





Model Curriculum

QP Name: Drone Manufacturing and Assembly Technician

QP Code: ELE/Q7307

QP Version: 1.0

NSQF Level: 4

Model Curriculum Version: 1.0

Electronics Sector Skills Council of India || 155, 2nd Floor, ESC House, Okhla Industrial Area- Phase 3, New Delhi– 110020

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Training Parameters

Sector	Electronics
Sub-Sector	Industrial Automation
Occupation	Assembly – I&A
Country	India
NSQF Level	4
Aligned to NCO/ISCO/ISIC Code	NCO-2015/NIL
Minimum Educational Qualification and Experience	10th class + 2 years of experience OR 12th class + 6 months experience OR 2 years ITI (after 10th) OR 3 years Eng. Diploma after 10th (Electrical/ Electronics/ Instrumentation Engineering) OR Course of NSQF Level-3 in the domain of Electrical/ Electronics/ Instrumentation/ Mechanical with 2 years of experience 18 Years
Pre-Requisite License or Training	ΝΑ
Minimum Job Entry Age	18 Years
Last Reviewed On	NA
Next Review Date	NA
NSQC Approval Date	ΝΑ
QP Version	1.0
Model Curriculum Creation Date	NA
Model Curriculum Valid Up to Date	NA
Model Curriculum Version	1.0
Minimum Duration of the Course	390 Hours, 0 Minutes
Maximum Duration of the Course	390 Hours, 0 Minutes





Program Overview

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

Training Outcomes

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

- State the role and responsibilities of an entrepreneur/businessman
- Demonstrate the basic flying physics and motions of the drone using a simulator
- Demonstrate the process of assembling/ disassembling different types of Drones
- Demonstrate the process of inspecting different components of a Drone for testing
- Explain the process of testing a Drone for correct functioning after Assembly
- Explain the process of manufacturing and deploying a Drone
- Explain the importance of following the quality and customer service standards
- Explain the importance of following inclusive practices for all genders and PwD at work
- Demonstrate the use of relevant health and safety equipment

Compulsory Modules

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

NOS and Module Details	Theory Duration	Practical Duration	On-the-Job Training Duration (Mandatory)	On-the-Job TrainingDuration (Recommended)	Total Duration
Bridge Module	10:00	00:00	00:00	00:00	10:00
Module1: Introduction and Orientation to the Role of a Drone Manufacturer	10:00	00:00	00:00	00:00	10:00
ELE/N7308 Manufacturing and Assembly of a Drone	48:00	102:00	102:00	00:00	252:00
Module 2: Types of Drones and Their Applications	4:00	4:00	4:00	00:00	12:00
Module 3: Study of Block Diagram of a Drone	4:00	6:00	6:00	00:00	16:00
Module 4: Required Constituents/ Tools to assemble a Drone	8:00	12:00	12:00	00:00	32:00
Module 5: Study of Done Electronics/Circuits	8:00	16:00	16:00	00:00	40:00
Module 6: Principles of Flying and Learning it with Drone Simulator	12:00	32:00	32:00	00:00	76:00
Module 7: Assembling, Testing and Quality check of the Drone	12:00	32:00	32:00	00:00	76:00
ELE/N9905 Work effectivelyat the workplace	16:00	24:00	24:00	00:00	64:00
Module 8: Soft Skills and Work Ethics	16:00	24:00	24:00	00:00	64:00
ELE/N1002 Apply healthand safety practices at workplace	16:00	24:00	24:00	00:00	64:00
Module 9: Basic Health and Safety Practice	16:00	24:00	24:00	00:00	64:00
Total Duration	90:00	150:00	150:00	00:00	390:00

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Module Details

Module 1: Introduction and orientation to the role of a Drone manufacturer

Duration: 10:00	Duration: 00:00		
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes		
 Describe the size and scope of the electronics industry and its sub- sectors 	• NA		
 List various types of Drones and their respective applications 			
 State the role and responsibilities of Drone Manufacturer 			
 Discuss various manufacturing opportunities for a Drone manufacturer in the electronics industry 			
 State the organization's policies on incentives, personnel management reporting structure etc. 			
Classroom Aids			
Training kit - Trainer guide, Presentations, Whiteboard, Marker, projector, laptop			
Tools, Equipment and Other Requirements			
NA			





Terminal Outcomes:

• State the different types of Drones and their applications

Duration: 4:00	Duration: 4:00	
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes	
 Explain the fundamental concept of a Drone Explain types of Drones based on Wing Geometry – Fixed Wing, Multi-rotor etc. Describe the applications of different types of Drones. Describe the rationale behind having different Drone types for different applications. Types of Fixed Wing drones, make, parts, terminology Operations & Maneuver of fixed wing drones Applications of Fixed Wing drones. Introduction to Multi-rotor drones. Advantages and disadvantages of Fixed Wing drones over Multi-rotor drones 	 Demonstrate different types of Drones in physical form or Demonstrate the Types of Drones through videos and simulator 	
Classroom Aids		
Drone videos, Whiteboard, Marker, projector, laptop		
Tools, Equipment and Other Requirements		
Different Types of drones in physical form, drone simulator		





Module 3: Study of Block Diagram of a Drone Mapped to ELE/N7308

Duration: 04:00	Duration: 06:00		
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes		
Explain the functional Block Diagram of Drones. Describe functionality of each block and its importance with respect to the operations of the drone.	Practically explain showing the parts forming the functional blocks and their significance in the drone operation.		
Classroom Aids			
Whiteboard, Marker, projector, laptop			
Tools, Equipment and Other Requirements			
Working model of Drone for demonstration.			

Module 4: Required Constituents to make a Drone Mapped to ELE/N7308

Duration: 08:00	Duration: 12:00		
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes		
 Explain from block diagram to actual constituents that go into making of a Drone. Describe in brief, significance, positioning of each constituent. Explain the working of tools needed to assemble and make a drone. Describe the functionality of each part of the Drone. 	 Practically explain showing the parts forming the functional blocks and their significance in the drone operation. Demonstration of using tools needed for drone assembly. 		
Classroom Aids			
Whiteboard, Marker, projector, laptop			
Tools, Equipment and Other Requirements			
Working model of Drone for demonstration of Block diagram, Tools needed for Drone assembly			





Module 5: Study of Drone Electronics/ Circuits Mapped to ELE/N7308

Duration: 08:00	Duration: 16:00
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
 Overview of basic electronic components such as a resistor, capacitor, transistor, coil, motors, sensors etc. Brushed and Brushless Motors Factors in selection of motors in drones Electronic Speed Control (ESC) Calibrate and mount Electronic Speed Controllers (ESCs) Explain Transmitters & Receivers and communication modules used in drones Drone batteries and their types, pros and cons Explain different sensors used in drones Distinguish between different flight controllers and compare them Explain Payloads in drones such as Cameras, Load Grippers etc. Drone weight and payload weight Explain payload weight distribution for a set of conditions Payload based controller calibration 	 Demonstrate basic electronic components Demonstrate different Drone motors Demonstrate ESC, Trans-receivers etc. Demonstrate Flight controllers Demonstrate payload mechanisms Demonstrate different payload effects on drone flight Demonstrate effect of imbalanced payload conditions
Classroom Aids	
Whiteboard, Marker, projector, laptop	

Tools, Equipment and Other Requirements

Working model of Drone,

Electronic constituents of Drone such as Motors, ESC, Flight controllers, Trans-receivers, different payload mechanisms for demonstration





Module 6: Principles of Flying and Learning it with Drone Simulator Mapped to ELE/N7308

Mandatory Duration: 12:00	Recommended Duration: 32:00
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
 Understand basic principles of flying like Bernoulli's Principle etc. Apply principles of flight to Drones. Understand Longitude/Latitude etc. Take-off, Flight, Landing, Maneuvers, turns etc. Multi-rotor configurations, airframe sizes and construction materials Different propeller designs Knowledge of the purpose of the different parts of the drones. Acquire knowledge of thrust to weight ratio of a drone and how the propellers help in controlling the same Apply concepts of Lift and drag for drone flight using a drone simulator Understand concept of reverse torque acting on drones. Knowledge of 3-axis drone motions roll, pitch and yaw and impact of propellors on the motion Know sensor interfacing with the drone Simulate the concept of Pitch, roll, yaw, thrust to weight ratio using Drone simulator Simulate the concept of Hovering a drone, soft landing, controlled pitch and roll angles with a Drone Simulator 	 Demonstrate airframes and propellors Demonstrate aerodynamics of motion control Demonstrate maneuvering in drones using these principles Simulate full flight sequences on the Drone Simulator for understanding of – Set Up – Drone, Site, Coordinates Pre-flight checks, start-up Take-off Fly Approach and soft landing Handle fly-aways and exceptions Yaw, pitch, roll Thrust-to-weight ratio, lift, drag Controlled roll and pitch angles
Classroom Aids	
Whiteboard, Marker, projector, laptop	
Tools, Equipment and Other Requirements	

Drone Simulator capable with all above-mentioned simulation parameters and facilities





Module 7: Assembling, Testing and Quality check of the Drone Mapped to ELE/N7308

Mandatory Duration: 12:00	Recommended Duration: 32:00
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
 On the basis of previous module knowledge gained in module 6 and 7 of electronics & aerodynamics(mechanical) of drones And from the drone components (Bill of materials) With the help of tools studied previously Assemble different types of Drones from their components and sub-assemblies To study the assembly procedures for at least 2 different types of drones To study configurations and setting of drones to make them operational with desired functionality To study the methods to carry out testing of drone sub-assemblies and also fully assembled drone with/without payload Performing the necessary pre-dispatch Quality Checks on the Assembled / Manufactured drone. 	 Practicing actual assembly and manufacturing of the drone Identifying BOM of components and assemble the drone from drawing supplied with drone kits Carry out configuration and settings for the drone. Charging the drone batteries Repeat for at least 2 types of drones Carry out testing and Quality Check / Assurance of the drone without payload and then with rated payload Deploy the drone
Classroom Aids	

Whiteboard, Marker, projector, laptop

Tools, Equipment and Other Requirements

Full CKD (Complete Knock-Down) components for at least 2 different types of Drones. Full tool set – $\ensuremath{\mathsf{Full}}$

Soldering Iron, Screwdriver, Torque Screwdriver, Nut Driver, Safety Knife, Pliers, Wire Strippers, Wire Cutters, Glue Gun, Tweezers, Multi-meter, Heat Gun, Desk Light and Magnifier, Digital Weighing Scale, Wattmeter and Clamp Meter, Motor Thrust Stand, Servo Tester, Connectors etc.





Module 8: Soft Skills and Work Ethics Mapped to ELE/N9905

Terminal Outcomes:

- Work effectively at the workplace.
- Demonstrate practices related to gender and PwD sensitization

Duration: 16:00	Duration: 24:00
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
 State the importance of work ethicsand workplace etiquette 	 Develop a sample plan to achieve organizational goals and targets.
 State the importance of effective communication and interpersonalskills. 	• Create a sample feedback form to obtain feedback from customers, colleagues etc.
 Explain ways to maintain discipline at the workplace. 	Roleplay to demonstrate the use of professional language and behavior that is
 Discuss the common reasons for interpersonal conflict and ways of managing them effectively. 	 Apply organizational protocol on data confidentiality and sharing only with the
 Discuss the importance of following organizational guidelines for dress code, time schedules, language usageand other behavioral aspects. 	authorized personnel.
 Explain the importance of working as per the workflow of the organization toreceive instructions and report problems. 	
 Explain the importance of conveying information/instructions as per defined protocols to the authorized persons/team members. 	
 Explain the common workplace guidelines and legal requirements onnon-disclosure and confidentiality ofbusiness-sensitive information. 	
 Describe the process of reporting grievances and unethical conduct suchas data breach, sexual harassment at the workplace, etc. 	
 Explain the concept and importance of gender sensitivity and equality. 	
 Discuss ways to create sensitivity for different genders and Persons with Disabilities (PwD). 	
• Discuss ways of dealing with heightened emotions of self andothers.	





Classroom Aids

Training kit (Trainer guide, Presentations)

Tools, Equipment and Other Requirements

Sample of escalation matrix, organization structure.





Module 9: Basic Health and Safety Practice Mapped to ELE/N1002

Terminal Outcomes:

• Apply health and safety practices at the workplace.

	D
Duration: 16:00	Duration: 24:00
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
 Discuss job-site hazards, risks and accidents. Explain the organizational safety 	 Demonstrate the use of protective equipment suitable as per tasks andwork conditions.
procedures for maintaining electrical safety, handling tools and hazardous materials.	 Report any abnormal situation/behavior of any equipment/system to the relevantauthorities.
 Elaborate electronic waste disposal procedures. 	 Administer first aid in case of a minor accident.
 Describe the process of disposal of hazardous waste 	• Demonstrate the steps to free a personfrom electrocution safely.
 List the name and location of concerned people, documents and equipment for 	 Administer Cardiopulmonary Resuscitation (CPR).
maintaining health andsafety in the workplace.	• Demonstrate the application of defined emergency procedures such as raising alarm,
 Describe how to interpret warning signs while accessing sensitive workareas. 	safe/efficient, evacuation, moving injured people, etc.
 Explain the importance of good housekeeping. 	 Prepare a sample incident report. Use a fire extinguisher in case of a fire
 Describe the importance of maintaining appropriate postures whilelifting heavy objects 	incident.Demonstrate the correct method of lifting
 List the types of fire and fire extinguishers. 	and handling heavy objects.
 Explain the importance of efficient utilization of water, electricity and other resources. 	
 List the common sources of pollution and ways to minimize it. 	
 Describe the concept of waste management and methods of disposing hazardous waste. 	
• Explain various warning and safetysigns.	
 Describe different ways of preventing accidents at the workplace. 	



Classroom Aids



Training kit (Trainer guide, Presentations)

Tools, Equipment and Other Requirements

Personal Protection Equipment: safety glasses, head protection, rubber gloves, safety footwear, warning signs and tapes, fire extinguisher, first aid kit, fire extinguishers and warning signs.





Module 10: On-The-Job Training Mapped to ELE/N7307

Mandatory Duration: 150:00

Recommended Duration: 00:00

Terminal Outcomes

- Explain the fundamental concept of a Drone
- Illustrate the preliminary tasks involve in the Manufacture and Assembly of a Drone
- Demonstrate how to perform preliminary checks on a Drone
- Demonstrate how to carry out Testing of a Drone prior to deployment
- Test functioning of the Drone post assembly
- Communicate product and service-related information to the customer
- Interact and coordinate with supervisor and colleagues
- Perform assigned work within timelines and with defined quality
- Demonstrate how to maintain a healthy, safe and secure working environment







Trainer Requirements

Trainer Prerequisites						
Minimum Educational	Specialization	Relevant Industry Experience		Training Experience		Remarks
Qualification		Years	Specialization	Years	Specialization	
Diploma / Degree in	Should have knowledge of	2	Drone Manufacturing & Assembly	1	Electronics	
Electronics (related fields) or	Aerospace		Technician			
Aeronautical Engineering	engineering					

Trainer Certification				
Domain Certification	Platform Certification			
"Drone Manufacturing & Assembly Technician", "ELE/Q7307, v1.0", Minimum accepted score is 80%	"Trainer", "MEP/Q2601" with a minimum scoreof 80%			





Assessor Requirements

Assessor Prerequisites						
Minimum Educational Qualification	Specialization	Relevant Industry Experience		Training/Assessment Experience		Remarks
		Years	Specialization	Years	Specialization	
Diploma / Degree in	Should have knowledge of	3	Drone Manufacturing & Assembly	2	Electronics	
Electrical/Electronic or	aerospace		Technician			
Aeronautical Engineering.	engineering					

Assessor Certification				
Domain Certification	Platform Certification			
"Drone Manufacturing & Assembly Technician", "ELE/Q7307, v1.0", Minimum accepted score is 75%	"Assessor", "MEP/Q2701" with a minimum score of 75%			





Assessment Strategy

- 1. Assessment System Overview:
 - Batches assigned to the assessment agencies for conducting the assessment on SDMS/SIPor email
 - Assessment agencies send the assessment confirmation to VTP/TC looping SSC
 - Assessment agency deploys the ToA certified Assessor for executing the assessment
 - SSC monitors the assessment process & records
- 2. Testing Environment
 - To ensure a conducive environment for conducting a test, the trainer will:
 - Confirm that the centre is available at the same address as mentioned on SDMS or SIP
 - Check the duration of the training.
 - Check the Assessment Start and End time are 10 a.m. and 5 p.m. respectively
 - Ensure there are 2 Assessors if the batch size is more than 30.
 - Check that the allotted time to the candidates to complete Theory & Practical Assessmentis correct.
 - Check the mode of assessment—Online (TAB/Computer) or Offline (OMR/PP).
 - Confirm the number of TABs on the ground are correct to execute the Assessment smoothly.
 - Check the availability of the Lab Equipment for the particular Job Role.
- 3. Assessment Quality Assurance levels / Framework:
 - Question papers created by the Subject Matter Experts (SME)
 - Question papers created by the SME verified by the other subject Matter Experts
 - Questions are mapped with NOS and PC
 - Question papers are prepared considering that level 1 to 3 are for the unskilled & semi-skilled individuals, and level 4 and above are for the skilled, supervisor & higher management
 - The assessor must be ToA certified & trainer must be ToT Certified
 - Assessment agency must follow the assessment guidelines to conduct the assessment
- 4. Types of evidence or evidence-gathering protocol:
 - Time-stamped & geotagged reporting of the assessor from assessment location
 - Centre photographs with signboards and scheme-specific branding
 - Biometric or manual attendance sheet (stamped by TP) of the trainees during the trainingperiod
 - Time-stamped & geotagged assessment (Theory + Viva + Practical) photographs & videos
- 5. Method of verification or validation:
 - To verify the details submitted by the training centre, the assessor will undertake:
 - A surprise visit to the assessment location
 - A random audit of the batch
 - A random audit of any candidate
- 6. Method for assessment documentation, archiving, and access

To protect the assessment papers and information, the assessor will ensure:

- Hard copies of the documents are stored
- Soft copies of the documents & photographs of the assessment are uploaded/ accessed from Cloud Storage
- Soft copies of the documents & photographs of the assessment are stored on the Harddrive



References



Glossary

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





Acronyms and Abbreviations

Term	Description
AMC	Annual Maintenance Contract
CPR	Cardiopulmonary Resuscitation
DC	Direct Current
EM&B	E-Mobility & Battery
GPS	Global Positioning System
IC	integrated Circuit
NCO	National Occupational Standards
NOS	National Skills Qualification Committee
NSQF	National Skills Qualification Framework
OMR	Optical Mark Recognition
OJT	On-the-Job Training
PC	Performance Criteria
PwD	Persons with Disabilities
QP	Qualification Pack
SDMS	Skill Development & Management System
SIP	Skill India Portal
SME	Small and Medium Enterprises
SOP	Standard Operating Procedure
SSC	Sector Skill Council
ТАВ	Tablet
тс	Trainer Certificate
ТоА	Training of Assessors
ТоТ	Training of Trainers
ТР	Training Provider
VTP	Vocational Training Provider