Quality Council for Trades & Occupations
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OCCUPATIONAL SKILLS PROGRAMME CURRICULUM DOCUMENT

IN LINE WITH THE OQSF POLICY (2021) OCCUPATIONAL QUALIFICATION TYPE (NOMENCLATURE)

SKILLS PROGRAMME	SKILLS PROGRAMME ID	TITLE (DESCRIPTOR)	NQF LEVEL	CREDITS
	SP-250305	Solar Photovoltaic Installation Tester	5	59
CURRICULUM CODE	900279-000-00-00			

PARTNER DETAILS	ORGANISATION NAME	WEBSITE ADDRESS	TELEPHONE NUMBER	LOGO
QUALITY PARTNER - DEVELOPMENT	EWSETA	https://www.ewseta.org.za	011 274 4700	EW SETA

Contents

SECTION 1: CURRICULUM SUMMARY

1.1 Occupational Information:

1.1.1 Associated, Organising Framework for Occupations (OFO) Occupational Code and Title

313109: Solar Photovoltaic Service Technician

1.1.2 Occupation/Specialisation/Part-Qualification/Skills Programme Type, Title, NQF Level, Credits and Curriculum Code, addressed by this Curriculum.

TYPE	TITLE	NQF LEVEL	CREDITS	CURRICULUM CODE
Skills Programme	Solar Photovoltaic Installation Tester	5	60	900279-000-00-00

1.1.3 Alternative titles used by industry:

None

1.2 Curriculum Information:

1.2.1 Articulation for Qualifications and Part- Qualifications

1.2.2 Articulation for Skills Programmes

(a) Work Opportunities:

There are several work opportunities for a person who has successfully completed a Solar Photovoltaic Tester skills programme may access employment opportunities in public and private organisations, become self-employed and may also work as instructors/coach in education and training organisations.

(b) Learning Opportunities:

An individual who has successfully completed a Tester skills programme may access several further learning opportunities available in the energy or engineering fields.

1.3 Curriculum Structure:

1.3.1 Knowledge/Theory Modules:

- 900279-000-00-KM-01, Basic Communication Theory, NQF Level 3, Credits 3
- 313109-002-00-KM-05, Maintenance, troubleshooting, fault-finding and repairs to PV systems, NQF Level 5, Credits 13
- 111204-003-00-KM-07, Record-Keeping and Registry Administration Principles and Processes, NQF Level 5, Credits 2
- 313109-001-00-KM-08, Components of PV systems, NQF Level 4, Credits 20

- 111204-003-00-KM-11, Professional Skills and Personal Development, NQF Level 5, Credits 3

Total number of credits: 41

1.3.2 Practical Skills Modules:

- 313109-002-00-PM-02, Maintain, test, diagnose, repair, and replace inverters in PV systems, NQF Level 5, Credits 4
- 313109-001-01-PM-03, Use toolsC, measuring instruments and equipment, NQF Level 3, 7 Credits
- 313109-002-00-PM-04, Maintain, test, diagnose and replace batteries in PV systems, NQF Level 5, Credits 4
- 313109-002-00-PM-05, Maintain, test, diagnose and replace cables, cable inter-connections, smart boxes, PV junction/string boxes, string diodes, connectors, and fuses in PV systems, NQF Level 5, Credits 4

Total number of credits: 19

1.3.3 Work Experience Modules:

N/A

Total number of credits: N/A

1.4 Entry Requirements:

NQF Level 4 qualification with Mathematics

1.5 Recognition of Prior Learning (RPL):

1.5.1 RPL for Access:

Learners may use the RPL process to gain access to training opportunities for a programme of learning, qualification, part-qualification or skills programme if they do not meet the formal, minimum entry requirements for admission. RPL assessment provides an alternative access route into a programme of learning, qualification, part-qualification, or skills programme.

Such an RPL assessment may be developed, moderated and conducted by the accredited Skills Development Provider which offers that specific qualification/part qualification/skills programme. Such an assessment must ensure that the learner is able to display the equivalent level of competencies required for access, based on the NQF level descriptors.

1.5.2 RPL for Exemption:

For exemption from modules through RPL, learners who have gained the stipulated competencies of the modules of a programme of learning, qualification, part-qualification or skills programme through any means of formal, informal or non-formal learning and/or work experience, may be awarded credits towards relevant modules, and gaps identified for training, which is then concluded.

1.5.3 RPL for awarding credits:

Learners who have gained the stipulated competencies of the modules of a programme of learning, qualification, part-qualification or skills programme through any means of formal, informal or non-formal learning and/or work experience, may be awarded credits towards relevant modules, and gaps identified for training, which is then concluded.

For a Skills Programme, the accredited Skills Development Provider (SDP) must ensure all modular competency requirements are met prior to the FISA and keep record of such evidence.

Upon successful completion of the FISA, RPL learners will be issued with the QCTO certificate for the qualification, part-qualification or skills programme. Quality Partners are responsible for ensuring the RPL mechanism and process for qualifications and part-qualification is approved by the QCTO.

Such an RPL assessment may be developed, moderated, and conducted by the accredited Skills Development Provider which offers that specific qualification/part qualification/skills programme. Such an assessment must ensure that the learner is able to display the equivalent level of competencies required for access, based on the NQF level descriptors.

For exemption from modules through RPL, learners who have gained the stipulated competencies of the modules of a programme of learning, qualification, part-qualification, or skills programme through any means of formal, informal, or non-formal learning and/or work experience, may be awarded credits towards relevant modules, and gaps identified for training, which is then concluded.

1.6 Quality Partner for Assessment:

Not applicable

1.7 List of Qualification(s)/Part- Qualification(s)/Skills Programme(s) Related to this Curriculum

- Higher Occupational Certificate: Solar Photovoltaic Standalone Service Technician, (SAQA ID: 120863)
- National Occupational Certificate: Solar Photovoltaic Standalone System Installer, NQF Level 4, (SAQA ID: 120883)
- Occupational Certificate: Solar Photovoltaic Standalone System Mounter, NQF Level 5 (SAQA ID: 120885)

SECTION 2: OCCUPATIONAL/SPECIALISATION/PART-QUALIFICATION/SKILLS PROGRAMME PROFILE

2.1 Purpose:

The purpose of this skills programme is to prepare a learner to operate as a Solar Photovoltaic Installation Tester.

A Solar PV Installation Tester conducts electrical inspection of an industrial/commercial/residential solar photovoltaic installations, maintains, safely tests all aspects of solar photovoltaic system under supervision, diagnoses, conducts system performance evaluation, identifies, troubleshoots and records faults, maintains the PV system for optimal performance in accordance with the applicable statutory requirements, safety protocols, and standards operating procedures.

2.2 Tasks:

TASK	LINKS TO ELO
Task 01: Conduct inspections and evaluate the functionality of the installed solar photovoltaic system, NQF Level 5	ELO 1: Perform site evaluations of an installed solar photovoltaic systems through the application of appropriate principles and procedures.
Task 02: Maintain, test and replace inverters and transformers, NQF Level 5	ELO 2: Apply techniques and procedures to perform electrical testing and inspection on solar photovoltaic system components
Task 03: Interpret test results and rectifies the solar photovoltaic systems for performance optimisation, NQF Level 5	ELO 3: Monitor the solar photovoltaic system performance using the applicable principles.
Task 04: Test and troubleshoot faults on solar photovoltaic systems under supervision, NQF Level 5	ELO 4: Maintain electrical and mechanical components of a solar photovoltaic system applying suitable methods and techniques.

2.3 Occupational Task Details

2.3.1 Plan, prepare for, and execute activities pertaining to solar photovoltaic system testing, NQF Level 5

Unique Product or Service:

- Compliant and functional solar photovoltaic system

Occupational Responsibilities:

- Conduct site visit and identify hazards and risks associated with to solar photovoltaic system testing, NQF Level 5
- Communicate and keep records effectively and professionally, NQF Level 5
- Select and use appropriate tools, equipment and measuring instruments to maintain, test, diagnose and rectify faults ensuring the safety and performance of the solar photovoltaic system, NQF Level 5

Occupational Contexts:

- Solar photovoltaic system testing planning and preparing processes, NQF Level 5

2.3.2 Maintain, test, diagnose, repair and/or replace solar photovoltaic system components, NQF Level 5

Unique Product or Service:

- Fully operational and optimally functioning solar photovoltaic components and system

Occupational Responsibilities:

- Maintain, test, diagnose, repair and replace inverters in solar photovoltaic systems, NQF Level 5
- Maintain, test, diagnose and replace batteries in solar photovoltaic systems, NQF Level 5
- Maintain, test, diagnose and replace cables, cable inter-connections, smart boxes, PV junction/string boxes, string diodes, connectors and fuses in solar photovoltaic systems, NQF Level 5

Occupational Contexts

- Maintain, test, diagnose, repair and replace inverters in solar photovoltaic systems, NQF Level 5
- Processes to check, test, maintain, diagnose and replace batteries in solar photovoltaic systems, NQF Level 5
- Processes to check, test, maintain, diagnose, repair and replace cable, cable inter-connections, smart boxes, solar photovoltaic junction/string boxes, string diodes, connectors and fuses in solar photovoltaic systems, NQF Level 5

2.3.3 Interpret test results and rectifies the solar photovoltaic systems for performance optimisation, NQF Level 5

Unique Product or Service:

- Optimised solar photovoltaic system

Occupational Responsibilities:

- Analyse, adjust and optimise solar photovoltaic system to ensure safety and performance, NQF Level 5

Occupational Contexts

- Sola photovoltaic systems optimisation processes, NQF Level 5

2.3.4 Test and troubleshoot faults on solar photovoltaic system under supervision, NQF Level 5

Unique Product or Service:

- Safe, reliable and functional solar photovoltaic system

Occupational Responsibilities:

- Carry out testing using appropriate tools, equipment, measuring instruments and procedures on solar photovoltaic systems under supervision, NQF Level 5
- Maintain accurate records and compile a maintenance and testing report, NQF Level 5

Occupational Contexts

- Solar photovoltaic system testing and troubleshooting processes, NQF Level 5

SECTION 3: CURRICULUM COMPONENT SPECIFICATIONS

3.1 Knowledge Module Specifications:

- 900279-000-00-KM-01, Basic Communication Theory, NQF Level 3, Credits 3
- 313109-002-00-KM-05, Maintenance, troubleshooting, fault-finding and repairs to PV systems, NQF Level 5, Credits 13
- 111204-003-00-KM-07, Record-Keeping and Registry Administration Principles and Processes, NQF Level 5, Credits 2
- 313109-001-00-KM-08, Components of PV systems, NQF Level 4, Credits 20
- 111204-003-00-KM-11, Professional Skills and Personal Development, NQF Level 5, Credits 3

Total Credits = 41

3.1.1 Detailing knowledge \Module (KM) contents

Knowledge Module (KM) - 01

MODULE CODE	MODULE TITLE	NQF LEVEL	CREDITS	MODE OF DELIVERY
900279-000-00-KM-01	Basic Communication Theory	3	3	Blended

(a) Purpose of the Practical Skills Module:

The main focus of the learning in this knowledge module is to build an understanding of basic communications theory. The knowledge acquired will enable learners to demonstrate an understanding of principles, channels and methods of communication including administration in the workplace.

(b) List of Knowledge Topics:

TOPIC CODE	TOPIC TITLE	% OF TIME TO BE SPENT
KM-02-KT01	Principles, methods, channels, process and barriers of communication	20%
KM-02-KT02	Basic radio communication	60%
KM-02-KT03	Basic telephone skills	10%
KM-02-KT04	Accessing and processing documentation in the workplace	20%

(c) Detailing each topic listed above into topic elements:

KM-02-KT01 PRINCIPLES, METHODS, CHANNELS, PROCESS AND BARRIERS OF COMMUNICATION (20%)		
TOPIC ELEMENT CODE	**TOPIC ELEMENT TITLE**	**% OF TIME TO BE SPENT**
KT0101	Various methods and techniques of communication	5%
KT0102	Principles and process of communication	10%
KT0103	Potential barriers to communication and techniques to overcome barriers	5%

(d) Internal Assessment Criteria (IAC) and Weight

IAC CODE	IAC DESCRIPTION	% OF TIME TO BE SPENT
IAC0101	Describe various methods and channels of communication	5%
IAC0102	Explain the techniques and principles of effective communication	**5**%
IAC0103	Explain the steps and components of the communication process to enable the transmission of a message	**5**%
IAC010	Identify and describe potential barriers to communication and ways to overcome them	**5**%

KM-02-KT03 BASIC RADIO COMMUNICATION (60%)		
TOPIC ELEMENT CODE	**TOPIC ELEMENT TITLE**	**% OF TIME TO BE SPENT**
KT0201	Types and uses of handheld portable radio in the workplace	10%
KT0202	Types and uses of radio Frequencies	15%
KT0203	Types of transmissions for radio serviceability	15%
KT0204	Techniques to operate base and hand-held radio (portable and mobile) equipment	20%

(d) Internal Assessment Criteria (IAC) and Weight

IAC CODE	IAC DESCRIPTION	% OF TIME TO BE SPENT
IAC0201	Identify the various types of radios used in the workplace	5%
IAC0202	Differentiate and specify the Frequencies used in the workplace	5%
IAC0203	Explain the radio terminology used in the workplace in accordance with company-specific operational standards	15%
IAC0204	Explain the different types of transmissions and their impact on message transmission	10%
IAC0205	Explain the different techniques to operate a radio and ways to identify possible faults on the device operation	15%
IAC0206	Identify and describe the different hand signals used in the workplace in terms of their meaning	20%
IAC0207	Identify and describe potential communication barriers when using radio communication equipment and how to mitigate them	15%
	Explain communication and safe working protocols to be followed in accordance with company-specific protocols and safe working rules	15%

KM-02-KT03 BASIC TELEPHONE SKILLS (10%)		
TOPIC ELEMENT CODE	**TOPIC ELEMENT TITLE**	**% OF TIME TO BE SPENT**
KT0301	Processing incoming and out-going telephone calls	50%
KT0302	Telephone Etiquette	50%

(d) Internal Assessment Criteria (IAC) and Weight

IAC CODE	IAC DESCRIPTION	% OF TIME TO BE SPENT
IAC0301	Explain the importance of telephone in a workplace	20%
IAC0302	Explain the importance of answering a telephone is a professional manner	40%
IAC0303	Explain telephone etiquette	40%

KM-02-KT04 ACCESSING AND PROCESSING DOCUMENTATION IN THE WORKPLACE (10%)		
TOPIC ELEMENT CODE	**TOPIC ELEMENT TITLE**	**% OF TIME TO BE SPENT**
KT0401	Types and purposes of workplace documentation Types and purposes of workplace documentation	40%
KT0402	Information gathering and recording methods	30%
KT0403	Information processing and reporting methods	30%

(d) Internal Assessment Criteria (IAC) and Weight

IAC CODE	IAC DESCRIPTION	% OF TIME TO BE SPENT
IAC0401	Identify and describe the various documents used for train driving operation in terms of their purposes	20%
IAC0402	Information needed for completing workplace documentation is identified and prepared as required in accordance with company-specific procedures	**20%**
IAC0403	Relevant workplace documentation is accessed and prepared and forms are competed correctly in accordance with company specific policies and procedures	**20**%
IAC0404	Information gathered is entered into computerised system as required in accordance with company specific policies and procedures	20%
IAC0405	Completed forms are filed/saved into computerised system properly in in accordance with company specific policies and procedures	20%

3.1.2 Criteria for accreditation

Add additional line spaces as required. Requirements, against which Skills Development Providers (SDP) and Assessment Centres, will be accredited, as listed below.

Physical Requirements:

SKILLS DEVELOPMENT PROVIDER (SDP)	
EQUIPMENT & TOOLS	Standard facilities for classroom training, learning materials, facilitation aids, media, Whiteboard, Flipchart Stand and Projector Screen If online training, the following equipment and tools must be provided: - Computer

	- Access to Internet, - Relevant Software Learning Management System (LMS) and Learning Management Information System (LMIS)
CONSUMABLES	None

ASSESSMENT CENTRE	
EQUIPMENT & TOOLS	N/A
CONSUMABLES	N/A

Human Resource Requirements:

SKILLS DEVELOPMENT PROVIDER (SDP)	
QUALIFICATIONS & EXPERIENCE	• NQF Level 4 qualification with communication.
FACILITATOR/LEARNER RATIO	1: 24

ASSESSMENT CENTRE	
EQUIPMENT & TOOLS	N/A
CONSUMABLES	N/A

Legal Requirements:

SKILLS DEVELOPMENT PROVIDER (SDP)	
QUALIFICATIONS & EXPERIENCE	• Compliance with relevant occupational health, safety and environmental regulations.

ASSESSMENT CENTRE	
EQUIPMENT & TOOLS	N/A
CONSUMABLES	N/A

3.1.3 Exemptions

- None

3.1.2 Detailing knowledge \Module (KM) contents

Knowledge Module (KM) – 11

MODULE CODE	MODULE TITLE	NQF LEVEL	CREDITS	MODE OF DELIVERY
111204-003-00-KM-11	Professional Skills and Personal Development	5	3	Blended

(a) Purpose of the Practical Skills Module:

The main focus of the learning in this knowledge module is to provide the learner with an opportunity to acquire knowledge and understanding of the importance of stress, conflict and diversity management in terms of personal and professional development

(b) List of Knowledge Topics:

TOPIC CODE	TOPIC TITLE	% OF TIME TO BE SPENT
KM-11-KT01	Stress management	10%
KM-11-KT02	Conflict management	10%
KM-11-KT03	Harnessing diversity and building on strengths of a diverse working environment	10%
KM-11-KT04	Personal development	20%
KM-11-KT05	Analytical and critical thinking	15%
KM-11-KT06	Personal skills	20%
KM-11-KT07	Professional development	15%

(c) Detailing each topic listed above into topic elements:

KM-11-KT01 STRESS MANAGEMENT (10%)		
TOPIC ELEMENT CODE	**TOPIC ELEMENT TITLE**	**% OF TIME TO BE SPENT**
KT0101	Concept and definition	2%
KT0102	Types of stress	3%
KT0103	Positive and negative stressors	10%
KT0104	Personal stressors	10%
KT0105	Societal stressors	10%

KT0106	Environmental stressors	10%
KT0107	Organisational stressors	10%
KT0108	Interrelationship of stressors	10%
KT0109	Impact of stress on personal life and work situation	10%
KT0110	Reactions to stress	10%
KT0111	Optimal stress levels	5%
KT0112	Strategies to maximise optimal stress levels	10%

(d) Internal Assessment Criteria (IAC) and Weight

IAC CODE	IAC DESCRIPTION	% OF TIME TO BE SPENT
IAC0101	The concept of stress is explained, with examples.	5%
IAC0102	Positive and negative stressors are identified in personal life and own work situation.	10%
IAC0103	Personal stressors are identified and an indication is given of how these stressors impact on the individual and an organisation. Range: Personal stressors include, but are not limited to, issues of diversity, different value systems, perception of self, self- worth as a human being, knowledge of self as a unique individual, relationships with others, financial status, work position, health, mental state, age, marital status and attitude to change.	10%
IAC0104	Societal stressors are identified and an indication is given of how these stressors impact on the individual and an organisation. RANGE Societal stressors include, but are not limited to, changes in belief systems, attitudes and values in society at large, health system, defence, security and the demographics of society.	10%
IAC0105	Environmental stressors are identified and an indication is given of how these stressors impact on the individual and organisation. RANGE Environmental stressors include, but are not limited to, the home and work environments.	10%
IAC0106	Organisational stressors are identified and an indication is given of how these stressors impact on the individual and an organisation. Organisational stressors include, but are not limited to, family related, support systems, management style, leadership style in work situations and the day to day functioning of an organisation	10%

IAC0107	The interrelationship of the different stressors is analysed for three case studies.	15%
IAC0108	Typical physical, emotional, cognitive and behavioural reactions to negative stress are explored and an indication is given of how an individual can recognise negative stress in own life.	20%
IAC0109	The impact of positive and negative stress on health, work performance and interpersonal relationships is explained, with examples.	10%

KM-11-KT03 CONFLICT MANAGEMENT (10%)		
TOPIC ELEMENT CODE	**TOPIC ELEMENT TITLE**	**% OF TIME TO BE SPENT**
KT0201	Concept and definition	5%
KT0202	Types of conflict	5%
KT0203	Sources of conflict	5%
KT0204	Characteristics of conflict (positive and negative)	10%
KT0205	Organisational conflict modes	10%
KT0206	Personality types and conflict	15%
KT0207	Techniques for managing conflict	20%
KT0208	The route of conflict resolution	5%
KT0209	Action plans	5%
KT0210	Relevant sections of the Labour Relations Act	5%
KT0211	Policies and procedures	10%
KT0212	Attributes of an effective conflict manager	5%

(d) Internal Assessment Criteria (IAC) and Weight

IAC CODE	IAC DESCRIPTION	% OF TIME TO BE SPENT
IAC0201	A list of possible sources of conflict, including perceptions and assumptions, is drawn up with examples of where they are most likely to occur.	2%

IAC0202	Positive and negative characteristics of conflict in the workplace are discussed, with examples.	10%
IAC0203	Organisational conflict modes are explained, with examples.	5%
IAC0204	Conflict, which may arise in personality types, can be described, using transactional analysis.	5%
IAC0205	The various business conflict modes are discussed, with examples.	5%
IAC0206	Useful steps to be taken to manage conflict are explained, with examples.	10%
IAC0207	The route, which conflicts normally follow toward resolution, can be described with examples	3%
IAC0208	Methods available to resolve conflict in terms of the Labour Relations Act are listed, with examples.	10%
IAC0209	The most appropriate strategy to resolve a particular conflict is chosen with a justification for the choice of strategy.	10%
IAC0210	The need to adopt action plans and adapt them to a particular conflict is demonstrated, with examples.	10%
IAC0211	The role of policies and procedures in place in the organisation is explained in terms of their role in preventing and/or resolving conflicts.	10%
IAC0212	Personal attributes of a good conflict manager can be listed with examples of how each characteristic contributes to conflict resolution.	5%
IAC0213	A skills audit is done by the learner to identify the skills he/she needs to develop to be an effective conflict manager.	5%
IAC0214	The negative attributes which should be avoided or controlled by an effective conflict manager are listed with an explanation of the negative effect each has on the resolution of conflict	5%

KM-02-KT03 BASIC HARNESSING DIVERSITY AND BUILDING ON STRENGTHS OF A DIVERSE WORKING ENVIRONMENT (10%)		
TOPIC ELEMENT CODE	**TOPIC ELEMENT TITLE**	**% OF TIME TO BE SPENT**
KT0301	Concepts, definitions and terminology **Range:** Identities include, but are not limited to social (ethnicity), professional, national, corporate, cultural, race, class, gender and religious identities	10%

KT0302	Research on LGBTQI+	10%
KT0303	Underlying dynamics that give rise to perceptions of diversity	10%
KT0304	The influence of child-raising practices and socio-cultural aspects on attitudes, values and behaviours	10%
KT0305	Issues relating to class in the South African context with reference to past and present attitudes, values and behaviours	10%
KT0306	The role of the media in influencing perception with reference to positive and negative influences on perceptions of diversity	10%
KT0307	Psycho-social factors that have relevance for inter-group relationships	10%
KT0308	Differences in privilege and power among members of a specific community/organisation	10%
KT0309	Strategies for changing entrenched attitudes, values and behaviours	20%

(d) Internal Assessment Criteria (IAC) and Weight

IAC CODE	IAC DESCRIPTION	% OF TIME TO BE SPENT
IAC0301	Increasing globalisation and growing demographic diversity are understood and explained.	15%
IAC0302	Diversity is defined. Range: Diversity includes differences in culture, language, ideology, philosophy, age, race, prejudice, stereotypes, sexual orientation, gender, faith, class, socialisation, nationality, personality and education on a macro and/or micro scale.	10%
IAC0303	Identities are defined. Range: Community is about groups of people with at least one thing in common including, but not limited to, geographic location, faith, interest, common values, common concerns, needs and goals. Communities are dynamic and individuals may belong to more than one community. For the purpose of this Unit Standard, a community may be a nation, local community, sector, organisation, religious or cultural group, school, class or social group	20%
IAC0304	The implications of diversity for external and internal relationships are explored and explained, with examples.	15%
IAC0305	Cultural biases, stereotypes and perceptions are identified together with the influence they can have on dealing with diversity.	15%
IAC0306	The benefits of diversity in the work environment are identified and ways of utilizing the diverse talents, attitudes and values of employees are explored	15%

	with a view to maximising the productivity of the section/division/department.	

KM-11-KT04 PERSONAL DEVELOPMENT (20%)		
TOPIC ELEMENT CODE	**TOPIC ELEMENT TITLE**	**% OF TIME TO BE SPENT**
KT0401	Emotional intelligence	10%
KT0402	Self-esteem	15%
KT0403	Personal needs and expectations	15%
KT0404	Goals	15%
KT0405	Support services	15%
KT0406	Continuous professional development	15%
KT0407	Personal safety and security	15%

(d) Internal Assessment Criteria (IAC) and Weight

IAC CODE	IAC DESCRIPTION	% OF TIME TO BE SPENT
IAC0401	Strategies to enhance own self-esteem are planned	20%
IAC0402	Personal needs and expectations are evaluated and compiled.	20%
IAC0403	Interpersonal skills are demonstrated.	20%
IAC0404	Own goals to address shortcomings are articulated, with relevant timeframes	15%
IAC0405	Skills to achieve set goals are mapped out.	15%
IAC0406	Assistance of support services is sought to address shortcomings.	5%
IAC0407	Emotional intelligence in managing relationships is demonstrated	5%

KM-11-KT05 ANALYTICAL AND CRITICAL THINKING (15%)		
TOPIC ELEMENT CODE	**TOPIC ELEMENT TITLE**	**% OF TIME TO BE SPENT**
KT0501	Modes of thinking	20%
KT0502	Critical, creative and logical thinking	20%
KT0503	Problem solving	20%
KT0504	Active listening	10%

KT0505	Mind maps	15%
KT0506	Thinking styles	15%

(d) Internal Assessment Criteria (IAC) and Weight

IAC CODE	IAC DESCRIPTION	% OF TIME TO BE SPENT
IAC0501	The functions of the brain and memory systems are explained.	20%
IAC0502	Modes of thinking are identified.	20%
IAC0503	Critical, creative and logical thinking skills are explained	20%
IAC0504	Problem solving skills are enhanced and role-played in different scenarios and critical incidents.	20%
IAC0505	Active listening techniques are demonstrated	10%
IAC0506	Mind mapping is demonstrated.	10%

KM-11-KT06 PERSONAL SKILLS (20%)		
TOPIC ELEMENT CODE	**TOPIC ELEMENT TITLE**	**% OF TIME TO BE SPENT**
KT0601	Time management	10%
KT0602	Assertiveness	30%
KT0603	Team work and team building	30%
KT0604	Coping mechanisms in foreign environments	30%

(d) Internal Assessment Criteria (IAC) and Weight

IAC CODE	IAC DESCRIPTION	% OF TIME TO BE SPENT
IAC0601	Principles of time management are discussed.	10%
IAC0602	The importance of good time management is reasoned.	5%
IAC0603	Principles of assertiveness are discussed	10%
IAC0604	The importance of assertiveness is reasoned.	5%
IAC0605	Foundations for developing healthy relationships are identified.	15%
IAC0606	Strategies to create an environment for co-operation and effective teamwork are planned	20%

IAC0607	Coping mechanisms to deal with culture shock and to adjust to new environments are devised.	20%
IAC0608	Support structures for family members to deal with change are identified and support services are consulted.	5%
IAC0609	Skills of assertiveness are demonstrated.	10%

KM-11-KT07 PROFESSIONAL DEVELOPMENT (15%)		
TOPIC ELEMENT CODE	**TOPIC ELEMENT TITLE**	**% OF TIME TO BE SPENT**
KT0701	Base-line knowledge of self in a diplomatic career context	30%
KT0702	Personal development	20%
KT0703	Continuous professional development	20%
KT0704	Personal safety and security	30%

(d) Internal Assessment Criteria (IAC) and Weight

IAC CODE	IAC DESCRIPTION	% OF TIME TO BE SPENT
IAC0701	Socio-economic factors, personal values, interests and abilities are identified and evaluated with regards to a career.	2%
IAC0702	Personal expectations and abilities are identified.	3%
IAC0703	The trends and demands of a career in a foreign country are investigated and reported.	2%
IAC0704	Personal challenges of a career in a foreign agency are identified.	2%
IAC0705	Long, medium and short-term goals are articulated in terms of a career in the diplomatic field.	2%
IAC0706	A personal profile is compiled of personal strengths and weaknesses in meeting the challenges of working in a foreign environment.	2%
IAC0707	Strategies to enhance personal safety and security are explained	2%

3.1.2 Criteria for accreditation

Add additional line spaces as required. Requirements, against which Skills Development Providers (SDP) and Assessment Centres, will be accredited, as listed below.

Physical Requirements:

SKILLS DEVELOPMENT PROVIDER (SDP)	
EQUIPMENT & TOOLS	• Equipped learning facilitation venue, meeting health and safety standards • Access for people with disabilities • Has Access to: ➢ Structured examples and scenarios o Learner support resources ➢ Reference resources such as internet, required literature and research facilities ➢ Assessment instruments ➢ o Learning exercises
CONSUMABLES	None

ASSESSMENT CENTRE	
EQUIPMENT & TOOLS	N/A
CONSUMABLES	None

Human Resource Requirements:

SKILLS DEVELOPMENT PROVIDER (SDP)	
QUALIFICATIONS & EXPERIENCE	• Facilitators have a NQF 6 qualification in a related field • Facilitators with experience in field of expertise for at least 3 years • Internal assessors can be the same person as the facilitator
FACILITATOR/LEARNER RATIO	1: 30

ASSESSMENT CENTRE	
EQUIPMENT & TOOLS	N/A
CONSUMABLES	N/A

Legal Requirements:

SKILLS DEVELOPMENT PROVIDER (SDP)	
QUALIFICATIONS & EXPERIENCE	• Compliance with relevant occupational health, safety and environmental regulations.

ASSESSMENT CENTRE	
EQUIPMENT & TOOLS	N/A
CONSUMABLES	N/A

3.1.3 Exemptions

- None

3.1.3 Detailing knowledge \Module (KM) contents

Knowledge Module (KM) – 07

MODULE CODE	MODULE TITLE	NQF LEVEL	CREDITS	MODE OF DELIVERY
111204-003-00-KM-07	Record-Keeping and Registry Administration Principles and Processes	5	2	Blended

(a) Purpose of the Practical Skills Module:

The main focus of the learning in this knowledge module is to provide the learner with an opportunity to acquire knowledge and understanding of the importance of safe-keeping of face-value items and information in general.

(b) List of Knowledge Topics:

TOPIC CODE	TOPIC TITLE	% OF TIME TO BE SPENT
KM-07-KT01	Recording and accessibility of records	25%
KM-07-KT02	Types of information and records	20%
KM-07-KT03	Purpose of recording and record-keeping	20%
KM-07-KT04	Registry administration and management	25%
KM-07-KT05	Storage facilities	10%

(c) Detailing each topic listed above into topic elements:

KM-07-KT01 RECORDING AND ACCESSIBILITY OF RECORDS (25%)		
TOPIC ELEMENT CODE	**TOPIC ELEMENT TITLE**	**% OF TIME TO BE SPENT**
KT0101	Concepts, terminology and definitions	10%
KT0102	Principles of record-keeping	10%
KT0103	Requirements for record-keeping	20%
KT0104	Safety, security and accessibility of records	20%
KT0105	Methods of record-keeping (manual and electronic)	20%
KT0106	Legislative framework for record-keeping management	20%

(d) Internal Assessment Criteria (IAC) and Weight

IAC CODE	IAC DESCRIPTION	% OF TIME TO BE SPENT
IAC0101	The reasons for recording information are explained with reference to actual documentation used in a business context.	25%
IAC0102	The types of information contained in records are explained in line with practices in a specific organisation.	50%
IAC0103	Methods of creating records using different types of technology are named, with examples.	**25**%

KM-07-KT02 TYPES OF INFORMATION AND RECORDS (20%)		
TOPIC ELEMENT CODE	**TOPIC ELEMENT TITLE**	**% OF TIME TO BE SPENT**
KT0201	Types of information	10%
KT0202	Types of records	10%
KT0203	Systems for record-keeping	20%
KT0204	Methods of creating records using different types of technology	20%
KT0205	Processes and procedures for recording information	10%
KT0206	Information flows within the organisation	10%

KT0207	Organisational, external agency and employee requirements for information	10%
KT0208	Sources of information for the resolution of discrepancies	10%

(d) Internal Assessment Criteria (IAC) and Weight

IAC CODE	IAC DESCRIPTION	% OF TIME TO BE SPENT
IAC0201	The different types of records used by a specific organisation are identified and explained, with examples	**30**%
IAC0202	The different types of records used by a specific organisation are identified and explained, with examples	70%

KM-07-KT03 PURPOSE OF RECORDING AND RECORD-KEEPING (20%)		
TOPIC ELEMENT CODE	**TOPIC ELEMENT TITLE**	**% OF TIME TO BE SPENT**
KT0301	Purpose of maintaining records	40%
KT0302	Importance of recording information	20%
KT0303	Purpose of recording changes to information	40%

(d) Internal Assessment Criteria (IAC) and Weight

IAC CODE	IAC DESCRIPTION	% OF TIME TO BE SPENT
IAC0301	The purpose of maintaining a record of contracts, agreements and quotations is described with reference to legislative and organisational requirements.	40%
IAC0302	The importance of recording client specific details is known and explained with examples from one's own business sector in line with organisational requirements	20%
IAC0303	The purpose of recording changes to contracts, agreements and quotations is explained with reference to different circumstances and legislative and organisational requirements.	40%

KM-07-KT04 REGISTRY ADMINISTRATION AND MANAGEMENT (25%)		
TOPIC ELEMENT CODE	**TOPIC ELEMENT TITLE**	**% OF TIME TO BE SPENT**
KT0401	Business functions, activities and record classification methods	10%
KT0402	Principles of identifying, securing and accessing vital records	10%
KT0403	Principles related to reading and interpreting records in order to classify them, applying retention and disposal authorities	10%
KT0404	Electronic record management	10%
KT0405	Concepts, terminology and ethics applicable to archives and record management	10%
KT0406	Statutory and legislative requirements which impact on record management and archives	10%
KT0407	Factors that impact on the life-cycle of records	10%
KT0408	Organisational administrative policies, systems and procedures	10%
KT0409	Statutory requirements for the compilation and arrangement of the lists	10%
KT0410	Interpretation of finding aids/classification systems	10%

(d) Internal Assessment Criteria (IAC) and Weight

IAC CODE	IAC DESCRIPTION	% OF TIME TO BE SPENT
IAC0401	Registry administration and management principles are reasoned.	30%
IAC0402	Registry administration and management methods are reasoned.	**30%**
IAC0403	Registry administration and management systems are described	**40**%

KM-07-KT05 STORAGE FACILITIES (25%)		
TOPIC ELEMENT CODE	**TOPIC ELEMENT TITLE**	**% OF TIME TO BE SPENT**
KT0501	Organisational storage methods and techniques	50%
KT0502	Types of storage facilities for different types of records	50%

(d) Internal Assessment Criteria (IAC) and Weight

IAC CODE	IAC DESCRIPTION	% OF TIME TO BE SPENT
IAC0501	The benefits of adequate storage facilities are justified.	100%

3.1.2 Criteria for accreditation

Add additional line spaces as required. Requirements, against which Skills Development Providers (SDP) and Assessment Centres, will be accredited, as listed below.

Physical Requirements:

SKILLS DEVELOPMENT PROVIDER (SDP)	
EQUIPMENT & TOOLS	Standard facilities for classroom training, learning materials, facilitation aids, media, Whiteboard, Flipchart Stand and Projector Screen If online training, the following equipment and tools must be provided: - Computer - Access to Internet, - Relevant Software Learning Management System (LMS) and Learning Management Information System (LMIS)
CONSUMABLES	None

ASSESSMENT CENTRE	
EQUIPMENT & TOOLS	N/A
CONSUMABLES	N/A

Human Resource Requirements:

SKILLS DEVELOPMENT PROVIDER (SDP)	
QUALIFICATIONS & EXPERIENCE	• NQF level 5 qualification in records management, administration, or related fields.
FACILITATOR/LEARNER RATIO	1: 24

ASSESSMENT CENTRE	
EQUIPMENT & TOOLS	N/A
CONSUMABLES	N/A

Legal Requirements:

SKILLS DEVELOPMENT PROVIDER (SDP)	
QUALIFICATIONS & EXPERIENCE	• Compliance with relevant occupational health, safety and environmental regulations.

ASSESSMENT CENTRE	
EQUIPMENT & TOOLS	N/A
CONSUMABLES	N/A

3.1.3 Exemptions

- No

3.1.6 Detailing Knowledge Module (KM) contents

Knowledge Module (KM) – 08

MODULE CODE	MODULE TITLE	NQF LEVEL	CREDITS	MODE OF DELIVERY
313109-001-00-KM-08	Components of the solar PV system	4	20	Face to face/contact

(a) Purpose of Knowledge Module:

The main focus of the learning in this knowledge subject is the components of a PV system and theoretical concepts related to PV.

(b) List of Knowledge Topics:

TOPIC CODE	TOPIC TITLE	% OF TIME TO BE SPENT
KM-08-KT01	PV array systems and PV applications	(13%)
KM-08-KT02	Solar radiation	(5%)
KM-08-KT03	The photovoltaic effect	(5%)
KM-08-KT04	Solar cell types	(13%)
KM-08-KT05	Electrical properties of solar cells	(5%)
KM-08-KT06	PV modules	(10%)

KM-08-KT07	PV junction/string boxes, smart boxes, string diodes, connectors and fuses	(8%)
KM-08-KT08	Inverters	(13%)
KM-08-KT09	Cabling, wiring and connection systems, installation materials and switching (direct current load switch [DC main switch] and AC switch disconnector)	(8%)
KM-08-KT10	Batteries	(10%)
KM-08-KT11	Charge Controllers	(10%)

(c) Detailing each topic listed above into topic elements:

KM-08-KT01 PV ARRAY SYSTEMS AND PV APPLICATIONS (13%)		
TOPIC ELEMENT CODE	**TOPIC ELEMENT TITLE**	**% OF TIME TO BE SPENT**
KT0101	Stand-alone systems (without storage, with storage, hybrid systems)	33%
KT0102	Grid-connected systems	34%
KT0103	Components of the two systems	33%

(d) Internal Assessment Criteria (IAC) and Weight

IAC CODE	IAC DESCRIPTION	% OF TIME TO BE SPENT
IAC0101	Describe stand-alone systems and grid-connected systems	**30%**
IAC0102	Identify their main components and describe their functions	**40%**
IAC0103	Explain the principles of operation of these two systems	**30%**

KM-01-KT02 SOLAR RADIATION (5%)		
TOPIC ELEMENT CODE	**TOPIC ELEMENT TITLE**	**% OF TIME TO BE SPENT**
KT0201	Sun as energy source	12%
KT0202	Distribution of solar radiation	12%
KT0203	Direct and diffuse radiation	11%
KT0204	Angle definition	11%
KT0205	Sun position and solar spectrum	11%

KT0206	Solar radiation on an inclined plane	11%
KT0207	Ground reflection	11%
KT0208	Measuring solar radiation	11%
KT0209	Tracking PV rays	10%

(d) Internal Assessment Criteria (IAC) and Weight

IAC CODE	IAC DESCRIPTION	% OF TIME TO BE SPENT
IAC0201	Explain the concepts of irradiance, insolation, energy content and the solar constant	9%
IAC0202	Explain the difference between direct and diffuse radiation	9%
IAC0203	Explain the concept of angle definition and identify some of the symbols used to depict the angles	9%
IAC0204	Explain the relationship between solar altitude and air mass	9%
IAC0205	Describe solar positions and air mass (AM) in different places in the world	9%
IAC0206	Explain the concept of the solar spectrum and describe how the sun‟s position affects the solar spectrum	9%
IAC0207	Identify the factors that reduce the passage of light through the earth's atmosphere	9%
IAC0208	Explain the impact of angle of inclination on solar radiation	9%
IAC0209	Explain the concept of ground reflection in terms of the albedo value	9%
IAC0210	Identify the instruments used to measure radiation and describe their accuracy	9%
IAC0211	Describe the advantages of tracking PV arrays and identify tracker systems	10%

KM-08-KT03 THE PHOTOVOLTAIC EFFECT (5%)

TOPIC ELEMENT CODE	TOPIC ELEMENT TITLE	% OF TIME TO BE SPENT
KT0301	Operation of a solar cell	50%
KT0302	Design and function of a crystalline silicon solar cell	50%

(d) Internal Assessment Criteria (IAC) and Weight

IAC CODE	IAC DESCRIPTION	% OF TIME TO BE SPENT
IAC0301	Explain the concept of intrinsic conductivity using the atomic theory	33%
IAC0302	Describe the design and function of a crystalline silicon solar cell	34%
IAC0303	Explain the concept of energy balance	33%

KM-08-KT04 SOLAR CELL TYPES (13%)		
TOPIC ELEMENT CODE	**TOPIC ELEMENT TITLE**	**% OF TIME TO BE SPENT**
KT0401	Crystalline silicon	5%
KT0402	Monocrystalline (single-crystal) silicon cells	5%
KT0403	Polycrystalline silicon cells	5%
KT0404	Polycrystalline UMG silicon cells	5%
KT0405	Ribbon pulled silicon cells	5%
KT0406	Texturing and anti-reflection coating	5%
KT0407	Front contacts	5%
KT0408	Back contacts	5%
KT0409	Alternatives for wafer production	5%
KT0410	High performance cells (manufacturing processes - float-zone method, optimised cell structures, surface passivation, selective emitters, edge isolation, back surface field, point contacts, back-contacted solar cells [types include MWT, EWT and back-contact (IBC) solar cells]; polarisation effect [HIT solar cells, transparent solar cells, spherical solar cells, silver cells])	10%
KT0411	Thin-film cell technology	10%
KT0412	Amorphous silicon cells	5%
KT0413	Micromorphous solar cells	5%
KT0414	Copper indium diselenide (CIS) cells	5%

KT0415	Cadmium telluride cells (CdTe)	5%
KT0416	Nano-structured solar cells (nano-structured CIS cells, organic solar cells: dyesensitised nano-crystalline cells)	5%
KT0417	Concentrator solar cells and concentrating systems	5%
KT0418	Comparison of solar cell types and trends	10%

(d) Internal Assessment Criteria (IAC) and Weight

IAC CODE	IAC DESCRIPTION	% OF TIME TO BE SPENT
IAC0401	Explain the use of silicon in crystalline solar cells	25%
IAC0402	Describe polycrystalline, monocrystalline and amorphous cells in detail	25%
IAC0403	Discuss thin-film technology	25%
IAC0404	Briefly describe each of the other solar cell types	25%

KM-08-KT05 ELECTRICAL PROPERTIES OF SOLAR CELLS (5%)

TOPIC ELEMENT CODE	TOPIC ELEMENT TITLE	% OF TIME TO BE SPENT
KT0501	Equivalent circuit diagrams of solar cells (additional solar cell models, the effective solar cell model)	40%
KT0502	Spectral sensitivity	30%
KT0503	Efficiency of solar cells and PV modules	30%

(d) Internal Assessment Criteria (IAC) and Weight

IAC CODE	IAC DESCRIPTION	% OF TIME TO BE SPENT
IAC0501	Discuss two solar cell models using circuit diagrams	35%
IAC0502	Explain spectral sensitivity of different solar cells	35%
IAC0503	Explain efficiency of solar cells and PV modules	30%

KM-08 -KT06 PV MODULES (10%)		
TOPIC ELEMENT CODE	**TOPIC ELEMENT TITLE**	**% OF TIME TO BE SPENT**
KT0601	Cell stringing	10%
KT0602	Glass and cell encapsulation (EVA, PVB, PTFE, Ionomer, TPU, acrylates or silicon (TPSE), new module concepts)	10%
KT0603	Module junction boxes and connection cables	10%
KT0604	Module frames	10%
KT0605	Types of modules and classification of modules (substrate, frame structure, construction- specific additional functions etc.)	10%
KT0606	Design options for PV modules (cell type, glass size, cell coverage, glass type, glass format, cell shape, cell contacting, encapsulation material, cell background etc.)	10%
KT0607	Wiring symbols	10%
KT0608	Module characteristics	10%
KT0609	Irradiance dependence and temperature characteristics	5%
KT0610	Hot spots, bypass diodes and shading	5%
KT0611	Electrical characteristics of thin-film modules	5%
KT0612	Expansion and contraction of modules	5%

(d) Internal Assessment Criteria (IAC) and Weight

IAC CODE	IAC DESCRIPTION	% OF TIME TO BE SPENT
IAC0601	Explain the importance of conducting a scoping exercise in a work management process	10%
IAC0602	Differentiate and discuss the various magnitude between scope of work and job scoping making use of examples	10%
IAC0603	Identify and describe the basic planning process steps with regard to work at hand	10%
IAC0604	Describe the module frames in terms of use, mounting and types	10%
IAC0605	Describe the different types of modules and design options	10%

IAC0606	Draw the wiring symbol used for solar cells, solar cell string, PV module, string of PV modules, PV sub-array and PV array	**10%**
IAC0607	Discuss briefly the characteristics of different types of modules	**10%**
IAC0608	Discuss the relationship between irradiation, temperature, power and voltage	**10%**
IAC0609	Explain hot spot and shading and the role of diodes in these instances	**10%**
IAC0610	Explain the electrical characteristics of thin-film modules	**10%**
IAC0611	Explain the aspect of expansion and contraction of modules	**10%**

KM-08-KT07 PV JUNCTION/STRING BOXES, SMART BOXES, STRING DIODES, CONNECTORS AND FUSES (8%)

TOPIC ELEMENT CODE	TOPIC ELEMENT TITLE	% OF TIME TO BE SPENT
KT0701	PV junction/string boxes	20**%**
KT0702	Smart boxes	20**%**
KT0703	String diodes	20**%**
KT0704	Connectors	20**%**
KT0705	Fuses	10**%**
KT0706	Telemetry/intelligence	10**%**

(d) Internal Assessment Criteria (IAC) and Weight

IAC CODE	IAC DESCRIPTION	% OF TIME TO BE SPENT
IAC0701	Describe the functions of PV junction/string boxes, smart boxes, string diodes, connectors and fuses	**50%**
IAC0702	Explain telemetry/intelligence system of smart boxes	**50%**

KM-08-KT08 INVERTERS (13%)

TOPIC ELEMENT CODE	TOPIC ELEMENT TITLE	% OF TIME TO BE SPENT
KT0801	Wiring symbols, inverter symbols (single and three phase)	**15**%
KT0802	Internal circuit diagrams	**15**%

KT0803	Self-commuted inverters (with high frequency, transformerless)	15%
KT0804	Specifications, characteristics and properties of inverters (different efficiencies like conversion, static, Euro, Californian, overall)	10%
KT0805	Grid-connected inverter types and construction sizes in various power classes (multiple MPP trackers [multi-string concept]; master slave concept in low power ranges, three phase concept in low power ranges, thin-film optimised inverters, back-up inverters or inverters optimised for self-use, medium voltage inverter)	20%
KT0806	Stand-alone inverters (sine-wave and square-wave)	15%
KT0807	Telemetry/intelligence of inverters	10%

(d) Internal Assessment Criteria (IAC) and Weight

IAC CODE	IAC DESCRIPTION	% OF TIME TO BE SPENT
IAC0801	Describe the functions of the inverter	15%
IAC0802	Identify and explain inverter symbols	5%
IAC0803	Draw the internal circuit diagram for an inverter and explain its operating principles	10%
IAC0804	Discuss the different efficiencies and overload behaviour of inverters	15%
IAC0805	Discuss the inverter's recording of operation data	10%
IAC0806	Discuss the characteristics and properties of inverters	10%
IAC0807	Explain the principle of grid connection when using an inverter	15%
IAC0808	Describe the types of inverters	10%
IAC0809	Explain telemetry/intelligence system of inverters	5%
IAC0810	Explain how to interpret inverter data sheets	5%

KM-08-KT09 CABLING, WIRING AND CONNECTION SYSTEMS, INSTALLATION MATERIALS AND SWITCHING (DIRECT CURRENT LOAD SWITCH [DC MAIN SWITCH] AND AC SWITCH DISCONNECTOR) (8%)

TOPIC ELEMENT CODE	TOPIC ELEMENT TITLE	% OF TIME TO BE SPENT

KT0901	Module and string cables	10%
KT0902	Connection systems	10%
KT0903	DC main cable	10%
KT0904	AC connection cable	10%
KT0905	Installation materials (PG protective tubing, finned tubing, cable duct, cable ties, cable clamps and nail clamps	10%
KT0906	Direct current load switch (DC main switch)	10%
KT0907	Miniature circuit breakers (MCBs)	10%
KT0908	Residual current device (RCD)	10%
KT0909	Isolation switches and grid integration	10%
KT0910	Integration of decentralised feed-in sources in the grid management process	5%
KT0911	Metering	5%

(d) Internal Assessment Criteria (IAC) and Weight

IAC CODE	IAC DESCRIPTION	% OF TIME TO BE SPENT
IAC0801	Describe module and string cables, connection systems, the DC main cable and the AC connection cable and explain their functions	20%
IAC0802	Describe the installation materials and explain their functions	10%
IAC0803	Describe the impact of quality of cables in terms of system losses	15%
IAC0804	Explain the functions of direct current load switch (DC main switch), miniature circuit breakers (MCBs), residual current device (RCD), isolation switches and grid integration	20%
IAC0805	Describe the two types of residual current devices	15%
IAC0806	Elaborate on the integration of decentralised feed-in sources in the grid management process	20%

KM-01-KT10 BATTERIES (10%)		
TOPIC ELEMENT CODE	**TOPIC ELEMENT TITLE**	**% OF TIME TO BE SPENT**
KT01001	Construction and operating principles	10%

KT01002	Types and designs of lead-acid batteries (lead-acid gel batteries, stationary tubular plate batteries [types OPzS and OPzV], block batteries with positive plates [OGi block], excursus modern battery concepts – lithium-ion batteries etc.)	20%
KT01003	Batteries and system specifications	15%
KT01004	Operating behaviour and characteristics of lead-acid batteries (voltage, charging and discharging, state of charge)	10%
KT01005	Ageing effects (acid stratification, sulphation, corrosion, studging, drying out)	10%
KT01006	Battery replacement	10%
KT01007	Battery safety and maintenance	10%
KT01008	Recycling	15%

(d) Internal Assessment Criteria (IAC) and Weight

IAC CODE	IAC DESCRIPTION	% OF TIME TO BE SPENT
IAC1001	Describe the construction, types and designs of batteries used in PV systems	**20%**
IAC1002	Explain the operating principles, operating behaviour and characteristics of leadacid batteries	**15%**
IAC1003	Discuss ageing effects on batteries	**10%**
IAC1004	Describe the criteria and specifications to be used when selecting batteries for PV system	**15%**
IAC1005	Describe the safety requirements when working with batteries	**15%**
IAC1006	Describe battery replacement procedures	**10%**
IAC1007	Describe battery maintenance and recycling procedures	**15%**

KM-08-KT11 CHARGE CONTROLLERS (10%)		
TOPIC ELEMENT CODE	**TOPIC ELEMENT TITLE**	**% OF TIME TO BE SPENT**
KT01101	Deep discharge protection and charging	20%
KT01102	Series controller	20%

KT01103	Shunt controllers	10%
KT01104	MPP charge controllers	20%
KT01105	Stand-alone inverters (sine-wave inverters, square-wave inverters, application criteria for inverters in stand-alone systems)	15%
KT01106	Telemetry/intelligence of charge controllers	15%

d) Internal Assessment Criteria (IAC) and Weight

IAC CODE	IAC DESCRIPTION	% OF TIME TO BE SPENT
IAC01101	Describe the main function of a charge controller	20%
IAC01102	Describe the essential features expected from a modern charge controller	15%
IAC01103	Describe a deep discharge protector and explain its function	10%
IAC01104	Explain the 3- or 4-stage charging cycle	15%
IAC01105	Describe the functions and operating principles of series controllers, shunt controllers and MPP charge controllers	20%
IAC01106	Explain telemetry/intelligence system of charge controllers	20%

3.1.2 Criteria for accreditation

Add additional line spaces as required. Requirements, against which Skills Development Providers (SDP) and Assessment Centres, will be accredited, as listed below.

Physical Requirements:

SKILLS DEVELOPMENT PROVIDER (SDP)	
EQUIPMENT & TOOLS	Standard facilities for classroom training, learning materials, facilitation aids, media, Whiteboard, Flipchart Stand and Projector Screen If online training, the following equipment and tools must be provided: - Computer - Access to Internet, - Relevant Software Learning Management System (LMS) and Learning Management Information System (LMIS)
CONSUMABLES	None

ASSESSMENT CENTRE	
EQUIPMENT & TOOLS	N/A
CONSUMABLES	N/A

Human Resource Requirements:

SKILLS DEVELOPMENT PROVIDER (SDP)	
QUALIFICATIONS & EXPERIENCE	• NQF level 6 qualification in an appropriate engineering field e.g. electrical and mechanical • At least 2 years of experience in maintaining, testing, troubleshooting, fault-finding, diagnosing and replacing PV systems/components **OR** • Trade qualification in electrical engineering or NQF level 5 qualification in solar photovoltaics, and • At least 3 years of experience in maintaining, testing, troubleshooting, fault-finding, diagnosing and replacing PV systems/components
FACILITATOR/LEARNER RATIO	1: 24

ASSESSMENT CENTRE	
QUALIFICATIONS & EXPERIENCE	N/A
INVIGILATOR/LEARNER RATIO	N/A

Legal Requirements:

SKILLS DEVELOPMENT PROVIDER (SDP)	
QUALIFICATIONS & EXPERIENCE	• Compliance with relevant occupational health, safety and environmental regulations.
FACILITATOR/LEARNER RATIO	1:24

ASSESSMENT CENTRE	
QUALIFICATIONS & EXPERIENCE	N/A
INVIGILATOR/LEARNER RATIO	N/A

3.1.3 Exemptions

- None

3.1.2 Detailing Knowledge Module (KM) contents

Knowledge Module (KM) – 05

MODULE CODE	MODULE TITLE	NQF LEVEL	CREDITS	MODE OF DELIVERY
313109-002-00-KM-05	Maintenance, troubleshooting, fault-finding and repairs to PV systems	5	13	Blended

(a) Purpose of Knowledge Module:

The main focus of the learning in this knowledge module is to build an understanding of the main focus of the learning in this knowledge subject is on maintaining PV systems both on PV farms and domestic (stand-alone) installations.

(b) List of Knowledge Topics:

TOPIC CODE	TOPIC TITLE	% OF TIME TO BE SPENT
KM-08-KT01	Maintenance of PV systems	(35%)
KM-08-KT02	Troubleshooting PV systems	35%)
KM-08-KT03	Repairing and/or replacing components of PV systems	(30%)

(c) Detailing each topic listed above into topic elements:

KM-08-KT01 MAINTENANCE OF PV SYSTEMS (35%)		
TOPIC ELEMENT CODE	**TOPIC ELEMENT TITLE**	**% OF TIME TO BE SPENT**
KT0101	Types of maintenance (Scheduled [preventative], unscheduled and corrective, opportunity maintenance [when plant is completely shut down])	(10%)
KT0102	Maintenance schedules and protocols	(10%)
KT0103	Environmental Impact Assessment (EIA) requirements	(10%)
KT0104	Manufacturers	(5%)
KT0105	Monitoring meter and equipment readings.	(10%)
KT0106	Information analysis	(10%)

KT0107	Decommission and recommission of whole or part of farm or installation.	(10%)
KT0108	Switching off procedures to perform maintenance.	(10%)
KT0109	Isolation of system in cooperation with controller/authorisation	(10%)
KT0110	Lock-out procedures	(10%)
KT0111	Improved equipment and upgrades	(10%)
KT0112	Cleaning (chemical free, ecological cleaning procedures) and OEM cleaning products	(5%)

(d) Internal Assessment Criteria (IAC) and Weight

IAC CODE	IAC DESCRIPTION	% OF TIME TO BE SPENT
IAC0101	Discuss the different types of maintenance that take place at different PV installations	(10%)
IAC0102	Describe the kinds of maintenance schedules and protocols involved at PV installations.	(20%)
IAC0103	Describe EIA requirements and manufacturers‟ specifications pertaining to maintenance	(20%)
IAC0104	Describe how to monitor meter and equipment readings and analyse the information available.	(10%)
IAC0105	Describe decommission and recommission procedures for the whole or part of farm or installation	(10%)
IAC0106	Describe switching off, isolation and lock-out procedures to perform maintenance.	(10%)
IAC0107	Identify the kind of improvements and upgrades that can be affected on a PV installation	(5%)
IAC0108	Describe cleaning procedures and products for modules and other equipment at an installation.	(5%)
IAC0109	Describe the method of reading the inverters fault display.	(10%)

KM-01-KT02 TROUBLE-SHOOTING PV SYSTEMS (35%)		
TOPIC ELEMENT CODE	**TOPIC ELEMENT TITLE**	**% OF TIME TO BE SPENT**
KT0201	Devices and procedures for fault investigation (multi-meter; pyranometer; special device to measure peak output using PC interface, power meter; current	(10%)

	injection probe; temperature sensor; thermographic measurement device; infrared thermometer; thermal imaging camera; insulation resistance tester, device for module testing)	
KT0202	Wiring/circuit diagrams for electronic technicians (one-line or block diagram, schematic/elementary diagram and interconnection diagrams and the use of tracing circuits.)	(10%)
KT0203	Fundamental steps in electronic troubleshooting (Perform an operational check; Analyse the malfunction; Locate the malfunction; Perform corrective action; Perform an operational check)	(10%)
KT0204	Visual inspections	(5%)
KT0205	Testing procedures: (testing operating data at the inverter; performing measurement test on AC side and DC side of inverter; checking if there is mains voltage; checking DC cable and the DC main disconnect/isolator switch; measuring insulation resistance; checking the string fuses, surge voltage protector and, where applicable, the string diodes at PV combiner/ junction box and checking for faulty string at PV combiner/junction box; measuring the voltage during operation in parallel at the string fuses and, if applicable, at the string diodes; measuring faulty strings; testing module connections and bypass diodes; measuring the open circuit voltage V0 and the short-circuit current; troubleshooting earth/ground faults or short-circuit faults in a multi-string system by separating and measuring individually; determining the location of a ground fault within a line with a double voltage measurement; measuring voltage from ground to the positive terminal; measuring peak output; performing functional analysis; thermography; electroluminescence measuring)	(35%)
KT0206	Typical faults in PV installations (faults at inverter, defective string fuses, defects with modules, partial or total failure of a string [bypass diodes etc.]; defective surge protector, insulation fault; component fault; installation faults; external damages; faults at transformers, faults with cables, inter-connections, diodes/ string diodes, fuses, PV combiner/junction box, etc.)	(10%)

KT0207	Electrostatic discharge (ESD) (ESD sources, failure mechanisms, defect types, ESD control, storing ESD items)	(10%)
KT0208	Typical electrical faults (opens; shorts [direct, cross, shorted control]; grounds; and low power and their causes, symptoms, and processes for locating them)	(10%)

(d) Internal Assessment Criteria (IAC) and Weight

IAC CODE	IAC DESCRIPTION	% OF TIME TO BE SPENT
IAC0201	Identify and describe devices and instruments used in fault-finding and explain how and when they are used.	(10%)
IAC0202	Describe the methods of performing visual inspections on the PV installation and system	(10%)
IAC0203	Describe the methods and procedures of testing the system.	(10%)
IAC0204	Explain the importance and purpose of wiring/circuit diagrams in troubleshooting	(10%)
IAC0205	Identify and describe the three types of wiring diagrams used by electronics technician.	(15%)
IAC0206	Identify the rules for tracing and extracting circuits from larger diagrams.	(10%)
IAC0207	Explain how diagrams can be used in troubleshooting.	(10%)
IAC0208	Identify the five fundamental steps in electronic troubleshooting	(10%)
IAC0209	Describe the typical faults that can occur in the PV system.	(10%)
IAC0210	Describe typical electrical faults and identify their causes, symptoms, and methods of locating them	(10%)
IAC0211	Discuss the precautions to be taken before cleaning modules	(5%)

KM-08-KT03 REPAIRING AND/OR REPLACING COMPONENTS OF PV SYSTEMS (30%)		
TOPIC ELEMENT CODE	**TOPIC ELEMENT TITLE**	**% OF TIME TO BE SPENT**
KT0301	Replacement procedures for modules	(20%)
KT0302	Repair and replacement procedures for inverters	(10%)
KT0303	Repair procedures for transformers	(20%)

KT0304	Repair and replacement procedures for cables, inter-connections, junction boxes, diodes, fuses, controllers	(10%)
KT0305	Replacement procedures for batteries	(20%)
KT0306	Repair and replacement procedures for telemetry systems (telemetry systems on tracking systems, smart boxes, inverters, and charge controllers)	(20%)

(d) Internal Assessment Criteria (IAC) and Weight

IAC CODE	IAC DESCRIPTION	% OF TIME TO BE SPENT
IAC0301	Describe replacement procedures for modules	(20%)
IAC0302	Describe replacement procedures for batteries.	(20%)
IAC0303	Describe the repair and replacement procedures for the system (modules, inverters, transformers, cables, inter-connections, diodes/ string diodes, fuses, surge voltage protector, PV combiner/junction box, controllers etc.)	(30%)
IAC0304	Describe repair and replacement procedures for inverters or components of inverters, that are within the scope of a PV Technician	(10%)
IAC0305	Describe repair procedures for transformers, that are within the scope of a PV Technician	(10%)
IAC0306	Describe repair and replacement procedures for telemetry systems	(10%)

3.1.2 Criteria for accreditation

Add additional line spaces as required. Requirements, against which Skills Development Providers (SDP) and Assessment Centres, will be accredited, as listed below.

Physical Requirements:

SKILLS DEVELOPMENT PROVIDER (SDP)	
EQUIPMENT & TOOLS	Standard facilities for classroom training, learning materials, facilitation aids, media, Whiteboard, Flipchart Stand and Projector Screen If online training, the following equipment and tools must be provided: - Computer - Access to Internet, - Relevant Software

	Learning Management System (LMS) and Learning Management Information System (LMIS)
CONSUMABLES	None
ASSESSMENT CENTRE	
EQUIPMENT & TOOLS	N/A
CONSUMABLES	N/A

Human Resource Requirements:

SKILLS DEVELOPMENT PROVIDER (SDP)	
QUALIFICATIONS & EXPERIENCE	• NQF level 6 qualification in an appropriate engineering field e.g. electrical and mechanical • At least 2 years of experience in maintaining, testing, troubleshooting, fault-finding, diagnosing and replacing PV systems/components **OR** • Trade qualification in electrical engineering or NQF level 5 qualification in solar photovoltaics, and - At least 3 years of experience in maintaining, testing, troubleshooting, fault-finding, diagnosing and replacing PV systems/components
FACILITATOR/LEARNER RATIO	1: 24

ASSESSMENT CENTRE	
QUALIFICATIONS & EXPERIENCE	N/A
INVIGILATOR/LEARNER RATIO	N/A

Legal Requirements:

SKILLS DEVELOPMENT PROVIDER (SDP)	
QUALIFICATIONS & EXPERIENCE	• Compliance with relevant occupational health, safety and environmental regulations.
FACILITATOR/LEARNER RATIO	1:24

ASSESSMENT CENTRE	
QUALIFICATIONS & EXPERIENCE	N/A
INVIGILATOR/LEARNER RATIO	N/A

3.1.3 Exemptions

- None

3.2 Practical Skill Module (PM) Specifications:

State compulsory modules:

- 313109-002-00-PM-02, Maintain, test, diagnose, repair, and/or replace inverters in PV systems, NQF Level 5, Credits 4
- 313109-001-00-PM-03 Use tools, measuring instruments and equipment, NQF Level 3, Credits 7
- 313109-002-PM-04, Maintain, test, diagnose and replace batteries in PV systems, NQF Level 5, Credits 4
- 313109-002-PM-PM-05 Maintain, test, diagnose and replace cables, cable inter-connections, smart boxes, PV junction/string boxes, string diodes, connectors and fuses in PV systems, NQF Level 5, Credits 4

Total credits of credits: 19

3.1.4 Detailing Practical Skill Module (PM) contents

3.2.1 Practical Module (PM) – 03

MODULE CODE	MODULE TITLE	NQF LEVEL	CREDITS	MODE OF DELIVERY
13109-001-00-PM-03	Use tools, measuring instruments and equipment,	3	7	Face-to-Face

(a) Purpose of the Practical Skills Module:

The focus of the learning in this module is on providing the learner with an opportunity to select, use and care for a range of tools and equipment relevant to the PV Technician

(b) List of Practical Skill Activities:

PRACTICAL SKILL CODE	ACTIVITY TITLE
PM-03-PS01	Select, use and care of engineering hand tools
PM-03-PS02	Select, use and care for power tools and equipment
PM-03-PS03	Perform marking-off activities
PM-03-PS04	Select, use and care for mechanical instruments
PM-03-PS05	Rivet materials together
PM-03-PS06	Perform soft soldering activities
PM-03-PS07	Lift loads

(c) Scope of each Practical Skill Activity:

PM-03-PS01 SELECT, USE AND CARE OF ENGINEERING HAND TOOLS	
PRACTICAL SKILL ACTIVITY SCOPE OUTLINE:	
Given work instructions, checklists, work area, drawings, documents, templates, forms, safety and quality principles, hand saws, hammers, screw drivers, sockets, spanners, chassis punches, side cutters, pliers, wire strippers, drill bits, measuring and marking off tools, fastening tools, equipment standard operating procedures and, statutory requirements, the learner must be able to:	
PRACTICAL SKILL ACTIVITY ELEMENT CODES	**PRACTICAL SKILL ACTIVITY ELEMENTS**
PA0101	Select engineering hand tools and equipment for serviceability
PA0102	Use engineering hand tools and equipment
PA0103	Respond appropriately to potential hazards and risks related to the use of the engineering hand tools and equipment

(d) Applied Knowledge that underpins the Practical Skill

APPLIED KNOWLDEGE CODE	APPLIED KNOWLEDGE
AK0101	Workshop procedures including housekeeping practices according to statutory requirements
AK0102	Techniques for maintaining hand tools and equipment
AK0103	Techniques for using tools and equipment
AK0104	Practices related to quality, health, safety, and protection of the environment when using hand tools

(e) Internal Assessment Criteria (IAC)

IAC CODE	IAC DESCRIPTION
IAC0101	The correct application of tools is used for cutting steel, copper, aluminium, plastics and synthetic materials as per manufacturers‟ specifications
IAC0102	The correct application of tools is used to loosen or fasten a range of different types and sizes of nuts or bolts and different types and sizes of screws as per manufacturer's specifications
IAC0103	The correct application of tools is used to strip or cut a range of different types and sizes of electrical wire as per manufacturer’s specifications
IAC0104	Sharp edges on chisel/punch type tool heads with "mushroom effect" are removed to ensure that they can be used safely; then tips with burs or chips are sharpened for effective use
IAC0105	Flat screw driver tips with burs or chips are filed and prepared to manufacturer's specification ensuring that they are serviceable
IAC0106	The adjusting/moving mechanisms of shifting spanners, gas pump pliers, vice grip, dividers, stilson wrench are lubricated to ensure free movement and serviceability
IAC0107	Engineering files cutting edge are cleaned using a wire brush to ensure serviceability
IAC0108	Scribers, dividers and centre punches are sharpened to ensure serviceability

PM-03-PS02 SELECT, USE AND CARE FOR POWER TOOLS AND EQUIPMENT	
PRACTICAL SKILL ACTIVITY SCOPE OUTLINE	
Given work instructions, work area, documents, templates, drilling machines (portable and pedestal), grinders, and saws, bench grinder, standard operating procedures and, statutory requirements, the learner must be able to:	
PRACTICAL SKILL ACTIVITY ELEMENT CODES	**PRACTICAL SKILL ACTIVITY ELEMENTS**
PA0201	Select a power tool or equipment pertaining to specific job requirements
PA0202	Use fixed power or equipment tools
PA0203	Use portable power or equipment tools
PA0204	Care for and store power tools or equipment and their accessories
PA0205	Respond appropriately to potential hazards and risks related to the use of power tools

(d) Applied Knowledge that underpins the Practical Skill

APPLIED KNOWLDEGE CODE	APPLIED KNOWLEDGE
AK0201	Workshop procedures including housekeeping practices according to statutory requirements
AK0202	Safety practices relating to the use of power tools including the use of personal protective equipment, electrical and fire protection
AK0203	Types and uses of fixed and portable power tools and equipment

(e) Internal Assessment Criteria (IAC)

IAC CODE	IAC DESCRIPTION
IAC0201	Power tools and equipment are selected according to the task requirements
IAC0202	Pre-operational check is carried out in terms of safety requirements and function
IAC0203	Hazards associated with the use of power tools or equipment are recognised and necessary precautions taken according to workshop procedures
IAC0204	Faulty and unsafe tools or equipment are identified and reported in accordance with standard operating procedures
IAC0205	Personal safety equipment is selected and used according to tool or equipment requirement
IAC0206	Fixed and portable power tools are selected and set up according to job requirements
IAC0207	All guards and securing mechanisms are effectively utilised in terms of job requirements
IAC0208	Fixed and portable power tools and equipment are used safely and in accordance with manufacturer's specifications
IAC0209	Power tools and equipment are inspected, cleaned and lubricated after use according to workshop practices and/or manufactures specifications
IAC0210	Loose items are secured and minor defects repaired in accordance to workshop procedures
IAC0211	Portable power tools, equipment and accessories are stored in accordance to workshop procedures

PM-03-PS03 PERFORM MARKING-OFF ACTIVITIES
PRACTICAL SKILL ACTIVITY SCOPE OUTLINE
Given appropriate tools and equipment, dimensions, raw materials, instructions, templates and assignments to perform marking-off, the learner must be able to:

PRACTICAL SKILL ACTIVITY ELEMENT CODES	PRACTICAL SKILL ACTIVITY ELEMENTS
PA0301	Plan and prepare for the marking-off of materials using templates
PA0302	Select marking-off tools appropriate for different materials and sizes and to prevent negative influences on the final product
PA0303	Interpret job instructions and engineering drawings
PA0304	Perform marking-off using drawings, tools and equipment according to job specifications

(d) Applied Knowledge that underpins the Practical Skill

APPLIED KNOWLDEGE CODE	APPLIED KNOWLEDGE
AK0301	Method of checking and evaluating marking-off dimensions from working drawings (including methods of transferring dimensions)
AK0302	Tests for strength, flexibility and defects in raw materials
AK0303	Marking off tools and equipment include to centre punch and hammer, V-shaped block, marking-off scribe, steel rule, steel compass, block and flat table, height gauge, dividing heads, marking agents (pens, paint, chalk, marking blue), rotary tables, trammels and parallels
AK0304	Marking off templates

(e) Internal Assessment Criteria (IAC)

IAC CODE	IAC DESCRIPTION
IAC0301	Preparations for marking-off are made to ensure smooth operation
IAC0302	Check and evaluate marking-off dimensions from working drawings
IAC0303	Check and test raw materials to be marked-off defects
IAC0304	Convert scales from working drawings using various suitable methods
IAC0305	The sequence of activities for the marking-off process is planned to ensure a smooth process
IAC0306	Templates are used on material as per standard procedure, to maintain accuracy
IAC0307	Marking off is concluded to specifications and checked for quality
IAC0308	Work shows consideration for quality

PM-01-PS04: SELECT, USE AND CARE FOR MECHANICAL INSTRUMENTS	
PRACTICAL SKILL ACTIVITY SCOPE OUTLINE	
Given work instructions, work area, documents, including but not limited to inclinometers, tape measures, digital and laser distance meters, thermometers, steel rulers, engineer's squares, vernier callipers, torque wrench standard operating procedures and, statutory requirements the learner must be able to:	
PRACTICAL SKILL ACTIVITY ELEMENT CODES	**PRACTICAL SKILL ACTIVITY ELEMENTS**
PA0401	Identify and select mechanical measuring instruments
PA0402	Use and interpret mechanical measuring instrument readings
PA0403	Care for mechanical measuring instruments

(d) Applied Knowledge that underpins the Practical Skill

APPLIED KNOWLDEGE CODE	APPLIED KNOWLEDGE
AK0401	Handling procedures related to measuring instrument
AK0402	Basic operating principles of electrical measuring instruments
AK0403	Types, applications and functions of electrical measuring instruments

(e) Internal Assessment Criteria (IAC)

IAC CODE	IAC DESCRIPTION
IAC0401	Job instructions are interpreted correctly and sequence of operation is determined
IAC0402	Unsafe and faulty measuring instruments are identified visually and marked for repair or replacement
IAC0403	Mechanical measuring instruments are checked for correct operation and functionality
IAC0404	Mechanical measuring instruments are set-up and used in accordance with their specifications
IAC0405	Mechanical measuring instruments are read correctly
IAC0406	Results are recorded on appropriate documentation
IAC0407	Results are accurately interpreted against the specifications of the job requirements
IAC0408	Mechanical measuring instruments are placed and stored in accordance with manufacturer's specifications and workshop standards

PM-04-PS05 RIVET MATERIALS TOGETHER	
PRACTICAL SKILL ACTIVITY SCOPE OUTLINE	
Given two sheets of metal or plastic, drilling machine, pop rivet, rivets, washers etc. the learner must be able to:	
PRACTICAL SKILL ACTIVITY ELEMENT CODES	**PRACTICAL SKILL ACTIVITY ELEMENTS**
PA0201	Make holes using the drilling machine and appropriate measuring and marking tools
PA0202	Rivet the sheets together

(d) Applied Knowledge that underpins the Practical Skill

APPLIED KNOWLDEGE CODE	APPLIED KNOWLEDGE
AK0501	Equipment for riveting: riveting machine, drilling machine, washers, rivets (standard, countersunk, blind)
AK0502	Technique for riveting

(e) Internal Assessment Criteria (IAC)

IAC CODE	IAC DESCRIPTION
IAC0501	Materials to be riveted together are marked where holes will be made
IAC0502	Drilling machine is used correctly to make holes
IAC0503	Appropriate rivet and washer sizes are chosen
IAC0504	Pop rivet is used correctly to complete the task
IAC0505	Safety requirements are adhered to

PM-03-PS06 PERFORM SOFT SOLDERING ACTIVITIES	
PRACTICAL SKILL ACTIVITY SCOPE OUTLINE	
Given work instructions, work area, checklists, soldering irons; insulation strippers (thermaltype insulation strippers and mechanical wire strippers); wire bending tools; solder; flux; basic soldering connections (turret, bifurcated, hook, surface mounts, cups), solder sucker, accessories, standard operating procedures and statutory requirements the learner must be able to:	
PRACTICAL SKILL ACTIVITY ELEMENT CODES	**PRACTICAL SKILL ACTIVITY ELEMENTS**

PA0601	Solder various wire joints
PA0602	Solder components on a PC board or Vero board or joints
PA0603	De-solder components

(d) Applied Knowledge that underpins the Practical Skill

APPLIED KNOWLDEGE CODE	APPLIED KNOWLEDGE
AK0601	Soldering techniques and applications
AK0602	Safety practices relating to the use of soldering equipment including the use of personal protective equipment
AK0603	De-soldering methods
AK0604	Handling and storage of soldering equipment and accessories

(e) Internal Assessment Criteria (IAC)

IAC CODE	IAC DESCRIPTION
IAC0601	Work area is inspected for safe working conditions and corrective action is taken where required
IAC0602	Applicable soldering equipment is selected as required by task
IAC0603	Soldering material is correctly selected as required by the task
IAC0604	All connections are cleaned of any dirt or oxidation
IAC0605	Tinning of wire and connections are done according to manufacturer's specifications
IAC0606	Connections are soldered according to specifications and techniques
IAC0607	Components are laid out on the circuit board according to the circuit diagram
IAC0608	Components are soldered according to soldering techniques

PM-01-PS07 LIFT LOADS	
PRACTICAL SKILL ACTIVITY SCOPE OUTLINE	
Given appropriate lifting tools and equipment and assignments, the learner must be able to:	
PRACTICAL SKILL ACTIVITY ELEMENT CODES	**PRACTICAL SKILL ACTIVITY ELEMENTS**

PA0701	Assess the nature of the lifting task and the associated risks
PA0702	Plan the lifting process (including making simple calculations)
PA0703	Identify and select lifting equipment in accordance with load requirements
PA0704	Inspect the lifting equipment for safety and defects
PA0705	Sling loads in accordance with load requirements and worksite procedures
PA0706	Use applicable communication methods during slinging operations
PA0707	Lift, convey and place/stack loads safely

(d) Applied Knowledge that underpins the Practical Skill

APPLIED KNOWLDEGE CODE	APPLIED KNOWLEDGE
AK0701	Lifting equipment (chain slings, rope slings, steel wire slings, synthetic web slings, shackles, eyebolts, guide ropes, plate grabs, chain blocks, rope tackles/rope blocks jacks, come-alongs, small floor cranes, hoists [tirfor, coffin], lifting brackets, fasteners, colour codes of slings)
AK0702	Equipment defects (include wear, corrosion, stretched links, deterioration of splices, cracks, nicks and broken strands, contamination through oil and paint [synthetic slings])
AK0703	Load capacity of lifting equipment and the reason for not exceeding it
AK0704	Communication methods used may include the use of two-way radios, standard hand signals and warning devices such as hooters and whistles
AK0705	Lifting techniques
AK0706	Safety requirements
AK0707	Caring and storage procedures
AK0708	Load capacity for this practical skill not to exceed 2t (two metric tons)

(e) Internal Assessment Criteria (IAC)

IAC CODE	IAC DESCRIPTION
IAC0701	The task is assessed and an appropriate lifting technique is chosen
IAC0702	Risks are assessed and mitigated
IAC0703	Lifting task is planned in accordance with the task
IAC0704	Lifting equipment is selected and checked and its lifting capacity is noted

IAC0705	Lifting task is completed keeping in consideration all safety requirements
IAC0706	Equipment is cleaned, lubricated and stored according to procedures

3.2.2. Criteria for accreditation

Add additional line spaces as required. Requirements, against which Skills Development Providers (SDP) and Assessment Centres, will be accredited, as listed below.

Physical Requirements:

SKILLS DEVELOPMENT PROVIDER (SDP)	
EQUIPMENT & TOOLS	Work area, categories of tools equipment and materials described in this module
CONSUMABLES	None

ASSESSMENT CENTRE	
EQUIPMENT & TOOLS	N/A
CONSUMABLES	N/A

Human Resource Requirements:

SKILLS DEVELOPMENT PROVIDER (SDP)	
QUALIFICATIONS & EXPERIENCE	Facilitators should have a minimum NQF Level 4 qualification which includes competencies related to working with and caring for tools and equipment.
FACILITATOR/LEARNER RATIO	1:12

ASSESSMENT CENTRE	
QUALIFICATIONS & EXPERIENCE	N/A
FACILITATOR/LEARNER RATIO	N/A

Legal Requirements:

SKILLS DEVELOPMENT PROVIDER (SDP)	
QUALIFICATIONS & EXPERIENCE	Compliance to the relevant occupational health, safety and environmental protection legislation

ASSESSMENT CENTRE	
QUALIFICATIONS & EXPERIENCE	N/A
FACILITATOR/LEARNER RATIO	N/A

3.2.3 Exemptions

None

3.2.2 Practical Skill Module (PM) Specifications:

Practical Module (PM) - 02

MODULE CODE	MODULE TITLE	NQF LEVEL	CREDITS	MODE OF DELIVERY
313109-002-00-PM-02	Maintain, test, diagnose, repair, and/or replace inverters in PV systems	5	4	Face-to-Face

(a) Purpose of the Practical Skills Module:

The focus of the learning in this module is on providing the learner an opportunity to The focus of the learning in this module is on providing the learner an opportunity to: evaluate the performance of inverters; maintain, test and diagnose faults on inverters (domestic and industrial) and repair and /or replace inverters.

(b) List of Practical Skill Activities:

PRACTICAL SKILL CODE	ACTIVITY TITLE
PM-01-PS01	Prepare for scheduled maintenance on inverters
PM-01-PS02	Inspect, maintain, test and diagnose problems on inverters (on stand-alone installations and PV farms)
PM-01-PS03	Remove and replace inverters or components of inverters

(c) Scope of each Practical Skill Activity:

PM-01-PS01 PREPARE FOR SCHEDULED MAINTENANCE ON INVERTERS	
PRACTICAL SKILL ACTIVITY SCOPE OUTLINE:	
…	
PRACTICAL SKILL ACTIVITY ELEMENT CODES	**PRACTICAL SKILL ACTIVITY ELEMENTS**
PA0101	Identify and interpret maintenance schedules, documentation and diagrams

PA0102	Identify and implement authorisation procedures for maintenance
PA0103	Select tools and testing equipment
PA0104	Lock out and/or isolate the inverter

d) Applied Knowledge that underpins the Practical Skill

APPLIED KNOWLDEGE CODE	APPLIED KNOWLEDGE
AK0101	Maintenance schedules, documentation, diagrams
AK0102	Lock out or isolation procedures
AK0103	Importance and function of datasheets
AK0104	Safety aspects including PPE
AK0105	Types and functions of tools and maintenance equipment
AK0106	Manufacturer's specifications and guarantees

(e) Internal Assessment Criteria (IAC)

IAC CODE	IAC DESCRIPTION
IAC0101	Authorisation procedures are implemented to perform scheduled maintenance
IAC0102	A range of maintenance schedules, documentation etc. is interpreted and used to plan scheduled maintenance
IAC0103	Lock-out and isolation procedures are correctly implemented

PM-01-PS02 INSPECT, MAINTAIN, TEST AND DIAGNOSE PROBLEMS ON INVERTERS (ON STAND-ALONE INSTALLATIONS AND PV FARMS)	
PRACTICAL SKILL ACTIVITY SCOPE OUTLINE	
Given inverters, maintenance and testing equipment, the learner must be able to:	
PRACTICAL SKILL ACTIVITY ELEMENT CODES	**PRACTICAL SKILL ACTIVITY ELEMENTS**
PA0201	Carry out visual inspection of inverters (typical requirements for inverter inspections include: record and validate all voltages and production values from the human-machine interface (HMI) display; record last logged system error; clean filters; clean the inside of the cabinet; test fans for proper operation; check fuses, torque on terminations, gasket seal, integrity of lightning arrestors, continuity of system ground and

	equipment grounding, mechanical connection of the inverter to the wall or ground, check internal disconnect operation; confirm warning labels are in place; look for discoloration from excessive heat build-up; verify that current software is installed; contact installer and/or manufacturer about any issues found)
PA0202	Maintain inverters as per scheduled maintenance requirements (check earthing, lightning and lightning protection, Internal switches, programming, power supply [mainly ageing capacitators], heat and heat protection [shading etc.], telemetry [communication system], intrusion of rodents, geckos and other small animals, batteries wherever they are involved, might be a source of problems)
PA0203	Test inverters
PA0204	Diagnose faults on inverters

(d) Applied Knowledge that underpins the Practical Skill

APPLIED KNOWLDEGE CODE	APPLIED KNOWLEDGE
AK0201	Structure and composition of inverters
AK0202	Types of inverters
AK0203	Operating principles of inverters
AK0204	Visual inspection procedures
AK0205	Maintenance procedures
AK0206	Types of maintenance problems on inverters
AK0207	Testing and diagnosing procedures
AK0208	Testing and diagnosing tools and equipment
AK0209	Data sheets
AK0210	Safety aspects including PPE
AK0211	Mmanufacturer's specifications

(e) Internal Assessment Criteria (IAC)

IAC CODE	IAC DESCRIPTION
IAC0201	Visual inspections are performed according to procedures
IAC0202	Inverters are maintained according to manufacturer‟s requirements
IAC0203	Testing tools and equipment are used correctly to carry out a range of tests on inverters

IAC0204	Readings on inverter meters and on testing equipment are interpreted correctly
IAC0205	Data sheets are read and interpreted correctly
IAC0206	Accurate diagnoses are made
IAC0207	Safety requirements are applied when testing and diagnosing inverters
PM-01-PS03 REMOVE AND REPLACE INVERTERS OR COMPONENTS OF INVERTERS	
PRACTICAL SKILL ACTIVITY SCOPE OUTLINE	
Given tools and equipment and manufacturer's specifications, the learner must be able to	
PRACTICAL SKILL ACTIVITY ELEMENT CODES	**PRACTICAL SKILL ACTIVITY ELEMENTS**
PA0301	Rectify faults/problems on inverters or components of inverters (where applicable)
PA0302	Replace inverters
PA0303	Complete a re-commissioning test
PA0304	Prepare report

(d) Applied Knowledge that underpins the Practical Skill

APPLIED KNOWLDEGE CODE	APPLIED KNOWLEDGE
AK0301	Various fault conditions on inverters
AK0302	Methods of using testing instruments/equipment
AK0303	Interpretation of readings on inverters
AK0304	Fault finding techniques
AK0305	Removal and replacement techniques
AK0306	Techniques to carry out commissioning tests
AK0307	Lock-out and/isolation procedures
AK0308	Risks, hazards and safety precautions
AK0309	PV installation and maintenance report requirements

(e) Internal Assessment Criteria (IAC)

IAC CODE	IAC DESCRIPTION
IAC0301	Inverters are correctly and safely isolated/locked-out according to isolation and lock-out procedures
IAC0302	Identified faults/problems are correctly and safely rectified to the original operating status
IAC0303	Inverters and/or inverter components are removed and replaced according to manufacturer specifications
IAC0304	Risks associated with repair/replacement are correctly identified and safety precautions taken
IAC0305	Correct re-commissioning testing is completed according to standard operating procedure
IAC0306	Maintenance report is completed to specifications

3.2.2. Criteria for accreditation

Add additional line spaces as required. Requirements, against which Skills Development Providers (SDP) and Assessment Centres, will be accredited, as listed below.

Physical Requirements:

SKILLS DEVELOPMENT PROVIDER (SDP)	
EQUIPMENT & TOOLS	Work area, categories of tools equipment and materials described in this module
CONSUMABLES	None

ASSESSMENT CENTRE	
EQUIPMENT & TOOLS	N/A
CONSUMABLES	N/A

Human Resource Requirements:

SKILLS DEVELOPMENT PROVIDER (SDP)	
QUALIFICATIONS & EXPERIENCE	NQF Level 5 qualification in PV Technician with at least 2 years of experience OR A qualified electrician/millwright with PV related training and 2 years" relevant experience working within a PV environment.

FACILITATOR/LEARNER RATIO	1:12

ASSESSMENT CENTRE	
QUALIFICATIONS & EXPERIENCE	N/A
INVIGILATOR/LEARNER RATIO	N/A

Legal Requirements:

SKILLS DEVELOPMENT PROVIDER (SDP)	
QUALIFICATIONS & EXPERIENCE	Compliance to the relevant occupational health, safety and environmental protection legislation

3.2.3 Exemptions

- None

3.2.3 Detailing Practical Module (PM) contents

Practical Module (PM) - 11

MODULE CODE	MODULE TITLE	NQF LEVEL	CREDITS	MODE OF DELIVERY
313109-002-PM-11	Maintain, test, diagnose and replace batteries in PV systems	5	4	Face-to-Face

(a) Purpose of the Practical Skills Module:

The focus of the learning in this module is on providing the learner an opportunity to: perform scheduled maintenance on batteries; test, troubleshoot and diagnose problems on batteries and replace batteries.

(b) List of Practical Skill Activities:

PRACTICAL SKILL CODE	ACTIVITY TITLE
PM-11-PS01	Prepare for scheduled maintenance on batteries
PM-11-PS02	Inspect, test and diagnose batteries
PM-11-PS02	Remove and replace batteries

(c) Scope of each Practical Skill Activity:

PM-01-PS01 PREPARE FOR SCHEDULED MAINTENANCE ON BATTERIES	
PRACTICAL SKILL ACTIVITY SCOPE OUTLINE:	
Given maintenance schedules, documentation, diagrams, checklists, safety and quality principles, standard operating procedures and a range of assignments, the learner must be able to:	
PRACTICAL SKILL ACTIVITY ELEMENT CODES	**PRACTICAL SKILL ACTIVITY ELEMENTS**
PA0101	Identify and interpret maintenance schedules, documentation and diagrams
PA0102	Identify and implement authorisation procedures for maintenance
PA0103	Select tools and testing equipment
PA0104	Lock out or isolate the battery or battery system

(d) Applied Knowledge that underpins the Practical Skill

APPLIED KNOWLDEGE CODE	APPLIED KNOWLEDGE
AK0101	Maintenance schedules, documentation, diagrams
AK0102	Lock out or isolation procedures
AK0103	Safety aspects including PPE
AK0104	Types and functions of tools and maintenance equipment
AK0105	Manufacturer‟s specifications and guarantees

(e) Internal Assessment Criteria (IAC)

IAC CODE	IAC DESCRIPTION
IAC0101	Authorisation procedures are implemented to perform scheduled maintenance
IAC0102	A range of maintenance schedules, documentation etc. is used to plan scheduled maintenance
IAC0103	Lock-out and isolation procedures are correctly implemented

PM-01-PS02: Inspect, test and diagnose batteries	
PRACTICAL SKILL ACTIVITY SCOPE OUTLINE	
Given work batteries or battery systems, maintenance and testing equipment, the learner must be able to:	
PRACTICAL SKILL ACTIVITY ELEMENT CODES	**PRACTICAL SKILL ACTIVITY ELEMENTS**
PA0201	Carry out visual inspection on batteries
PA0202	Maintain batteries or battery banks (includes checking SG, terminals, casing, poles, connections, voltage, earthing, lightning and lightning protection)
PA0203	Test batteries
PA0204	Diagnose problems on batteries

(d) Applied Knowledge that underpins the Practical Skill

APPLIED KNOWLDEGE CODE	APPLIED KNOWLEDGE
AK0101	Structure and composition of batteries
AK0102	Types of batteries
AK0103	Operating principles of batteries
AK0104	Visual inspection procedures
AK0105	Maintenance procedures for batteries
AK0106	Types of maintenance problems on batteries
AK0107	Testing and diagnosing procedures
AK0108	Testing and diagnosing tools and equipment
AK0109	Safety aspects including PPE

(e) Internal Assessment Criteria (IAC)

IAC CODE	IAC DESCRIPTION
IAC0101	Visual inspections are performed on the batteries
IAC0102	Batteries or battery systems are maintained as per manufacturer‟s requirements
IAC0103	Testing tools and equipment are used correctly to carry out a range of tests on batteries

IAC0104	Readings on multi-meter and on testing equipment are interpreted correctly
IAC0105	Accurate diagnoses are made
IAC0106	Safety requirements are applied when testing and diagnosing batteries

PM-11-PS03: Remove and replace batteries	
PRACTICAL SKILL ACTIVITY SCOPE OUTLINE	
Given tools and equipment, and manufacturer‟s specifications, the learner must be able to:	
PRACTICAL SKILL ACTIVITY ELEMENT CODES	**PRACTICAL SKILL ACTIVITY ELEMENTS**
PA0301	Remove and replace batteries
PA0302	Complete a re-commissioning test
PA0303	Prepare report

(d) Applied Knowledge that underpins the Practical Skill

APPLIED KNOWLDEGE CODE	APPLIED KNOWLEDGE
AK0301	Removal and replacement techniques
AK0302	Techniques to carry out commissioning tests
AK0303	Risks, hazards and safety precautions
AK0304	Battery report requirements

(e) Internal Assessment Criteria (IAC)

IAC CODE	IAC DESCRIPTION
IAC0301	Batteries are correctly and safely isolated/locked-out according to isolation and lock-out procedures
IAC0302	Identified faults are correctly and safely rectified to the original operating status
IAC0303	Batteries are removed and replaced according to manufacturer specifications
IAC0304	Risks associated with repair/replacement of batteries are correctly identified and safety precautions taken
IAC0305	Correct re-commissioning testing is completed according to standard operating procedure

IAC0306	Report is completed to specifications

3.2.2. Criteria for accreditation

Add additional line spaces as required. Requirements, against which Skills Development Providers (SDP) and Assessment Centres, will be accredited, as listed below.

Physical Requirements:

SKILLS DEVELOPMENT PROVIDER (SDP)	
EQUIPMENT & TOOLS	Tools and equipment such as battery systems, battery banks, PPE, multi-meters, spanners, pliers, screw drivers, hand power tools, hammers, measuring tapes, cables and wires.
CONSUMABLES	None

ASSESSMENT CENTRE	
EQUIPMENT & TOOLS	N/A
CONSUMABLES	N/A

Human Resource Requirements:

SKILLS DEVELOPMENT PROVIDER (SDP)	
QUALIFICATIONS & EXPERIENCE	NQF Level 5 PV Technician qualification with at least 2 years of experience OR A qualified electrician/millwright with PV related training and 2 years‟ relevant experience working within a PV environment.
FACILITATOR/LEARNER RATIO	1:12

ASSESSMENT CENTRE	
QUALIFICATIONS & EXPERIENCE	N/A
INVIGILATOR/LEARNER RATIO	N/A

Legal Requirements:

SKILLS DEVELOPMENT PROVIDER (SDP)	
QUALIFICATIONS & EXPERIENCE	Compliance to the relevant occupational health, safety and environmental protection legislation

3.2.3 Exemptions None

3.2.4 Detailing Practical Module (PM) contents

Practical Module (PM) - 05

MODULE CODE	MODULE TITLE	NQF LEVEL	CREDITS	MODE OF DELIVERY
313109-002-00-PM-05	Maintain, test, diagnose and replace cables, cable inter connections, smart boxes, PV junction/string boxes, string diodes, connectors, and fuses in PV systems	5	4	Face-to-Face

(a) Purpose of the Practical Skills Module:

The focus of the learning in this module is on providing the learner an opportunity to the focus of the learning in this module is on providing the learner an opportunity to: maintain; test, troubleshoot and diagnose problems/faults; and replace cables, cable inter-connections, smart boxes, PV junction/string boxes, string diodes, connectors, and fuses.

(b) List of Practical Skill Activities:

PRACTICAL SKILL CODE	ACTIVITY TITLE
PM-05-PS01	Prepare for scheduled maintenance on cables, cable inter-connections, smart boxes, PV junction/string boxes, string diodes, connectors, and fuses.
PM-05-PS02	Test, troubleshoot and diagnose problems on cables, cable inter-connections, smart boxes, PV junction/string boxes, string diodes, connectors, and fuses.
PM-05-PS03	Remove and replace cables, cable inter-connections, smart boxes, PV junction/string boxes, string diodes, connectors, and fuses.

(c) Scope of each Practical Skill Activity:

PM-12-PS01: Prepare for scheduled maintenance on cables, cable inter-connections, smart boxes, PV junction/string boxes, string diodes, connectors and fuses
PRACTICAL SKILL ACTIVITY SCOPE OUTLINE:

Given maintenance schedules, documentation, diagrams, checklists, safety and quality principles, standard operating procedures, the learner must be able to:	
PRACTICAL SKILL ACTIVITY ELEMENT CODES	**PRACTICAL SKILL ACTIVITY ELEMENTS**
PA0101	Identify and interpret maintenance schedules, documentation and diagrams
PA0102	Identify and implement authorisation procedures for maintenance
PA0103	Select tools and testing equipment
PA0104	Lock out or isolate the cables, cable inter-connections, smart boxes, PV junction/string boxes, string diodes, connectors and fuses or system (if necessary)

(d) Applied Knowledge that underpins the Practical Skill

APPLIED KNOWLDEGE CODE	**APPLIED KNOWLEDGE**
AK0101	Maintenance schedules, documentation, diagrams
AK0102	Lock out or isolation procedures
AK0103	Safety aspects including PPE
AK0104	Types and functions of tools and maintenance equipment
AK0105	Manufacturer‟s specifications and guarantees

(e) Internal Assessment Criteria (IAC)

IAC CODE	**IAC DESCRIPTION**
IAC0101	Authorisation procedures are implemented to perform scheduled maintenance
IAC0102	A range of maintenance schedules, documentation etc is used to plan scheduled maintenance

PM-05-PS02: Test, troubleshoot and diagnose problems on cables, cable inter-connections, smart boxes, PV junction/string boxes, string diodes, connectors and fuses
PRACTICAL SKILL ACTIVITY SCOPE OUTLINE
Given testing equipment, cables, cable inter-connections, smart boxes, PV junction/string boxes, string diodes, connectors and fuses, the learner must be able to:

PRACTICAL SKILL ACTIVITY ELEMENT CODES	PRACTICAL SKILL ACTIVITY ELEMENTS
PA0201	Carry out visual inspection of cables, cable inter-connections, smart boxes, PV junction/string boxes, string diodes, connectors and fuses
PA0202	Maintain cables, cable inter-connections, smart boxes, PV junction/string boxes, string diodes, connectors and fuses as per manufacturer‟s requirements
PA0203	Test cables, cable inter-connections, smart boxes, PV junction/string boxes, string diodes, connectors and fuses
PA0204	Diagnose problems on cables, cable inter-connections, smart boxes, PV junction/string boxes, string diodes, connectors and fuses

(d) Applied Knowledge that underpins the Practical Skill

APPLIED KNOWLDEGE CODE	APPLIED KNOWLEDGE
AK0201	Structure and composition of cables, cable inter-connections, smart boxes, PV junction/string boxes, string diodes, connectors and fuses
AK0202	Types of cables, cable inter-connections, smart boxes, PV junction/string boxes, string diodes, connectors and fuses
AK0203	Operating principles of cables, cable inter-connections, smart boxes, PV junction/string boxes, string diodes, connectors and fuses
AK0204	Visual inspection procedures
AK0205	Maintenance procedures for cables, cable inter-connections, smart boxes, PV junction/string boxes, string diodes, connectors and fuses
AK0206	Types of maintenance problems on cables, cable inter-connections, smart boxes, PV junction/string boxes, string diodes, connectors and fuses
AK0207	Telemetry on smart boxes (communication system)
AK0208	Testing and diagnosing procedures
AK0209	Testing diagnosing tools and equipment

(e) Internal Assessment Criteria (IAC)

IAC CODE	IAC DESCRIPTION
IAC0201	Visual inspections are performed on cables, cable inter-connections, smart boxes, PV junction/string boxes, string diodes, connectors and fuses
IAC0202	Cables, cable inter-connections, smart boxes, PV junction/string boxes, string diodes, connectors and fuses are maintained as per manufacturer‟s requirements
IAC0203	Testing tools and equipment are used correctly to carry out a range of tests on cables, cable inter-connections, smart boxes, PV junction/string boxes, string diodes, connectors and fuses (including telemetry on smart boxes
IAC0204	Readings on testing equipment are interpreted correctly
IAC0205	Accurate diagnoses are made
IAC0206	Safety requirements are applied when testing and diagnosing cables, cable inter connections, smart boxes, PV junction/string boxes, string diodes, connectors and fuses

PM-05-PS03: Remove and replace cables, cable inter-connections, smart boxes, PV junction/string boxes, string diodes, connectors and fuses	
PRACTICAL SKILL ACTIVITY SCOPE OUTLINE	
Given tools and equipment and manufacturer‟s specifications, the learner must be able to:	
PRACTICAL SKILL ACTIVITY ELEMENT CODES	**PRACTICAL SKILL ACTIVITY ELEMENTS**
PA0301	Repair faults/problems on switchgear and control gear
PA0302	Replace switchgear and control gear or their components
PA0303	Complete a re-commissioning test on switchgear and control gear
PA0304	Prepare report

(d) Applied Knowledge that underpins the Practical Skill

APPLIED KNOWLDEGE CODE	APPLIED KNOWLEDGE
AK0301	Removal and replacement techniques
AK0302	Techniques to carry out commissioning tests

AK0303	Risks, hazards and safety precautions
AK0304	Cables, cable inter-connections, smart boxes, PV junction/string boxes, string diodes, connectors and fuses maintenance report requirements

(e) Internal Assessment Criteria (IAC)

IAC CODE	IAC DESCRIPTION
IAC0301	Cables, cable inter-connections, smart boxes, PV junction/string boxes, string diodes, connectors and fuses are correctly and safely isolated and locked-out according to isolation and lock-out procedures
IAC0302	Cables, cable inter-connections, smart boxes, PV junction/string boxes, string diodes, connectors, fuses and telemetry components are removed and replaced according to manufacturer specifications
IAC0303	Risks associated with repair/replacement of cables, cable inter-connections, smart boxes, PV junction/string boxes, string diodes, connectors and fuses are correctly identified and safety precautions taken
IAC0304	Correct re-commissioning testing is completed according to standard operating procedure
IAC0305	Report is written on the repair/replacement work

3.2.2. Criteria for accreditation

Add additional line spaces as required. Requirements, against which Skills Development Providers (SDP) and Assessment Centres, will be accredited, as listed below.

Physical Requirements:

SKILLS DEVELOPMENT PROVIDER (SDP)	
EQUIPMENT & TOOLS	PV Cables, cable inter-connections, smart boxes, PV junction/string boxes, string diodes, connectors, fuses and telemetry components, Tools and equipment (including testing equipment), Manufacturer"s specifications
CONSUMABLES	None

ASSESSMENT CENTRE	
EQUIPMENT & TOOLS	N/A
CONSUMABLES	N/A

Human Resource Requirements:

SKILLS DEVELOPMENT PROVIDER (SDP)	
QUALIFICATIONS & EXPERIENCE	NQF Level 5 PV Technician qualification with at least 2 years of experience OR A qualified electrician/millwright with PV related training and 2 years" relevant experience working within a PV environment.
FACILITATOR/LEARNER RATIO	1:12

ASSESSMENT CENTRE	
QUALIFICATIONS & EXPERIENCE	N/A
INVIGILATOR/LEARNER RATIO	N/A

Legal Requirements:

SKILLS DEVELOPMENT PROVIDER (SDP)	
QUALIFICATIONS & EXPERIENCE	Compliance to the relevant occupational health, safety and environmental protection legislation

3.2.4 Exemptions

None

3.4 POSSIBLE SEQUENCING AND INTEGRATION

Listing and order of modules in the sequence in which these modules will follow each other during delivery/implementation. This allows for integration of KM, AM (PM/ WM) as work logically flows.

ORDER	MODULE TITLE	MODULE CODE	LEVEL	CREDITS
1.	Basic Communication Theory	900279-000-00-KM-01	3	3
2.	Professional Skills and Personal Development	111204-003-00-KM-11	5	3
3.	Record-Keeping and Registry Administration Principles and Processes	111204-003-00-KM-07	5	2
4.	Components of PV systems, NQF Level 5, Credits 20	313109-001-00-KM-08	5	20
5.	Maintenance, troubleshooting, fault-finding and repairs to PV systems	313109-001-01-KM-05	5	13
6.	Use tools, measuring instruments and equipment	13109-001-00-PM-03	3	7
7.	Maintain, test, diagnose, repair, and replace inverters in PV systems	313109-002-00-PM-02	5	4
8.	Maintain, test, diagnose and replace batteries in PV systems	313109-002-00-PM-04	5	4
9.	Maintain, test, diagnose and replace cables, cable inter-connections, smart boxes, PV junction/string boxes, string diodes, connectors, and fuses in PV systems	313109-002-00-PM-05	5	4