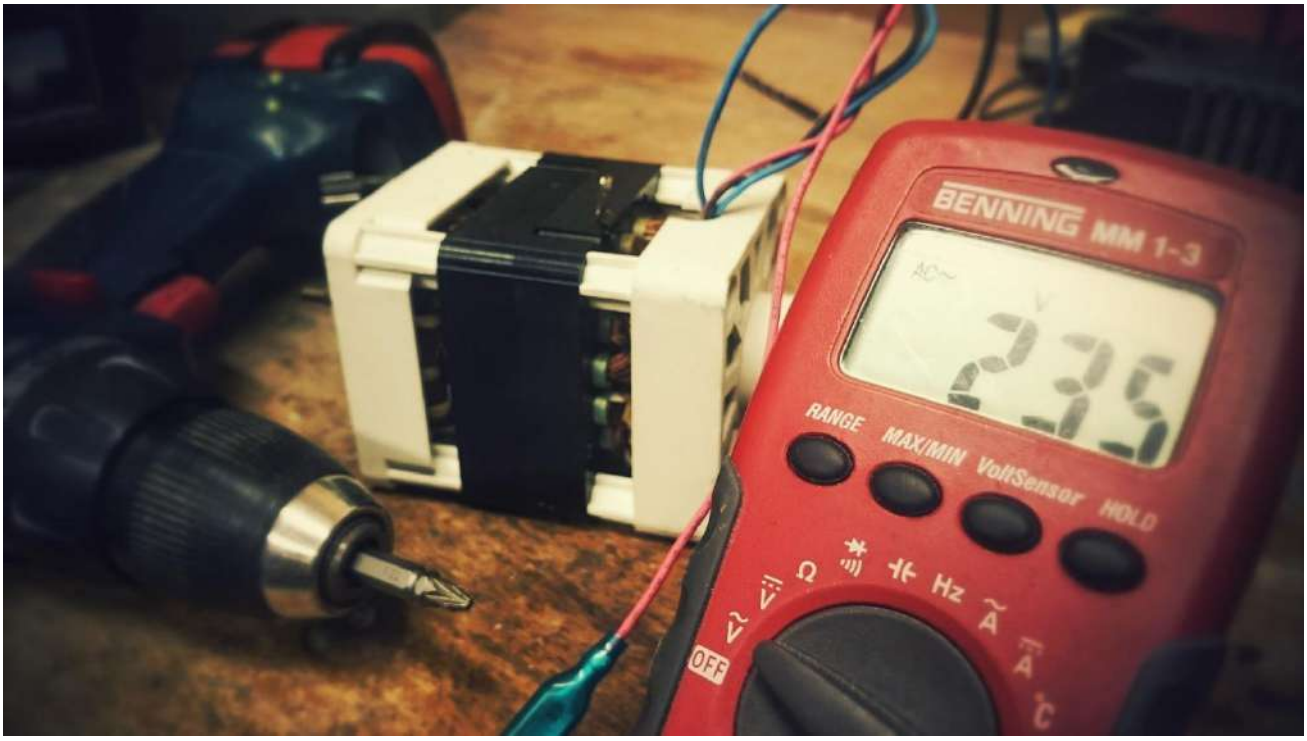

Model Curriculum

QP Name: Testing and Calibration Technician (Electrotechnical)

QP Code: IAS/Q5002

QP Version: 1.0

NSQF Level: 4

Model Curriculum Version: 1.0

Instrumentation Automation Surveillance & Communication Sector Skill Council
201-202 STBP NSIC Complex (Gate No. 02), Okhla Industrial Area, New Delhi-110020

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Training Parameters

Sector	Instrumentation Automation Surveillance and Communication
Sub-Sector	Instrumentation
Occupation	Testing and QA
Country	India
NSQF Level	4
Aligned to NCO/ISCO/ISIC Code	NCO-2015/7311.1001
Minimum Educational Qualification & Experience	B.Sc. (with Physics as a subject), Diploma in Mechanical, Instrumentation, Electrical or Electronics
Pre-Requisite License or Training	Not Applicable
Minimum Job Entry Age	19 Years
Last Reviewed On	05/02/2020
Next Review Date	05/02/2024
NSQC Approval Date	
Version	1.0
Model Curriculum Creation Date	05/02/2020
Model Curriculum Valid Up to Date	05/02/2024
Model Curriculum Version	1.0
Minimum Duration of the Course	312 Hours, 0 Minutes
Maximum Duration of the Course	312 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.

- Identify the role and responsibilities of a testing and calibration technician (electrotechnical).
- Implement the pre-requisites for electrotechnical calibration setup.
- Perform calculation of parameters associated with electrotechnical calibration and calibrate the instruments accordingly.
- Perform preventive maintenance and task reporting of the electrotechnical calibration setup.
- Work effectively and efficiently in a team.
- Comply with the health and safety procedures at workplace.

Compulsory Modules

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

NOS and Module Details	Theory Duration	Practical Duration	On-the-Job Training Duration (Mandatory)	On-the-Job Training Duration (Recommended)	Total Duration
Bridge Module	**16:00**	**32:00**	**00:00**	**00:00**	**48:00**
Module 1 – Introduction to the Role and Responsibilities of a Testing and Calibration Technician (Electrotechnical)	16:00	32:00	00:00	00:00	48:00
IAS/N5001 – Performing pre-calibration activities **NOS Version No. 1.0** **NSQF Level 4**	**24:00**	**40:00**	**00:00**	**08:00**	**64:00**
Module 2 – Pre-requisites for Electrotechnical Calibration	24:00	40:00	00:00	08:00	64:00
IAS/N5002 - Calibration of electrotechnical parameters **NOS Version No. 1.0** **NSQF Level 4**	**32:00**	**56:00**	**00:00**	**08:00**	**88:00**
Module 3 – Calibration and Calculation of Electrotechnical Parameters	32:00	56:00	00:00	08:00	88:00
IAS/N5003 - Preventive maintenance and task	**16:00**	**40:00**	**00:00**	**08:00**	**56:00**

reporting **NOS Version No. 1.0** **NSQF Level 4**					
Module 4 – Preventive Maintenance and Task Reporting	16:00	40:00	00:00	08:00	56:00
IAS/N9001 - Work effectively with teams **NOS Version No. 1.0** **NSQF Level 4**	**08:00**	**08:00**	**00:00**	**00:00**	**16:00**
Module 5 – Soft Skills and Work Ethics	08:00	08:00	00:00	00:00	16:00
IAS/N9002 - Maintain health and safety at workplace **NOS Version No. 1.0** **NSQF Level 4**	**12:00**	**12:00**	**00:00**	**00:00**	**24:00**
Module 6 – Basic Health and Safety Practices	08:00	08:00	00:00	00:00	16:00
Module 7 – Self Development Practices	04:00	04:00	00:00	00:00	08:00
Total Duration	**108:00**	**188:00**	**00:00**	**00:00**	**296:00**

Module Details

Module 1: Introduction to the Role and Responsibilities of a Testing and Calibration Technician (Electrotechnical)

Bridge Module

Terminal Outcomes:

- Identify the role and responsibilities a Testing and Calibration Technician (Electrotechnical)

Duration: *16:00*	**Duration**: *32:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain the electrotechnical calibration process. • Discuss the workflow process and its impact on the calibration accuracy. • Differentiate between the different types of calibration methods. • List the various electrotechnical devices, calibration instruments and equipment needed for calibration. • Discuss the various working and reference standards for calibration along with the importance of calibration. • List the sources of errors in the calibration process and how to identify them. • Discuss about SOP for calibration and Technician – Electrotechnical Dimensions.	• Demonstrate the use of different types of methods for adjustment, calibration and performance improvement. • Analyse calibration results through data processing and interpretation. • Prepare a sample report listing the various tasks and changes associated with the calibration environment setup. • Demonstrate the ways of resolving problems in setting up the environment for calibration, functioning of calibration instrument/equipment etc.
Classroom Aids	
White board/ black board marker / chalk, duster, computer or Laptop attached to LCD projector	
Tools, Equipment and Other Requirements	
Electrotechnical calibration equipment and devices	

Module 2: Pre-requisites for Electrotechnical Calibration

Mapped to NOS IAS/N5001

Terminal Outcomes:

- Analyse the pre-requisites for electrotechnical calibration setup

Duration: *24:00*	**Duration**: *40:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Discuss the norms for electromagnetic interference (EMI) and electromagnetic compatibility (EMC), earthing and stray magnetic fields as per standard operating procedure (SOP). • Describe the working conditions of a laboratory. • List the instruments required for setting Electrotechnical Metrology Calibration environment. • Explain the safety procedures and guidelines to be followed in case of emergencies such as electric shock. • Describe the procedure for connecting, setting up and operating different type of calibrations instruments. • Discuss ways to avoid dip in voltage and transient currents in case of operation of heavy loads. • Explain how to analyse requirements for protective equipment needed for the protection of the laboratory such as transient suppressors for shielding from high current spikes.	• Perform checks of the air conditioning plant to analyse the temperature of the laboratory. • Demonstrate how to check for abnormal noise and identify its source. • Examine electrical wiring, lighting and equipment to check their functioning and detect abnormalities, if any. • Demonstrate how to check for dust free environment, positive air pressure, ambient temperature, and humidity. • Demonstrate different techniques to check for intensity and location of magnetic field, and to minimise magnetic interference. • Demonstrate different ways to handle electric shock as per SOP. • Inspect various calibration parameters such as RF/Microwave, time, frequency etc. as per organisational standards. • Employ steps of inspecting quality of power supply from the UPS (e.g. hum interference and components such as isolation transformers, filters etc). • Demonstrate how to inspect instruments and power supply needed for the electrotechnical calibration setup.
Classroom Aids	
White board/ black board marker / chalk, duster, computer or Laptop attached to LCD projector	
Tools, Equipment and Other Requirements	
Electrotechnical calibration equipment and devices	

Module 3 Calibration and Calculation of Electrotechnical Parameters

Mapped to NOS IAS/N5002

Terminal Outcomes:

- Perform calibration and calculation of parameters associated with electrotechnical calibration

Duration: *32:00*	**Duration**: *56:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Identify the calibration method for various parameters as specified in the job order. • Differentiate between the various comparison methods such as difference method, null method, etc. • Describe the Unit Under Calibration (UUC), its acceptable condition and values as per SOP. • Explain the steps to prepare and record in the observation sheet the details of UUC. • Discuss the importance of stabilising the UUC and reference instrument after calibration. • Elaborate the process for calibration of all parameters. • Identify the calculation equation for the type of calibration to be performed along with the optimum value for various parameters.	• Perform steps to inspect and connect various equipment with UUC for measuring various parameters such as voltage, frequency etc. • Demonstrate how to measure parameters and record readings of temperature and humidity. • Use the machine interface to monitor the readings in case the process is automated. • Perform Type A and Type B uncertainty calculations as per SOP and record the result in the specified format. • Prepare the post calibration report as specified in the SOP. • Demonstrate how to return the UUC, reference instrument and accessories to appropriate storage position and mark tags to indicate completion of calibration.
Classroom Aids	
White board/ black board marker / chalk, duster, computer or Laptop attached to LCD projector	
Tools, Equipment and Other Requirements	
Electrotechnical calibration equipment and devices, function generators, resistors, inductors, capacitors, Reference instruments	

Module 4: Preventive Maintenance and Task Reporting

Mapped to NOS IAS/N5003

Terminal Outcomes:

- Perform preventive maintenance and ensure task reporting of the electrotechnical calibration setup

Duration: *16:00*	**Duration**: *40:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain the purpose and process of performing preventive maintenance. • Identify the devices and instruments to be used for preventive maintenance. • Discuss the various steps in maintenance of equipment. • Explain the documentation process for recording various details of preventive maintenance schedule. • Explain the process of reporting issues (equipment repairs and restoration, theft etc.) to the supervisor.	• Perform visual and validity checks of calibration certificates for all instruments and equipment. • Demonstrate how to check cables, sockets, calibration instruments, meters and accessories for current leakage. • Demonstrate various methods of complying to environment parameters. • Perform steps for cleaning and greasing of equipment using appropriate cleaning solvents. • Demonstrate how to create various records and reports for preventive and corrective maintenance.
Classroom Aids	
White board/ black board marker / chalk, duster, computer or Laptop attached to LCD projector	
Tools, Equipment and Other Requirements	
Electrotechnical calibration equipment and devices, function generators, resistors, inductors, capacitors, Reference instruments	

Module 5: Soft Skills and Work Ethics
Mapped to NOS IAS/N9001

Terminal Outcomes:

- Work effectively at the workplace

Duration: *08:00*	**Duration**: *08:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain the importance of working towards team objectives and goals. • Discuss the code of conduct towards team members w.r.t. their culture, preferences, roles and responsibilities. • Explain the importance of effective communication and interpersonal skills. • Identify the common reasons for interpersonal conflicts and ways of managing them effectively. • Explain the importance of standard operating procedures of the company w.r.t. privacy, confidentiality and security. • Explain the issues with process flow, repairs and maintenance of tools and machinery, and how to handle them. • Identify the need for implementing guidelines and practices pertaining to gender sensitivity at the workplace. • Explain different gender concepts such as gender roles, gender as a social construct, gender power relations etc. • Discuss the provisions of Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2013. • Identify the need for implementing guidelines and practices pertaining to sensitivity towards Persons with Disabilities (PwD). • Explain the schemes available for PwD. • Explain the ways to help persons with disability overcome the challenges. • List organisational guidelines for dress code, time schedules, language etc.	• Apply team building skills in a given situation. • Demonstrate active listening skills while communicating. • Demonstrate how to report problems that need escalation. • Demonstrate methods of working effectively with colleagues. • Demonstrate use of appropriate behaviour and language that is respectful of disability and the gender.
Classroom Aids	

White board/ black board marker / chalk, duster, computer or Laptop attached to LCD projector
Tools, Equipment and Other Requirements
Sample of escalation matrix, organisation structure.

Module 6: Basic Health and Safety Practices

Mapped to NOS IAS/N9002

Terminal Outcomes:

- Apply health and safety practices at the workplace.

Duration: *08:00*	**Duration**: *08:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• List the components of a basic first-aid kit. • List the daily safety instructions and the other recommended safety procedures for work. • Identify the types of fire and correct use of fire extinguishers. • Explain the safety procedures for handling tools, equipment and hazardous materials. • Identify the importance of good postures for lifting heavy objects. • Explain the importance of efficient utilisation of material and water. • Identify common practices of conserving electricity. • List the common sources of pollution and ways to minimise it. • Describe the concept of waste management (e.g. methods of waste segregation and disposal etc.). • Explain how to report any issues with any equipment/system to relevant authorities. • Discuss methods of accident prevention at the workplace.	• Demonstrate proper disposal of hazardous chemicals, tools and materials as per prescribed environmental norms/ company policy. • Demonstrate emergency fire rescue techniques. • Display how to administer first aid e.g. bandages, CPR process. • Demonstrate the steps to free a person from electrocution. • Demonstrate correct use of fire extinguishers. • Demonstrate the correct way to evacuate. • Demonstrate use of protective equipment suitable to tasks and work conditions. • Demonstrate the correct posture in different situations.
Classroom Aids	
White board/ black board marker / chalk, duster, computer or Laptop attached to LCD projector	
Tools, Equipment and Other Requirements	
Personal Protection Equipment: safety glasses, head protection, rubber gloves, safety footwear, warning signs and tapes, fire extinguisher and first aid kit	

Module 7: Self Development Practices
Mapped to NOS IAS/N9002

Terminal Outcomes:

- Discuss practices for self-direction learning and skill advancement.

Duration: *04:00*	**Duration**: *04:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain the importance of skill advancement and strategies to pursue it. • Discuss how to adapt new technologies in current products/services to succeed in achieving targets effectively. • Analyse the importance of being accountable for timely completion of tasks. • Describe how to express emotions in appropriate ways at workplace especially anger, grief, frustration. • Identify ways to develop critical-thinking and problem-solving skills • Discuss ways for correctly and timely identifying problems, causes and possible solutions.	• Demonstrate how to express emotions in appropriate ways in various mock situations. • Analyse a sample problem and find its cause and possible solutions.
Classroom Aids	
White board/ black board marker / chalk, duster, computer or Laptop attached to LCD projector	
Tools, Equipment and Other Requirements	

Annexure

Trainer Requirements

Trainer Prerequisites						
Minimum Educational Qualification	**Specialization**	**Relevant Industry Experience**		**Training Experience**		**Remarks**
		Years	***Specialization***	***Years***	***Specialization***	
B.Sc. (with Physics as a subject), Diploma	Mechanical, Instrumentation, Electrical or Electronics	2	Electrotechnical Metrology in a calibration laboratory	1		

Trainer Certification	
Domain Certification	**Platform Certification**
Certified for Job Role: "Testing and Calibration Technician (Electrotechnical)" mapped to QP: "IAS/Q5002". Minimum accepted score is 80%	Recommended that the Trainer is certified for the Job Role: "Trainer", mapped to the Qualification Pack: "MEP/Q0102". Minimum accepted score is 80%

Assessor Requirements

Assessor Prerequisites						
Minimum Educational Qualification	**Specialization**	**Relevant Industry Experience**		**Training Experience**		**Remarks**
		Years	***Specialization***	***Years***	***Specialization***	
B.Sc. (with Physics as a subject), Diploma	Mechanical, Instrumentation, Electrical or Electronics	3	Electrotechnical Metrology in a calibration laboratory	-		

Assessor Certification	
Domain Certification	**Platform Certification**
Certified for Job Role: "Testing and Calibration Technician (Electrotechnical)" mapped to QP: "IAS/Q5002". Minimum accepted score is 80%	Recommended that the Assessor is certified for the Job Role: "Assessor", mapped to the Qualification Pack: "MEP/Q0104". Minimum accepted score is 80%

Assessment Strategy

1. Assessment System Overview:
    - Batches assigned to the assessment agencies for conducting the assessment on SDSM/SIP or 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:
    - 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 to be as 10 a.m. and 5 p.m.
    - If the batch size is more than 30, then there should be 2 Assessors.
    - Check that the allotted time to the candidates to complete Theory & Practical Assessment is 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
    - 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 training period
    - Time-stamped & geotagged assessment (Theory + Viva + Practical) photographs & videos
5. Method of verification or validation:
    - Surprise visit to the assessment location
    - Random audit of the batch
    - Random audit of any candidate
6. Method for assessment documentation, archiving, and access
    - 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 in the Hard Drives

Reference

Glossary

Term	Description
Declarative Knowledge	Declarative knowledge refers to facts, concepts and principles that need to be known and/or understood in order to accomplish a task or to solve a problem.
Key Learning Outcome	Key learning outcome is the statement of what a learner needs to know, understand and be able to do in order to achieve the terminal outcomes. A set of key learning outcomes will make up the training outcomes. Training outcome is specified in terms of knowledge, understanding (theory) and skills (practical application).
OJT (M)	On-the-job training (Mandatory); trainees are mandated to complete specified hours of training on site
OJT (R)	On-the-job training (Recommended); trainees are recommended the specified hours of training on site
Procedural Knowledge	Procedural knowledge addresses how to do something, or how to perform a task. It is the ability to work, or produce a tangible work output by applying cognitive, affective or psychomotor skills.
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.
CPR	An emergency procedure used to manually restore spontaneous blood circulation and breathing in a person who is under cardiac arrest.

Acronyms and Abbreviations

Term	Description
QP	Qualification Pack
NSQF	National Skills Qualification Framework
NSQC	National Skills Qualification Committee
NOS	National Occupational Standards
SOP	Standard operating procedures
UUC	Unit Under Calibration
EMI	Electromagnetic interference
EMC	Electromagnetic compatibility
PwD	Persons with Disabilities
CPR	Cardiopulmonary resuscitation