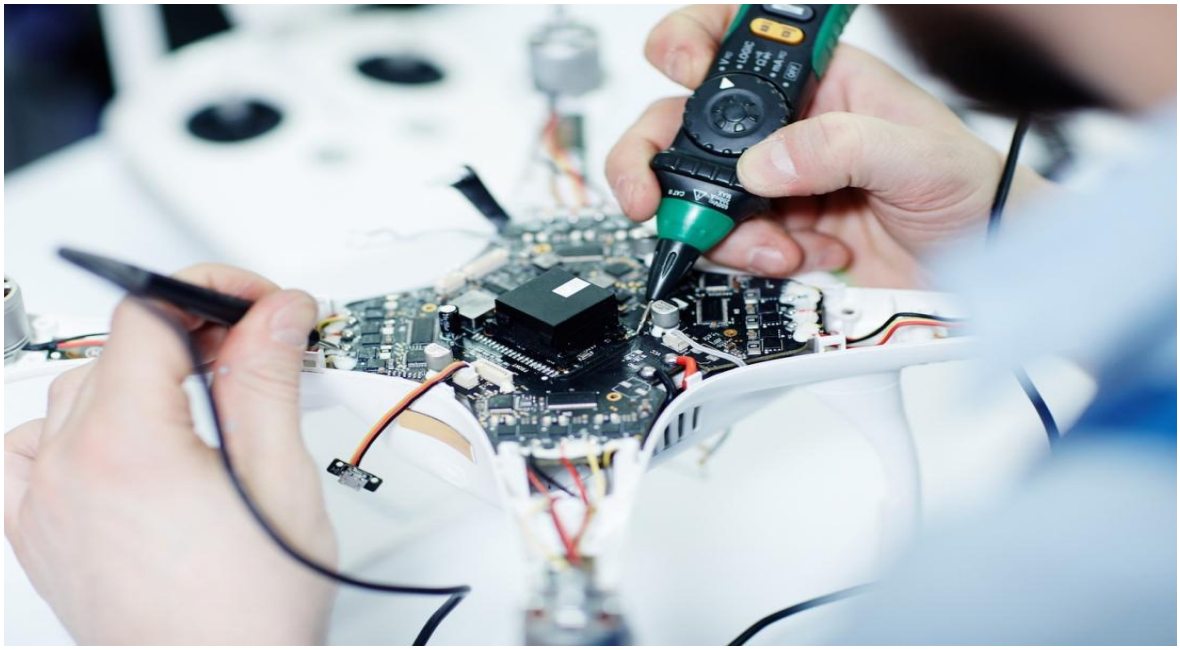
COMPETENCY BASED CURRICULUM

DRONE TECHNICIAN

(Duration: Six Months)

CRAFTSMEN TRAINING SCHEME (CTS)

NSQF LEVEL : 3



SECTOR – AEROSPACE & AVIATION

CENTRAL STAFF TRAINING AND RESEARCH INSTITUTE

Kolkata-700091

DRONE TECHNICIAN

(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 Technician** 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, fire-fighting and various safety practices for working in industrial environment. Identify & select different types of drones, drone rules and regulations, drone applications, and important safety precautions. Identify & select different drone's mechanical parts, aerodynamics of wings, propellers and disassembly and reassembly of common drone platform with flying practices. Identify and test various electronic SMD components using proper measuring instruments and Identify, place, solder and de-solder and different SMD discrete components and ICs package with due care and following safety norms using proper tools/setup. Measure different type electrical parameters and record the data related with drone hardware. Identification of different type of batteries, battery specifications and their charging techniques used in drone. Test different sensors, their characteristics and repair which are commonly used in different drones. Identify, select and test hardware assembly, driver for BLDC motors. Inspect, test and execute GPS navigation and telemetry module, different RF blocks and antennas used in RF transmitter and receiver. Test and troubleshoot Flight Controller Board (FCB), Electronic Speed Controller (ESC) and its associated peripherals. Calibrate and troubleshoot drone gimbal and drone payload. Identify and resolve common error messages and corrections by Software debugging. Inspect, test and execute primary and secondary servicing with troubleshoot malfunctioning, and repair issues discovered.

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 Technician**' 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 Aviation industry/other sectors as drone technician for implementing different applications of Drone and will progress further as Senior Technician, Supervisor and can rise up to the level of Manager.
- Can work in a Drone service centre or start own Drone Training Centre and become Entrepreneur in the related field.
- 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
1.	Professional Skill (Trade Practical)	420
2.	Professional Knowledge (Trade Theory)	120
3.	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 the assessment. Due consideration should be given while assessing for teamwork, avoidance/ reduction of scrap/ wastage and disposal of scrap/ waste as per procedure, behavioral

attitude, sensitivity to the 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 Technician performs troubleshooting and maintenance tasks on unmanned aerial vehicles. Test different electronic components, circuits, boards used in Drone to find the faulty part by using instruments like digital storage oscilloscope, mixed signal oscilloscope, spectrum analyzer, waveform generator and multimeter. Replace the faulty board and components and perform basic /SMD soldering/de-soldering.

Disassemble and assemble different parts of drone for testing and repair. Understand different batteries used for power supply of drone, their specifications and testing. Application and testing of different sensors used in drone.

Testing of different motors BLDC etc, Electronic Speed Controller card and it's connectivity with motor. Testing of flight controller and the communication between transmitter and receiver and its calibration.

Testing of landing gear, GPS Module, collision avoidance sensor and it's connectivity with console. Testing of transmitter, the control box to receiver at drone and the communication link. Testing of Gimbal Motor, Controller rand its programming.

The individual in this job identifies different applications in agriculture, surveillance, security and to

Electrical and Electronic Equipment Mechanics and Fitters and Related Workers, Other; include all other workers engaged in fitting, assembling, repairing and maintaining electronic and electrical equipment, machinery, appliances, etc., not elsewhere classified

Reference NCO-2015:

i) 7419.9900 - Electrical and Electronic Equipment Mechanics and Fitters and Related Workers, Other

4. GENERAL INFORMATION

Name of the Trade	**DRONE TECHNICIAN**
Trade Code	DGT/2019
NCO - 2015	7419.9900
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	15 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	70 Sq. m
Power Norms	4 KW
Instructors Qualification for:	
(i) Drone Technician 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 building & piloting/servicing 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 with **two years of teaching or industry experience** in building & piloting/servicing drones. Candidates with experience of a drone project or a project experience in Robotics are preferred. **OR** NTC/ NAC passed in "Drone Technician" with **three years of teaching or industry experience** in building & piloting/servicing 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 Technician trade under DGT. ***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.***
(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.
(iii) 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.	Learning Outcome	Duration		
		Practical	Theory	Total
1.	Identify & select different types of drones, drone rules and regulations, drone applications, and important safety precautions.	45	15	60
2.	Identify & select different drone's mechanical parts, aerodynamics of wings, propellers and disassembly and reassembly of common drone platform with flying practices.	25	5	30
3.	Identify and test various electronic SMD components using proper measuring instruments and identify, place, solder and de-solder and different SMD discrete components and ICs package with due care and following safety norms using proper tools/setup.	45	15	60
4.	Measure different type electrical parameters and record the data related with drone hardware.	25	5	30
5.	Checking of batteries specifications and their charging techniques used in drone.	30	15	45
6.	Test different sensors, their characteristics and repair which are commonly used in different drones.	35	10	45
7.	Testing of hardware assembly, driver for BLDC motors.	35	10	45
8.	Inspect, test and execute GPS navigation and telemetry module, different RF blocks and antennas used in RF transmitter and receiver.	35	10	45
9.	Test and troubleshoot Flight Controller Board (FCB), Electronic Speed Controller (ESC) and its associated peripherals.	25	5	30
10.	Troubleshooting of drone Gimbal.	35	10	45
11.	Resolving of common error messages and software debugging.	60	15	75
12.	Inspect, test and execute primary and secondary servicing with troubleshoot malfunctioning, and repair issues discovered.	25	5	30
Employability Skills		**-**	**60**	**60**
Grand Total		**420**	**180**	**600**

6. ASSESSMENT CRITERIA

LEARNING OUTCOMES	ASSESSMENT CRITERIA
1. Identify & select different types of drones, drone rules and regulations, drone applications, and important safety precautions.	• Apply workshop safety norms. • Identify & select safety rules to operate drone. • Apply DGCA safety regulations. • Recognize Do's and Don'ts of drone. • Perform drone 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.
2. Identify & select different drone's mechanical parts, aerodynamics of wings, propellers and disassembly and reassembly of common drone platform with flying practices.	• Identify & select different components, parts, block of the drone and its function & their interconnectivity. • Identify various types of body material used in drone. • 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 and design using 3D printer. • Identify different types of motor used in drone. • Identify & prepare specific flight planning procedures to drone flights. • Practice drone flying to check to identify faults in drone.
3. Identify and test various electronic SMD components using proper measuring instruments and Identify, place, solder and de-solder and different SMD discrete	• Identification of different types of SMD Components and measure their value using SMD Technology Kit, Tweezers and DMM. • Identify and use SMD soldering and de-soldering rework station. • Practice soldering and de-soldering the SMD components

components and ICs package with due care and following safety norms using proper tools/setup.	on the PCB. • Make necessary practice on SMD soldering station to solder and de-solder various IC's of different packages.
4. Measure different type electrical parameters and record the data related with drone hardware.	• Identify and use different functions of measuring instruments for different measurements of electrical parameters. • Measurement of voltage dc & ac using Digital Multimeter • Measurement of current dc & ac using Digital Multimeter • Measurement of frequency using Digital Multimeter • Measurement of peak to peak voltage, frequency, time period, and duty cycle using DSO and waveform generator. • Measurement of analog & digital signal using DSO. • Measurement of unknown frequency and it's level using spectrum analyzer
5. Checking of batteries specifications and their charging techniques used in drone.	• Identification of different type of batteries Li-ion and Li-Po. • Recognize different battery specifications. • Explore different charging techniques to charge batteries. • Battery management to measure and monitor different parameters of different batteries. • Inspect battery packs for bulges or leakage. • Inspect charger for visible damage and perform voltage and current reading of battery. • Explore Battery power management includes functions for charging, monitoring, and charge protection.
6. Test different sensors, their characteristics and repair which are commonly used in different drones.	• Identify and measure condition of drone sensors. • Identify and Install types of sensors used in drone. • Test & measure the resistance, voltage, current and frequency of drone sensors and actuators. • Test & measure accelerometers, inertial measurement units, tilt and lidar sensor, gyro sensor. • Write and upload computer code to FCB to test sensors results.

7. Testing of hardware assembly, driver for BLDC motors.	• Identify different BLDC motors and it's specifications • Test BLDC motor and measure speed-torque characteristics of BLDC Motor. • Test BLDC Motor driver circuit. • Identify DC, BLDC and servo motors and test driving circuits. • Perform running and reversing phenomenon of BLDC Motor • Demonstration speed control of BLDC Motor using PWM technique. • Inverted pendulum and its balancing using programming technique of motor. • Measure thrust to weight ratio and payload.
8. Inspect, test and execute GPS navigation and telemetry module, different RF blocks and antennas used in RF transmitter and receiver.	• Identity different antennas such as patch, helical, and omni-directional and check their radiation patterns. • Measure frequencies and directivity of the drone antenna. • Detecting a drone with a Real-Time Spectrum Analyzer. • Identify the characteristics of RF circuit blocks like amplifier, and filters. • Identify, configure and operate 433MHz and 2.4 GHz RC transmitter and receiver. • Operate drone using RC transmitter and receiver. • Dismantle, identify parts, service and test different parts of the drone system. • Knowledge of GPS and its hardware interfacing. • Measure and use signals from GPS module to determine latitude & longitude. • Explore the interfacing of GPS module to navigation drone. • Perform experiment to measure, GPGGA, GPGLL, GPGSA, GPGSV, GPRMC and GPVTG values.
9. Test and troubleshoot Flight Controller Board (FCB), Electronic Speed Controller (ESC) and its associated peripherals.	• Work upon electronic boards to perform specific tasks such as flight control board. • Programming and configure of parameters in flight control board (FCB). • Test the different peripheral interconnections with FCB • Configure, test and perform communication FCB with

	motor, GPS, ESC and sensors. • Configure and test FCB with battery to monitor battery level and perform defined operation. • Carry out drone leveling as per procedure using IMU sensor • Calibrate the compass, Lidar, and gyro sensor • Configure, test and perform communication FCB with RF transceiver. • Write and upload computer code to FCB to test sensors results. • Configure and check electronic speed control (ESC). • Test the different peripheral interconnections with ESC • Configure, test and perform communication of ESC with FCB. • Configure, test and perform communication of ESC with motor. • Configure and test ESC parameters on FCB to check its operation. • Write and upload computer code to FCB to ESC working.
10. Troubleshooting of drone Gimbal.	• Identify the different types of drones and its application in different areas. • Configure HD and thermal image camera with drone. • Perform Gimbal camera assembly and gimbal calibration. • Practice Gimbal stabilization and control of cameras using x, y, and z axes rotation. • Practice remote sensing, surveying & mapping, photogrammetry and precision agriculture using HD and thermal image camera. • Identify, select different application drones like agriculture, Surveillance, Inspections and gathering Information for disaster management. Also, maintenance, inspection, examinations and investigation of drone.
11. Resolving of common error messages and software debugging.	• Identify bugs in the software program as per the algorithms used and the libraries. • Resolve common error messages and apply the correct logic. • Perform firmware configuration and updates. • Identify and fix issues reported in drone hardware after

	firmware update. Perform Testing flight procedure and execution with virtualization. • Download and Install App, Menu, Planning, Set-up / Flight / Application. • Demonstration and perform base station software to debugging to get GPS and flight data. • Perform experiments on software debug tool use to identify coding errors at different stages. • Knowledge and advantage of preventative maintenance of drone. • Diagnose problems using Log Data / Analyze Data flash Log Data / Remote Communication Log Data / Save and Execute Log Data. • Upgrade/downgrade drone firmware.
12. Inspect, test and execute primary and secondary servicing with troubleshoot malfunctioning, and repair issues discovered.	• Perform primary and secondary servicing based upon the checklist. • Test and diagnose drone after 100 hours of flying for preventive maintenance. • Test and diagnose drone after 500 hours of flying. • Knowledge about drone troubleshooting check list like Equipment check, System reset, calibration, Motor Troubleshooting, Gimbal rotation, Battery Maintenance, and RF Signal and hardware. • Diagnose the common drone problem like GPS signals are blocked , Decreased battery life, Wrong direction during flight, Flight Planning, Mechanical issue, and Firmware issue. • Inspect drone before and after each flight. • First time drone hardware assembly and test. • Test, locate the fault and repair a wiring of drone. • Check bent or cracked on legs and feet of the drone • Demonstration drone wiring connections with different parts • Perform takeoff/Landing operation and identify faults in system.

7. TRADE SYLLABUS

SYLLABUS FOR DRONE TECHNICIAN TRADE			
DURATION: SIX MONTHS			
Duration	**Reference Learning outcome**	**Professional Skills (Trade Practical)**	**Professional Knowledge (Trade Theory)**
Professional Skill 45 Hrs; Professional Knowledge 15 Hrs	1. Identify & select different types of drones, drone rules and regulations, drone applications, and important safety precautions.	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.	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.
		7. Identify Different types of Drones. 8. Select basic components. 9. Apply principles of flight to Drones. 10. Identify & prepare specific Flight Planning Procedures for specific drone flights.	Define Drone and its usages, Different types of Drones & UAV, Nomenclatures, History of aerial drones, reputation, airframe, configurations, basic components, current/future uses of drones. DGCA type certifications.
Professional Skill 25 Hrs; Professional Knowledge 05 Hrs	2. Identify & select different drone's mechanical parts, aerodynamics	11. Identify & select different building blocks of the drone. 12. Test drone's different block functionality & their interconnectivity.	Understanding Aerial platforms. Types of drones based on aerial platforms. Types of drones based on body material. Introduction to aerodynamics,

	of wings, propellers and disassembly and reassembly of common drone platform with flying practices.	13. Identify various types of body material used in drone. 14. Recognize basic principles of applied mechanics in flying like Bernoulli's Principle, aerodynamics and weight distribution to understand the science behind drones etc. 15. Identify multi rotor design, fixed wing, helicopter/single rotor, hybrid & various configurations, airframe sizes and their construction. 16. Identify different propeller designs and design using 3D printer. Identify materials used for 3D printer. 17. Demonstration of 3D printer and related software to 3D print drone components. 18. Identify type of motor used in drone. 19. Identify & prepare specific flight planning procedures to drone flights using AI based flight navigation 20. Practice drone flying to check to identify faults in drone	history of Flight, Newton's Laws of Motion, Bernoulli's Principle, four forces of Fight, three axes of Fight, how they apply to drone Flight. Introduction to 3D printer and its software for designing various types of propellers.
Professional Skill 45 Hrs; Professional Knowledge 15 Hrs	3. Identify and test various electronic SMD components using proper measuring instruments and Identify,	21. Identify of different types of SMD Components like resistance, capacitance, diode and inductor. 22. Measure different components values using SMD Technology Kit, Tweezers and DMM.	Knowledge about soldering station, soldering tools, soldering iron, soldering wicks, soldering temperature etc. Different types of soldering guns, related to Temperature and wattages, types of tips. SMD components, IC.

	place, solder and de-solder and different SMD discrete components and ICs package with due care and following safety norms using proper tools/setup.	23. Identify of different types of SMD IC packages. 24. Explore and configure SMD soldering and de-soldering rework station. 25. Practice soldering and de-soldering the SMD components on the PCB. 26. Practice soldering and de-solder various IC's of different packages.	
Professional Skill 25 Hrs; Professional Knowledge 05 Hrs.	4. Measure different type electrical parameters and record the data related with drone hardware.	27. Identify the type of electronic instruments. 28. Measure the resistance, Voltage, Current through series and parallel connected networks using multi meter. 29. Measure AC and DC voltage using Digital Multi-meter. 30. Measure AC and DC current using Digital Multi-meter. 31. Measure frequency using Digital Multi-meter. 32. Measure the analog signals like of peak to peak voltage, frequency, time period, and duty cycle using of DSO. 33. Measure the frequency and level of RF signals using of spectrum analyzer.	Introduction of electrical components resistance, capacitance, inductance, diode, and transistor. Introduction of electrical parameters like DC voltage, DC current, AC voltage, AC current, frequency, duty cycle and Introduction to electrical and electronic measuring instruments. Working Principle of multimeter, digital storage oscilloscope, spectrum and waveform generator.
Professional Skill 30 Hrs; Professional Knowledge 15 Hrs.	5. Checking of batteries specifications and their charging techniques used in drone.	34. Identify different type of batteries Li-ion and Li-Po. 35. Record and recognize different battery specifications. 36. Explore different charging techniques to charge batteries. 37. Explore different	Introduction of different types of batteries used in drone. Understand different specifications and their significance of batteries. Different charging circuits or batteries, what is battery management system (BMS)

		discharging techniques and recovering of faulty battery. Perform connection of batteries in series and parallel and measure the parameters. 38. Measure and record different parameters of batteries using Battery management platform. 39. Inspect battery packs faults for bulges or leakage. 40. Identify fault related with chargers such as visible damage, voltage and current. 41. Measure and record different parameters of charging controller using software. 42. Calculate maximum discharge and battery capacities in order calculate flight time.	and different Building Blocks of BMS. Charging/Discharging of Battery Series & Parallel connection of batteries.
Professional Skill 35 Hrs; Professional Knowledge 10 Hrs	6. Test different sensors, their characteristics and repair which are commonly used in different drones.	43. Identify and measure condition of drone sensors. 44. Explore different converters like V/I, I/V, F/V, V/F 45. Verify frequency response of low pass and high pass filters. 46. Test and measure different amplifier functions. 47. Measure and record the resistance, voltage, current and frequency of different sensors used in drone. 48. Test & measure accelerometers, inertial measurement units, tilt and lidar sensor, gyro sensor, magnetometer and	Introduction of different sensors used in drone like accelerometers, inertial measurement units, tilt and lidar sensor, gyro sensor. Principle of operation of various sensors used in drone; their roles and characteristics. Selection of appropriate sensor as per requirement. Understanding and importance of signal conditioning like voltage to current, current to voltage, frequency to voltage and voltage to frequency convertor, inverting amplifier,

		barometer, pitot(Air Speed), optical flow sensor 49. Write and upload computer code to FCB to test sensors results. 50. Calibrate the compass, Lidar, and gyro sensor. 51. Measure and record angular rate, force, and magnetic field through IMU. 52. Perform amplification of low power signals using current, power, instrumentation, differential, inverting, non-inverting and buffer amplifier circuits.	non-inverting amplifier, instrumentation amplifier, differential amplifier, power amplifier, current amplifier. How to calibrate Compass sensor, Lidar Sensor, Gyro , magnetometer and barometer, pitot(Air Speed) , optical flow sensor. Concept of sensor calibration and using sensors in digital & analog mode. Understanding of different types of Lidars.
Professional Skill 35 Hrs; Professional Knowledge 10 Hrs	7. Testing of hardware assembly, driver for BLDC motors.	53. Identify different BLDC motors and their specifications 54. Inspect and test BLDC Motor driver circuit. 55. Measure and record speed-, thurst & torque characteristics of BLDC Motor using thrust measurement stand. 56. Explore driving circuit of DC, BLDC and servo motors. 57. Perform running and reversing phenomenon of BLDC Motor. 58. Demonstration speed control of BLDC Motor using PWM technique. 59. Practice Inverted pendulum balancing using programming technique and PID tuning. 60. Measure thrust to weight ratio and payload.	Introduction to different motors like DC, BLDC, servo motors, working, understanding its functioning. Studying BLDC motor using PWM techniques, speed torque characteristics, degree of freedom in drone. Performing mathematical calculations like payload calculation, speed control techniques, thrust to weight ratio. Introduction of Inverted Pendulum and PID control. PWM Duty operation and Motor control by Encoder counter.
Professional	8. Inspect, test	61. Identity different antennas	Various types of antennas

Skill 35 Hrs; Professional Knowledge 10 Hrs	and execute GPS navigation and telemetry module, different RF blocks and antennas used in RF transmitter and receiver.	like patch, helical, and omni-directional. 62. Record and plot radiation pattern of different antennas. 63. Measure directivity of the antenna. 64. Identify the characteristics of RF circuit blocks like amplifier and filters. 65. Configure and operate 2.4 GHz RC transmitter and receiver for radio. 66. Configure and operate 5.8 GHz receiver for video. 67. Perform and check connectivity of transmitter and receiver used in drone. 68. Understand GPS and its hardware interfacing with FCB. 69. Connect and Measure and record data of GPS module to determine latitude & longitude. 70. Perform the experiment of interfacing FPV camera & goggle. 71. Perform experiment to record, GPGGA, GPGLL, GPGSA, GPGSV, GPRMC and GPVTG values. 72. Perform the experiment of Drone jamming by RF disrupture.	used for drones and their characteristics. Introduction of antenna radiation pattern and directivity. Fundamentals of MIC amplifier and different filter used in RF range. Introduction to RF signals and components used for RC transmitter and receiver. Fundamentals of GPS and concept of navigation systems. Usage of signals from GPS satellites to determine latitude, longitude and altitude. Introduction about protocols on S-BUS.
Professional Skill 25 Hrs; Professional Knowledge 05 Hrs	9. Test and troubleshoot Flight Controller Board (FCB), Electronic	73. Identify different flight control board and electronic speed control. 74. Perform programming and configure flight control board (FCB).	Introduction to Flight controller boards and its connectivity with different peripherals like sensors, ESC, GPS, RF module. Introduction Electronic

	Speed Controller (ESC) and its associated peripherals.	75. Identify, explore and test interconnectivity of different peripheral with FCB like use of AI technology 76. Establish connection of FCB with motor, GPS, ESC and sensors. 77. Perform the experiment of use of FCB in Swarm mode. 78. Configure, test and record FCB with battery to monitor battery level and perform return to home operation. 79. Perform and carry out drone leveling using Inertial Measurement Unit (IMU) sensor. 80. Perform calibration of compass, Lidar, and gyro sensor. 81. Perform experiment of obstacle avoidance using Lidar / AI based system 82. Test communication link between FCB and RF transceiver. 83. Perform experiment of anti drone system using AI technology. 84. Upload & Configure given code to FCB , ESC to test sensors results. 85. Test and record data of motor connectivity with ESC. 86. Perform motor rotation using FCB and ESC. 87. Test signal flow into drone to test ESC parameters on FCB to check its operation.	Speed Controller and its connection with motor. ESC configurations using FCB to control speed and direction of motor. Protocols on UART, USART, SPI, I2C, CAN. Introduction to flight control box and various commands used in it. Configuration techniques for FCB with various motors, GPS etc.

Professional Skill 35 Hrs; Professional Knowledge 10 Hrs	10. Troubleshooting of drone Gimbal.	88. Identify the different types of drones and its application in different areas. 89. Identify different features and controls of HD and thermal image camera. 90. Test and install Gimbal camera assembly. 91. Perform and test Gimbal stabilization 92. Perform drone camera control using x, y, and z axes rotation. 93. Test and install different cameras on gimbal assembly. 94. Practice remote sensing, surveying & mapping, photogrammetry and precision agriculture using HD and thermal image camera. 95. Identify and record different application drones and their logged data for investigation.	Fundamental applications of various types of drones. Implementation and handling of HD and thermal image camera for remote sensing and mapping. Introduction to photogrammetry. Image recognition with OpenCV using the drone camera. Fundamental techniques for stabilizing Gimbal.
Professional Skill 60 Hrs; Professional Knowledge 15 Hrs	11. Resolving of common error messages and software debugging.	96. Identify bugs in the software program as per the algorithms used and the libraries. 97. Resolve common error messages and apply the correct logic. 98. Perform firmware configuration and updates. 99. Download and Install App / Menu / Planning / Set-up / Flight / Application. 100. Demonstration and perform base station software to debugging to get GPS and	Introduction to software debug tool use to identify coding errors at different stages of development. Introduction to various drone operation using Python and Arduino and setup development environment. Firmware and hardware integration with common errors and their solutions. Introduction to software debugging tools and how to identify cause of coding

		flight data. 101. Perform experiments on software debug tool use to identify coding errors at different stages. 102. Setup Arduino environment. 103. Remote automatic drone operation using GCS (Ground Control Station) application & AI navigation. 104. Knowledge and advantage of preventative maintenance of drone. 105. Diagnose problems using Log Data / Analyze Data flash Log Data / Remote Communication Log Data / Save and Execute Log Data. 106. Upgrade/downgrade drone firmware Identify error message and resolve approach.	errors. Introduction to ground base station assembly Introduction to preventive measures for drones.
Professional Skill 25 Hrs; Professional Knowledge 05 Hrs	12. Inspect, test and execute primary and secondary servicing with troubleshoot malfunctioning, and repair issues discovered.	107. Perform primary and secondary servicing based upon the checklist. 108. Test and diagnose drone after 50 hours of flying for preventive maintenance. 109. Test and diagnose drone after every 50 hours of flying. 110. Knowledge about drone troubleshooting check list like Equipment check, System reset, calibration, Motor Troubleshooting, Gimbal rotation, Battery Maintenance, and RF Signal and hardware. 111. Diagnose the common drone problem like GPS signals are blocked,	Fundamentals of primary and secondary services. Basics of Gimbal handling and its maintenance. Fundamentals of handling errors rise from GPS. Introduction to battery life maintenance, flight path monitoring. Studying throttle control by moving in either direction. Concept of Visual Inspection and Why Is It Important. Understand the various checks to be carried out to ensure the alignment of control surfaces.

		decreased battery life, Wrong direction during flight, Flight Planning, Mechanical issue, and Firmware issue. 112. Inspect drone before and after each flight. 113. First time drone hardware assembly and test. (03 hrs.) 114. Test, locate the fault and repair a wiring of drone. 115. Dimensionality confirmation of Motors leveling, Wheel base, Check & tightening of the fasteners 116. Check bent or cracked on legs and feet of the drone. 117. Demonstration drone wiring connections with different parts. 118. Perform takeoff/Landing operation and identify faults in system.	

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.

List of Tools & Equipment			
Drone Technician (For batch of 24 Candidates)			
S No.	**Name of the Tools and Equipment**	**Specification**	**Quantity**
A. GENERAL TOOLS			
1.	Pliers, cutter and wire steeper		06 nos.
2.	Soldering Station	70Watt or more with auto cut feature	06 nos.
3.	Multi meter		06nos.
4.	Tweezers	ESD tweezer set	06 nos.
5.	Binoculars		06 nos.
6.	Anemometer		06 nos.
7.	Magnifier	With helping hand for soldering purposes	06 nos.
8.	Consumables like Cable tie, Double sided tape, adhesive, raw material for 3D printer		As required
B. List of Equipment			
9.	Unassembled drone	Quad copter kit includes: ● GPS Module ● Propellers ● Frame - multi rotor design, fixed wing, helicopter/single rotor, hybrid ● BLDC Motors ● ESC (Electronic Speed controllers) ● FCB (Flight Controller Board) ● Camera ● Guard ● Lipo Battery and Charger ● RF Transmitter and receiver ● Drone base ● Receiver cables ● Obstacle avoidance using LiDAR sensor ● Mission planning function: AI enabled Waypoint routing, event execution ● Understanding Science & Dynamics of UAV: - Bluetooth enabled, Smartphone controlled Flight time: up to 10 minutes Battery: 150 Lipo quick charge	01 no.

		Sensors: Gyro, accelerometer prevent Nose dives and reduce choppiness Two high-speed motors: more thrust, Flight analytics: see heading, thrust levels and turn angles in real time and use data to improve	
10.	SMD Technology Kit with wall chart	SMD component identification board with SMD components Resistors, Capacitors, Inductors, Diodes, Transistors & IC's packages. Proto boards with readymade solder pads for various SMD Components. SMD Soldering Jig and Wall chart	02 nos.
11.	Multiple Output DC regulated programmable power supply	0-30V, 3A	02 nos.
12.	Smart SMD tweezer Handheld	SMD tester tweezer with Inductance, capacitance, resistance, and diode test capabilities.	02 nos.
13.	100 MHz Digital storage Oscilloscope	4 Channel, 50MHz Real Time Sampling 1G Samples/Sec, 12 Mpts Memory with PC Interface USB, LAN and math function includes +, -, FFT, differential, integral, abs, log etc.	01 no.
14.	25 MHz Arbitrary Waveform Generator with Digital Display for Frequency and Amplitude	Two Channel, 125MSa/Sec and 2Mpt memory with more than 150 different arbitrary waveforms, Connectivity USB Device & Host	01 no.
15.	Handheld multi-instrument	Should have multi-instruments like - DSO of 10MHz, Function generator and multimeter for Drone Test & repair functions	
16.	Handheld 3 $^{3/4}$ Digital Multimeter	Digital Multimeter with 4000 counts, Large Display with Auto/Manual and can measure DCV- 1000V-ACV-750V, DC & AC A – 20A, Resistance 40MΩ, Capacitance up to 200µF, Capacitance and Frequency – 30 MHz	12 nos.

17.	3GHz Spectrum Analyzer with built-in Tracking Generator	Frequency Range 9 kHz to 3.2 GHz Resolution Bandwidth (-3 dB): 10Hz to 1 MHz, Display 8" TFT or more Connectivity: USB Host & Device, LAN(LXI)	01 no. (optional)
18.	SMD Soldering & De soldering Station with necessary accessories	SMD Soldering & De-soldering, Station Digitally Calibrated, Temperature Control SMD, Soldering & De-soldering, Power Consumption 60 Watts, I/P Voltage 170 to 270 V, De-soldering 70 Watt, Temperature Range 180 to, 480º Centigrade, Power Consumption 270 Watts, Hot Air Temperature 200 to 480º C	02 nos.
19.	Drone Workbench	With Battery analyzer up to 65 Volt , Motor test zig with 2Nm Torque, maximum voltage 50 volt/55A Current and 5KG Thurst with PC based DAQ, , PC system, 6 1/2 DMM ,	01 no.
20.	BLDC (Brushless DC) Motor and ESC Training System for drone	370kV ,920kV, 2500kV BLDC motors with-Propeller loading arrangement creating thrust , DC voltmeter , ampere meter and with suitable variable power supply. Equipped with suitable ESC to study the drive functioning	01 no. (optional)
21.	Inverted pendulum / Drone PID Testing Rig	Inverted Pendulum control and its balance by PID control, Controller: 32bit ARM Cortex-M3 ATSAM3X8EA-AU, Motor: RA35GM, Encoder: E40S6-1024 1024 Pulse Rotary Encoder 2EA, PWM duty operation and motor control by Encoder counter, Inverted Status Monitoring by Emulation, Integrated development environment, Control DC-motor.	01 no.

22.	Drone Sensor Trainer Kit	Inbuilt cortex processor & DAQ for acquiring analog data and software for viewing the output waveforms for below mentioned sensors with USB storage and HDMI output. Ethernet port to connect real world. Inverting, Non – Inverting, Power, Current, Instrumentation and Differential Amplifier, F to V, V to F, I to V, V to I Converter, High Pass and Low Pass Filter, Buffer, LED, Buzzer, Relay, Included Sensors: Accelerometer, Pitot, Gyro, IMU, current, voltage and Optical flow sensor, Magnetometer, Barometer.	02 nos.
23.	Drone Antenna training system	RF Frequency 2.4 GHZ / 5.8 GHZ Modulation Generator 1KHz, RF detector folded dipole receiving antenna with digital display, rotation of antenna 0 – 360 degree different antennas ground plane, helical, slot ,folded dipole and patch.	01 no.
24.	GPS or NAVIC training platform	Channel : 12 Receiver Frequency : 1575.42 MHz Position Accuracy : 25 meters CEP without SA Velocity Accuracy : 0.1 meters/second, without SA Time Accuracy : Synchronized to GPS time Update rate : 1 sec. Receiver Sensitivity : -175 dB Serial Communication : 4800 Baud Rate (default) Protocol Messenger : NMEA0183 V 2.2, SiRf binary & RTCMSC-104 V2.0 type 1,2,9 Maximum Speed : 515 meters/sec. Maximum Altitude : 18000 meters Time to First Fix : 45 / 38 / 8 sec Analysis of GPS data with the help of integrated software to view location, set home position , configuration of geo fencing and Simulate return to home/Launch feature	01 no.

25.	Anti drone Training System	Quad-core ARM Cortex-A76 CPU @ 2.4 GHz with 8GB RAM, Compatible USB webcam with at least 30 FPS video support, Integrated buzzer or speaker for real-time audio alerts, RGB LED panel or display to indicate detection status, Dual-band Wi-Fi and Gigabit Ethernet for real-time cloud/internet alerting 64-bit OS, Pre-configured to run AI models using custom built models, Includes training scripts and datasets to train drone vs non-drone object detection, Real-time object detection via Python based scripts, Alert system on detection, will give: Audio alert (buzzer/beep), 2. Visual alert (LED/Screen), Internet based alerts	01 no.
26.	Drone jamming training System	Drone Jamming training system should have high frequence generators – 2 nos. inbuilt of selectable 2.4 GHz frequencies to produce RF disruption, Helical antennas, should be able to jam video & telemetry of suitable system.	01 no.
27.	FCB and ESC training platform Drone simulator	Two processors 8bit and 32bit, Cortex-M4F with 6050 MPU, 32bit STM32F103 redundant failsafe co-processor system, 14 PWM/Servo output. Bus interface (UART, I2C, SPI, CAN). Pre-Installed firmware with RTOS for Quadcopter (X and +) configuration, Gyroscope, Accelerometer/magnetometer, Barometer. 4x UART (Serial Ports), One High-Power Capable, 1x CAN, PPM Sum Signal Input. I2C, SPI, 3.3 - 6.6V ADC Inputs. 72-Channel GPS receiver GLONASS, Battery 3000mah, 1000kv Brushless Motor with soldered connector, Propellers,30A BLDC Electronic Speed Controller,2.4Ghz 6Ch transmitter with Receiver, Internal Micro USB Port And External Micro USB Port Extension. Provide automatic and manual modes. Provide redundant power input and failover. Multicolor LED lights. Provide multi-tone buzzer	06 nos.

		Interface. Micro SD recording flight data. The integrated backup power and backup controller fails, the primary controller fails over to the backup control is safe.	
28.	FPV Camera with Goggle		04 nos.
29.	Drone Gimbal Set with motor and control	2 Axis Brushless Gimbal, Carbon Fiber Material, Motor drivers, On-board MPU. This should be compatible with item no. 23	01 no.
30.	Power electronics Trainer Kit		04 nos.
31.	Micro UAV built for Mapping and Surveillance.	UAV Weight with standard payloads <2 Kg UAV Size with Propeller - < 80 cm x 80 cm Endurance/ Flight time (up to 1 Km AMSL) :15-25 minutes Range for live transmission (Radius) 500 meter Operating altitude (AGL) –100-120meter AGL (Above Ground Level) Maximum launch altitude (AMSL) - 3000m AMSL (Above Mean Sea Level) Wind Resistance - Minimum 10 m/s **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 Payload Characteristics - Mapping/RGB/Photogrammetry Payload, 15 MP Ground Control Station Software	01 no.

		with data-link equipment	
32.	Field Repair kits	Allen key set (T type), Magnifying lenses, Scissors, First aid kit, portable Soldering iron, de-soldering pump/wick, solder wire, no clean flux, Precision set of screw drivers, Handheld multimeter, and Long nose pliers. Heat shrink sleeve set	02 nos.
33.	Drones and spare parts kit	Li-Po, Li-ion Batteries, BLDC motors, Propeller set, ESC, GPS module, Landing gears, and RC remote batteries	02 nos.
34.	Balance Charger	Supports 1-8S LiPo, LiHV, and LiFe batteries. Charging Power (W): 600 Input Voltage (V): 7.0-35.0V @MAX 25A LCD: IPS 2.4 inch LCD 320*240 resolution	02 nos.
35.	Laptop latest configuration	Intel i5 or higher with 12/13thGeneration, 2.4 Ghz base speed, 16GB RAM | Storage 1 TB SSD, 4GB dedicated graphic cardPre-loaded Windows Windows 11 Display: 15.6-inch screen with full HD display, Battery life: 2 hrs.	01 no.
36.	Desktop Computer	Intel i5 or higher with 12/13th Generation, 2.4 GHz base speed, 16GB RAM | Storage 1 TB SSD, 4GB dedicated graphic card, Pre-loaded Windows 11 with Display: 15.6-inch screen with full HD display, 4 GB or higher graphic card	06 nos.
37.	Thrust measurement meter with stand	Alphanumeric LCD 16x2 , PWM signal output, External safety switch, Reset switch, Provided with Digital Voltmeter and Ammeter Microcontroller based, BLDC Motor, Thrust Sensor: VDC : 5 volt, Weighing Range: 1 kg., Multiplexer Digital ESC- 5 volt approx.	02 nos.

38.	Indoor netted facility		Size as required in Lab
39.	Outdoor controlled netted testing facility		Size as required for outdoor
40.	Different types of electronic and electrical cables, Connectors, sockets, terminations, Different types of Analog electronic components, digital ICs.		As required
41.	3D printer	**Build Volume**: 256 × 256 × 256 mm **Chassis**: Steel and extruded aluminum **Hot end**: All-metal, max temperature 300 °C Auto leveling Bed **Nozzle**: Stainless steel, 0.4 mm included C**amera**: Low-rate (up to 1080p), supports timelapse **Sensors**: Filament runout, tangle detection, odometry, power loss recovery **Display**: 3.5-inch IPS touchscreen (320×240) **Connectivity**: Wi-Fi, Micro SD card **Extruder Gears**: Hardened steel **Max Print Speed**: 500 mm/s **Filament Diameter**: 1.75 mm 3D Printer must be provided with temperature controlled enclosure.	01 no.
42.	Drone	● Automatic flight ● Payload or camera control ● Up to1- 3 kg payload ● IP55 rating ● Up to 2km ● Flight time up to 30 -40 minutes Modular Payloads- - 3 axis Gimbal camera with live video and thermal feed. - 1 Ltr. Spraying system with tank, pump - Servo mechanism for up to 1 kg payload drop - 2k resolution and 320P Thermal.	01 no. (optional)
43.	Drone up to 5km		01 no.
44.	Air Conditioner	1.5 T	02 Nos.

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 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	02 Nos.
51.	Transmitter & Receiver	Frequency range - 2.405 GHz- 2.475 GHz Band with - 400KHz 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	12+1 Nos.

		Frames Weight: 230	
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
Furnitures			
69.	Student tables	2 – 3 seater	12 Nos.
70.	Student Non revolving Chair		24 Nos.
71.	Faculty Table		01 No.
72.	Faculty revolving Chair		01 No.
73.	Pegboard Organizer Wall Control 4 ft		02 Nos.
74.	Drawers Tool Trolley	6- 8 drawers	02 Nos.
Note: - *1. Internet facility is desired to be provided in the class room.*			

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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ANNEXURE-III

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