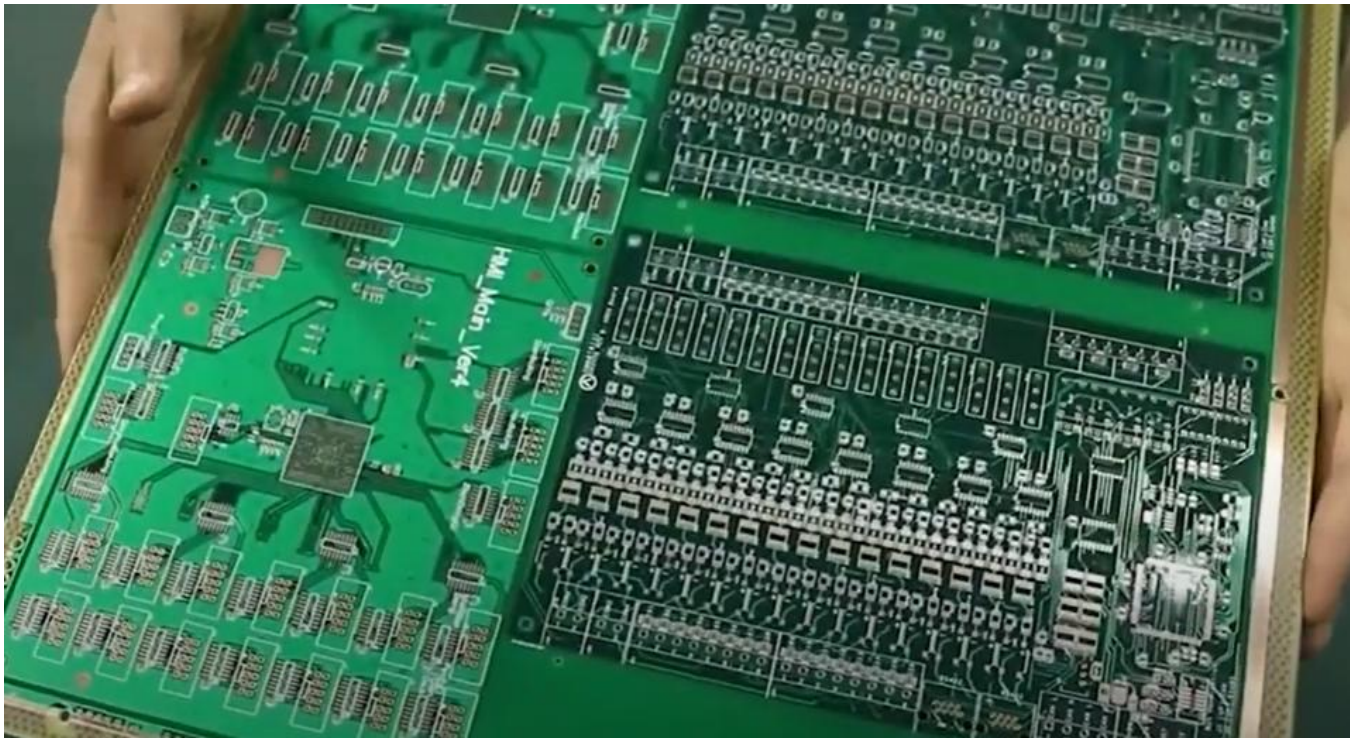




Model Curriculum

QP Name:– Substrate Design and Process Manager

QP Code: TEL/Q7205

QP Version: 1.0

NSQF Level: 6

Model Curriculum Version: 1.0

Telecom Sector Skill Council | Estel House, Sector-44, Plot No. 126, 3rd Floor
Gurugram-122003

Contents

Table of Contents

Training Parameters.....	3
Program Overview	4
Module Details.....	6
Module 1: Role and Responsibilities of Telecom Substrate Design Support Engineer (SDSE)	6
Mapped to NOS: TEL/N7216, v1.0	6
Module 2: Substrate Design Support.....	8
Mapped to NOS: TEL/N7216, v1.0	8
Module 3: Process Integration and Collaboration	10
Mapped to NOS: TEL/N7217, v1.0	10
Module 4: Quality Assurance and Documentation.....	11
Mapped to NOS: TEL/N7218, v1.0	11
Module 5: DGT/VSQ/N0103 Employability Skills (90 Hours)	12
Module 6: On-the-Job Training	15
Trainer Requirements	16
Annexure	16
Assessor Requirements	17
Assessment Strategy.....	18
Glossary.....	20
Acronyms and Abbreviations	20

Training Parameters

Sector	Telecom
Sub-Sector	Semiconductor-Manufacturing & Packaging
Occupation	Semiconductor – M&P
Country	India
NSQF Level	6
Aligned to NCO/ISCO/ISIC Code	NCO-2015/3522.9900
Minimum Educational Qualification and Experience	Completed 4 th year UG with 1 year of relevant experience OR Completed 2 year of diploma after 12 th with 4 years of relevant experience OR Previous relevant Qualification of NSQF Level (5.5) with 1.5 Years of Relevant Experience OR Previous relevant Qualification of NSQF Level (5) with 3 Years of Relevant Experience
Pre-Requisite License or Training	NA
Minimum Job Entry Age	18 Years
Last Reviewed On	NA
Next Review Date	28.08.2027
NSQC Approval Date	27.08.2024
QP Version	1.0
Model Curriculum Creation Date	27.08.2024
Model Curriculum Valid Up to Date	28.08.2027
Model Curriculum Version	1.0
Minimum Duration of the Course	600 hours
Maximum Duration of the Course	600 hours

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 to:

- Understand the core principles of semiconductor substrate design, including performance and manufacturability.
- Apply CAD tools to create substrate layouts, ensuring signal integrity and thermal management.
- Analyze design feedback to identify potential issues and improve manufacturability.
- Evaluate design modifications based on performance data and test results.
- Create detailed technical documentation and improvement plans with supporting data

Compulsory Modules

The table lists the modules, their duration and mode of delivery.

NOS and Module Details	Theory Duration	Practical Duration	On-the-Job Training Duration (Mandatory)	On-the-Job Training Duration (Recommended)	Total Duration
TEL/N7216: Substrate Design Support NOS Version No. 1 NSQF Level- 6	60:00	60:00	60:00	-	180:00
Module 1: Role and Responsibilities of Telecom Substrate Design Support Engineer (SDSE)	05:00	00:00	00:00	-	5:00
Module 2: Supporting Substrate Development	55:00	60:00	60:00	-	175:00
TEL/N7217: Process Integration and Collaboration NOS Version No. 1 NSQF Level- 6	60:00	60:00	60:00	-	180:00
Module 3: Optimizing Substrate Integration	60:00	60:00	60:00	-	180:00
TEL/N7218: Quality Assurance and Documentation NOS Version No. 1 NSQF Level- 6	30:00	60:00	60:00	-	150:00
Module 4: Maintaining Quality and Documentation	30:00	60:00	60:00	-	150:00

DGT/VSQ/N0103: Employability Skills (90 Hours) NOS Version No. 1 NSQF Level- 6	90:00	00:00	00:00	-	90:00
Module 5: Employability Skills (90 Hours)	90:00	00:00	00:00	-	90:00
Total Duration	240:00	180:00	180:00	-	600:00

Module Details

Module 1: Role and Responsibilities of Telecom Substrate Design Support Engineer (SDSE) Mapped to NOS: TEL/N7216, v1.0

Terminal Outcomes:

- Discuss the job role of Telecom Substrate Design Support Engineer (SDSE)
- Explain the scope of work for Telecom Substrate Design Support Engineer (SDSE)

Duration: 05:00	Duration: 00:00
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
• Explain the different types of substrates used in telecom network equipment (wired and wireless). • Identify the key considerations for substrate design in the context of telecom applications. • Explain the basic functionality of semiconductors in telecom devices. • Describe the importance of quality control procedures in ensuring the functionality and reliability of telecom substrates. • Explain the role of industry standards and regulations in telecom substrate design and production. • Identify essential safety precautions to be followed in a cleanroom environment. • Identify key technical skills and knowledge areas required for career advancement in telecom substrate design. • Explain the role and responsibilities of an Telecom Substrate Design Support Engineer (SDSE) within the semiconductor manufacturing process. • Explain the importance of proper handling procedures for telecom substrates to maintain quality and	

prevent damage. Identify the appropriate PPE required for handling telecom substrates in a controlled environment.	
Classroom Aids:	
Whiteboard, Marker, Duster, Projector, Laptop, PowerPoint Presentation	
Tools, Equipment and Other Requirements	
PPE Kit	

Module 2: Substrate Design Support

Mapped to NOS: TEL/N7216, v1.0

Terminal Outcomes:

- Contribute to the design and development of basic telecom substrate layouts using CAD software.
- Identify and address manufacturability concerns in substrate designs.
- Collaborate effectively with design and manufacturing engineers to optimize telecom substrate designs.

Duration: 55:00	Duration: 60:00
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
• Explain the functionalities and key parameters of telecom integrated circuits (ICs). • Describe how substrate requirements are derived from IC features like pin count and power needs. • Define critical dimensions, tolerances, and material properties for substrates. • Explain the purpose and content of design documents like layer stack-up, routing guidelines, and placement constraints. • Describe the role of design meetings and collaboration in substrate development. • Explain performance targets like signal integrity and thermal dissipation. • Analyze the impact of layout choices on manufacturability and cost (e.g., layer count, routing complexity). • Explain how material properties influence cost and performance of the substrate. • Identify common manufacturability limitations of fabrication processes. • Understand the concept of Design for Manufacturability (DFM) and its importance.	• Demonstrate proficiency in using CAD software to create basic layouts for telecom substrates. • Apply established design rules and layer definitions during layout creation. • Place and route components and signals according to design specifications and performance requirements. • Perform Design Rule Checks (DRC) to ensure the layout adheres to manufacturing guidelines. • Demonstrate analyzing feedback from senior designers and addressing manufacturability concerns in the layout. • Modify existing layouts based on feedback and identified issues. existing layouts based on feedback and identified issues. • Analyze the layout for potential manufacturability issues like minimum feature size limitations, via density, and complex routing patterns. • Demonstrate identifying areas where the design might exceed equipment capabilities or introduce processing challenges. • Show how to document key decisions and steps taken during the design process as well as identified DFM issues in a clear and concise manner.

- Propose solutions for DFM issues with supporting rationale for further review and approval.

Classroom Aids:

Training kit (Trainer guide, Presentations), Whiteboard, Marker, Projector, Laptop, Presentation, Participant Handbook, etc.

Tools, Equipment and Other Requirements

CAD Software for Substrate Design, Microscopes (for visual inspection), Calipers (for dimensional measurements), (Optional) Additional Inspection Tools (depending on specific program)

Module 3: Process Integration and Collaboration

Mapped to NOS: TEL/N7217, v1.0

Terminal Outcomes:

- Demonstrate effective communication and collaboration skills to facilitate information exchange and problem-solving between design, production, and quality control teams during the substrate development process.
- Analyze potential challenges in integrating substrate design with production workflows and propose solutions to streamline the integration process.
- Develop clear communication plans and documentation practices to enhance collaboration across teams in a substrate design and production environment.

Duration: 60:00	Duration: 60:00
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
• Explain telecom substrate functionalities and key specifications. • Describe the principles of Design for Manufacturability (DFM). • Identify production capabilities and limitations relevant to substrate assembly. • Explain quality control procedures for telecom substrates. • Explain the importance of effective communication and interpersonal skills in process integration. • Analyze potential challenges in integrating substrate design with the existing production workflow. • Describe the role of effective communication channels and documentation practices in facilitating information flow. • Explain the purpose and benefits of data analysis techniques for identifying process improvement opportunities.	• Role play participating in simulated design meetings focused on telecom substrate specifications. • Ask clarifying questions and contribute to discussions on technical details in a simulated environment. • Develop plans for collaboration with production and quality control teams based on hypothetical scenarios. • Identify potential bottlenecks and quality risks by analyzing case studies or mock production processes. • Collaborate with peers to establish clear inspection procedures for completed substrates in a simulated setting. • Develop and document clear communication channels between design, production, and quality control teams based on hypothetical scenarios.
Classroom Aids:	
Training kit (Trainer guide, Presentations), Whiteboard, Marker, Projector, Laptop, Presentation, Participant Handbook, etc.	
Tools, Equipment and Other Requirements	
Computers (for simulations, presentations, report writing), Presentation software (e.g., PowerPoint, Google Slides), Collaboration tools (e.g., online whiteboards, shared document platforms), Case study materials (printed or digital), Role-playing scenario handouts, Basic prototyping materials (optional, for mock inspection procedures)	

Module 4: Quality Assurance and Documentation

Mapped to NOS: TEL/N7218, v1.0

Terminal Outcomes:

- Demonstrate a thorough understanding of quality control principles and procedures relevant to substrate design.
- Effectively document substrate design activities and technical specifications, adhering to established procedures for file maintenance and revision control.
- Apply critical thinking skills to analyze simulated inspection data and identify potential areas for improvement in quality control practices.

Duration: 30:00	Duration: 60:00
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
• Explain the functionality of basic inspection tools and equipment commonly used for substrate inspection (e.g., microscopes, calipers) • Explain the importance of accurate and complete documentation in substrate design. • Describe established procedures for maintaining design files and revisions. • Explain how to prepare clear and concise technical documentation for completed substrate designs. • Explain quality control principles and procedures relevant to substrate design. • Describe data analysis techniques to identify areas for improvement in QC practices. • Analyze observations and inspection data to identify areas for improvement in existing QC practices. • Explain non-conformance documentation procedures, including identifying root causes. • Explain effective communication protocols for escalating quality issues.	• Visually inspect mock substrates to identify potential defects (e.g., dimensional errors, surface imperfections). • Utilize basic inspection tools and equipment as needed during simulated inspections. • Accurately record inspection results and document all relevant activities based on simulations or case studies. • Practice maintaining design files and revisions according to established procedures using a simulated design file management system. • Analyze data from simulated inspections to identify areas for improvement in QC practices. • Identify deviations from design specifications or process standards in scenario-based exercises. • Document non-conformances with clear descriptions and potential root causes based on the scenarios.
Classroom Aids:	
Training Kit - Trainer Guide, Presentations, Whiteboard, Marker, Projector, Laptop, Video Films	
Tools, Equipment and Other Requirements	
Computers (essential for documentation, presentations, data analysis), Presentation software (e.g., PowerPoint, Google Slides), Word processing software (e.g., Microsoft Word, Google Docs), Spreadsheet software (e.g., Microsoft Excel, Google Sheets), Data analysis software (optional, depending on the complexity of data analysis exercises), Case study materials (printed or digital), Collaborative whiteboard or online platform (optional, for group brainstorming or documentation), Sample documentation templates (e.g., inspection checklists, non-conformance reports), Basic prototyping materials (optional, for mock inspections or demonstrations)	

Module 5: DGT/VSQ/N0103 Employability Skills (90 Hours)

Mapped to NOS DGT/VSQ/N0103, v1.0

Mandatory Duration: 90:00			
Location: On-Site			
S. No.	Module Name	Key Learning Outcomes	Duration (hours)
1.	Introduction to Employability Skills	- Outline the importance of Employability Skills for the current job market and future of work - List different learning and employability related GOI and private portals and their usage - Research and prepare a note on different industries, trends, required skills and the available opportunities	3
2.	Constitutional values - Citizenship	- Explain the constitutional values, including civic rights and duties, citizenship, responsibility towards society and personal values and ethics such as honesty, integrity, caring and respecting others that are required to become a responsible citizen - Demonstrate how to practice different environmentally sustainable practices	1.5
3.	Becoming a Professional in the 21st Century	- Discuss relevant 21st century skills required for employment - Highlight the importance of practicing 21st century skills like Self-Awareness, Behavior Skills, time management, critical and adaptive thinking, problem-solving, creative thinking, social and cultural awareness, emotional awareness, learning to learn etc. in personal or professional life - Create a pathway for adopting a continuous learning mindset for personal and professional development	5
4.	Basic English Skills	- Show how to use basic English sentences for everyday conversation in different contexts, in person and over the telephone - Read and understand text written in basic English - Write a short note/paragraph / letter/e-mail using correct basic English	10
5.	Career Development & Goal Setting	- Create a career development plan - Identify well-defined short- and long-term goals	4
6.	Communication Skills	- Demonstrate how to communicate effectively using verbal and nonverbal communication etiquette - Write a brief note/paragraph on a familiar topic - Explain the importance of communication etiquette including active listening for effective communication - Role play a situation on how to work collaboratively with others in a team	10

7.	Diversity & Inclusion	• Demonstrate how to behave, communicate, and conduct appropriately with all genders and PwD • Discuss the significance of escalating sexual harassment issues as per POSH act	2.5
8.	Financial and Legal Literacy	• Discuss various financial institutions, products, and services • Demonstrate how to conduct offline and online financial transactions, safely and securely and check passbook/statement • Explain the common components of salary such as Basic, PF, Allowances (HRA, TA, DA, etc.), tax deductions • Calculate income and expenditure for budgeting • Discuss the legal rights, laws, and aids	10
9.	Essential Digital Skills	• Describe the role of digital technology in day-to-day life and the workplace • Demonstrate how to operate digital devices and use the associated applications and features, safely and securely • Demonstrate how to connect devices securely to internet using different means • Follow the dos and don'ts of cyber security to protect against cyber crimes • Discuss the significance of displaying responsible online behavior while using various social media platforms • Create an e-mail id and follow e- mail etiquette to exchange e -mails • Show how to create documents, spreadsheets and presentations using appropriate applications • utilize virtual collaboration tools to work effectively	20
10.	Entrepreneurship	• Explain the types of entrepreneurship and enterprises • Discuss how to identify opportunities for potential business, sources of funding and associated financial and legal risks with its mitigation plan • Describe the 4Ps of Marketing-Product, Price, Place and Promotion and apply them as per requirement • Create a sample business plan, for the selected business opportunity	7
11	Customer Service	• Classify different types of customers • Demonstrate how to identify customer needs and respond to them in a professional manner • Discuss various tools used to collect customer feedback • Discuss the significance of maintaining hygiene and dressing appropriately	9
12	Getting Ready for Apprenticeship & Jobs	• Draft a professional Curriculum Vitae (CV) • Use various offline and online job search sources to find and apply for jobs • Discuss the significance of maintaining hygiene and dressing appropriately for an interview • Role play a mock interview • List the steps for searching and registering for apprenticeship opportunities	8

LIST OF TOOLS & EQUIPMENT FOR EMPLOYABILITY SKILLS

S No.	Name of the Equipment	Quantity
1.	Computer (PC) with latest configurations – and Internet connection with standard operating system and standard word processor and worksheet software (Licensed) (all software should either be latest version or one/two version below)	As required
2.	UPS	As required
3.	Scanner cum Printer	As required
4.	Computer Tables	As required
5.	Computer Chairs	As required
6.	LCD Projector	As required
7.	White Board 1200mm x 900mm	As required

Note: Above Tools & Equipment not required, if Computer LAB is available in the institute.

Module 6: On-the-Job Training

Mapped to Substrate Design and Process Manager

Mandatory Duration: 180:00	Recommended Duration: 00:00
Module Name: On-the-Job Training	
Location: On Site	
Terminal Outcomes 1. Demonstrate proficiency in using substrate design software and tools to create and modify substrate layouts. 2. Interpret and apply design specifications to develop substrates that meet technical requirements and industry standards. 3. Conduct design validation and verification to ensure substrates meet functional and performance criteria before production. 4. Collaborate effectively with cross-functional teams, including design, manufacturing, and quality assurance, to ensure seamless process integration. 5. Identify and implement process improvements to enhance the efficiency and effectiveness of substrate design and integration. 6. Develop strong communication skills to clearly convey design requirements, changes, and updates to relevant stakeholders. 7. Implement and follow rigorous quality control procedures to ensure all substrates meet the required standards and specifications. 8. Accurately identify defects or issues in substrate designs and implement corrective actions to resolve them. 9. Maintain detailed and accurate documentation of design processes, modifications, and quality control activities. 10. Ensure all design and documentation practices comply with industry standards and organizational requirements. 11. Analyze quality assurance data to identify trends and areas for improvement in substrate design processes. 12. Engage in continuous improvement initiatives, leveraging feedback and data analysis to enhance substrate design quality and efficiency.	

Annexure

Trainer Requirements

Trainer Prerequisites						
Minimum Educational Qualification	Specialization	Relevant Industry Experience		Training Experience		Remarks
		Year s	Specialization	Year s	Specialization	
Engineering Diploma in (Electronics/Telecom/IT)	NA	9		6		
Graduate (Electronics/Telecom/IT)	NA	6		3		

Trainer Certification	
Domain Certification	Platform Certification
Job Role “ Substrate Design and Process Manager ”, “TEL/Q7205, v1.0”, Minimum accepted score is 80%.	Trainer is certified for the job role " Trainer (VET & SKILLS) "; mapped to Qualification Pack: - "MEP/Q2601, v2.0" with minimum 80% of score.

Assessor Requirements

Assessor Prerequisites						
Minimum Educational Qualification	Specialization	Relevant Industry Experience		Training/Assessment Experience		Remarks
		Years	Specialization	Years	Specialization	
Engineering Diploma in (Electronics/Telecom/IT)	NA	9				
Graduate (Electronics/Telecom/IT)	NA	6				

Assessor Certification	
Domain Certification	Platform Certification
Job Role “ Substrate Design and Process Manager ”, “TEL/Q7205, v1.0”, Minimum accepted score is 80%.	Assessor is certified for the job role “ Assessor (VET & SKILLS) ”; mapped to Qualification Pack: - “MEP/Q2701, v2.0” with minimum 80% of score.

Assessment Strategy

1. Assessment System Overview:

- Batches assigned to the assessment agencies for conducting the assessment on SDMS/SIP or email.
- Assessment agencies send the assessment confirmation to VTP/TC looping SSC.
- The 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.
- An assessor must be ToA certified & the trainer must be ToT Certified.
- The 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.
- Center 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:

- A surprise visit to the assessment location.
- A 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.

References

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	A key learning outcome is a 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	The 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
NOS	National Occupational Standard (s)
NSQF	National Skills Qualifications Framework
OJT	On-the-job Training
QP	Qualifications Pack
PwD	People with Disability
PPE	Personal Protective Equipment