

MICRO HYDRO POWER PLANT TECHNOLOGY

CBT Curriculum

National Vocational
Certificate Level 4

Version 1 - July 2015



EUROPEAN UNION



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Zusammenarbeit (GIZ) GmbH



Islamic Republic of Pakistan
اسلامی جمہوریہ پاکستان
Islāmī Jumhūrīyeh Pākistān



NAVTC

Published by

National Vocational and Technical Training Commission
Government of Pakistan

Headquarter

Plot 38, Kirthar Road, Sector H-9/4, Islamabad, Pakistan
www.navttc.org

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Layout & design

SAP Communications

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This document has been produced with the technical assistance of the TVET Reform Support Programme, which is funded by the European Union, the Embassy of the Kingdom of the Netherlands, the Federal Republic of Germany and the Royal Norwegian Embassy and has been commissioned by the German Federal Ministry for Economic Cooperation and Development (BMZ). The Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH in close collaboration with the National Vocational and Technical Training Commission (NAVTTTC) as well as provincial Technical Education and Vocational Training Authorities (TEVTAs), Punjab Vocational Training Council (PVTC), Qualification Awarding Bodies (QABs) and private sector organizations.

Document Version

July, 2015

Islamabad, Pakistan

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1. Introduction

Today's 'World of Work' has undergone radical changes. The emergence of new technologies, global markets for products and services, and international competition require economies to upgrade and enhance the skill level of their human resources. Technical and Vocational Education and Training (TVET) systems all over the world are constantly challenged by this question of how to respond to the demand of a knowledge-based economy. As TVET systems and their training programmes directly relate to the world of work in terms of quantity and quality output, the approach of TVET programmes need to focus on the acquisition of technical and non-technical skills, also referred to employability skills.

With the release of the National Skills Strategy 2009-2013 the Pakistan government has made skills development a political priority. The framework for skills development aims to:

- Change TVET education from time-bound, curriculum-based training to flexible, competency-based training;
- Bring about a shift from supply-led training to demand-driven (outcome-based) skills development by promoting the role of industry in designing and delivering TVET.

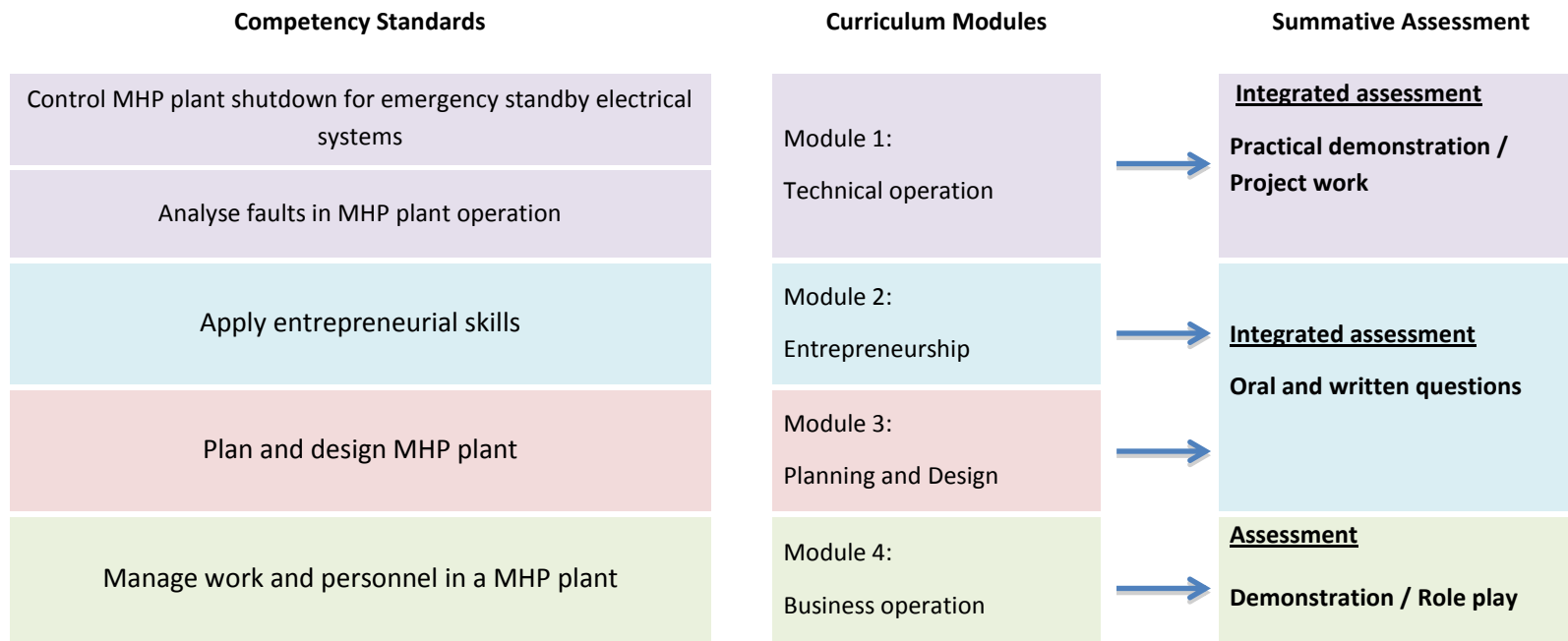
The curriculum for ***Micro Hydel Power Plant operations (Technician) – Level 4*** aims to respond to this demand. It has been developed as an outcome-based course designed to transfer a range of specialised skills needed to perform in a high-performance work environment, as defined by labour market requirements. This programme may also articulate with other training programmes at NVQF level 4 or higher in a number of Electrical, Mechanical and/or Civil construction trade areas. People who wish to go this route are advised to seek Recognition of Prior Learning for their achievements.

1.1 Course objective

The overall objective of this course is to facilitate transferable skills to the trainees necessary to succeed in an ever-changing work environment. The modules delivered through this programme will provide specialised knowledge and skills, required to accomplish a career in MHP operations.

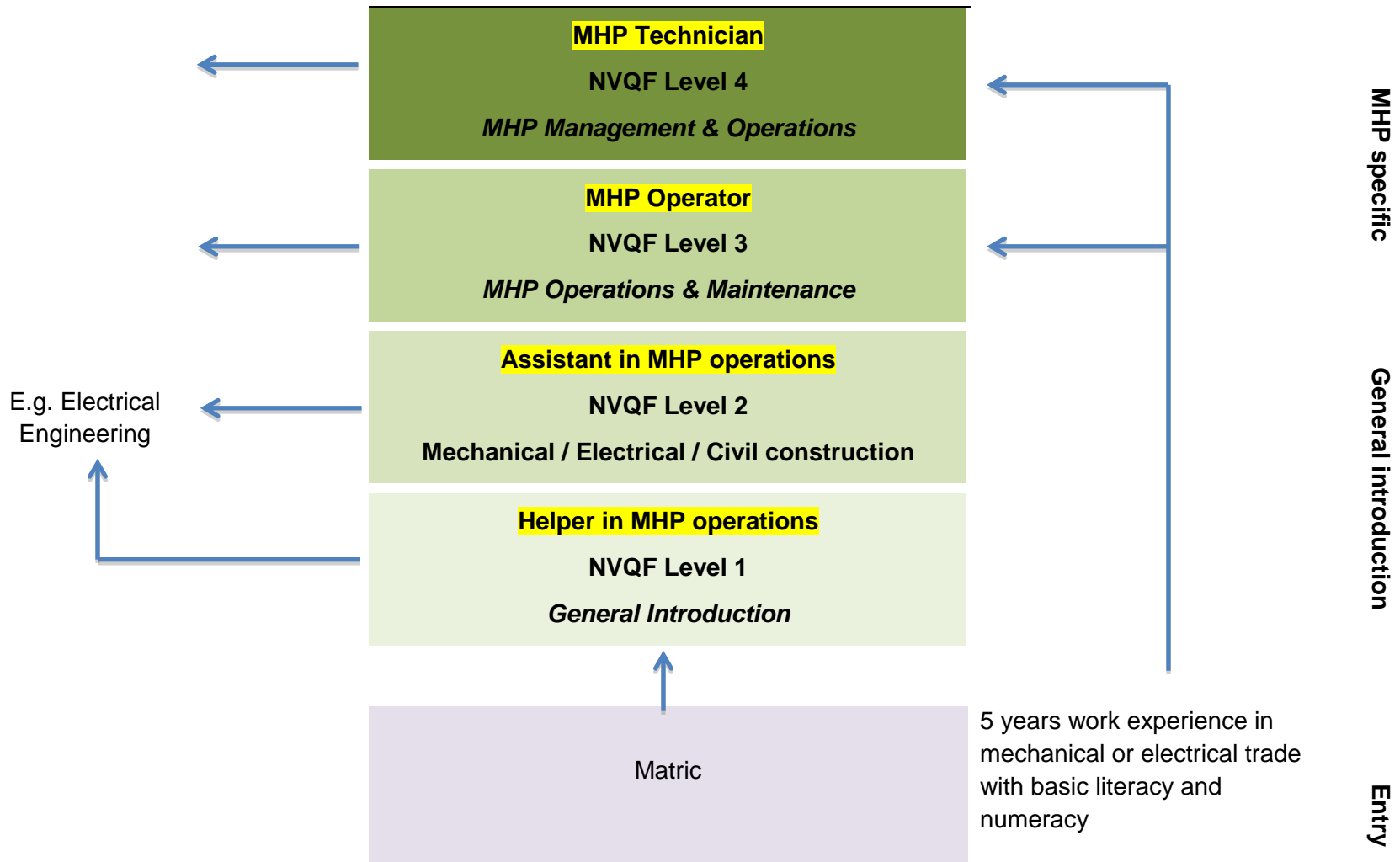
1.2 Course competencies

Curriculum modules (training input) are clusters of competencies expressed in learning units, learning outcomes, and learning elements. After successful completion of this course, the trainee has gained a range of competencies required to progress to the next NVQF level. The framework below reflects industry requirements expressed in competency standards (training output).



1.3 Job opportunities

The level 4 training course related to **MHP operations (Technician)** transfers employment skills and may articulate with a number of other level 4 training programmes. Based on the design and flexible approach qualified trainees will find opportunities to continue their studies in MHP operations or persuade a career in e.g. Electrical, Mechanical or Civil Engineering as shown in the diagram below:



1.4 Trainee entry level

Individuals who wish to enter this course of study have to comply against the following criteria:

- NVQF level 3 qualification in MHP operations, or equivalent;
- Comfort level of English language and mathematics;
- Satisfactory completion of appropriate admission assessment test/interview.

1.5 Trainer requirements

Trainers who wish to offer this programme should meet one of the following requirements:

- B.Sc. Eng. and 2 years of relevant work experience; or
- B-Tech and 4 years of relevant work experience; or
- Diploma Associate Engineer (DAE) and 5 years relevant work experience; or
- Certificate issued by authentic authority/body as Electrician with a minimum of 5 years relevant work experience

Trainers offering this programme must be computer literate and be conversant with the delivery of competency-based education and training (CBET). All legislative requirements applicable to carry out training and assessment, if any, must be complied with.

1.6 Teaching strategies in a competency-based environment

Training in a competency-based environment differs from the traditional method of training delivery. It is based on defined competency standards, which are industry oriented.

The traditional role of the trainer changes and shifts towards the facilitation of training. A facilitator in CBET encourages and assists trainees to learn for themselves. Trainees are likely to work in groups (pairs) and all doing something different. Some are doing practical tasks in the workshop, some writing, some not even in the classroom or workshop but in another part of the building using specialist equipment, working on computers doing research on the Internet or the library. As trainees learn at different pace they might well be at different stages in their learning, thus learning must be tailored to suit individual needs.

The following facilitation methods (teaching strategies) are generally employed in CBET programmes:

- **Direct Instruction Method:** This might be effective when introducing a new topic to a larger group of trainees in a relative short amount of time. In most cases this method relies on one-way communication, hence there are limited opportunities to get feedback on the trainee's understanding.
- **Discussion Method:** This allows trainees to actively participate in sharing knowledge and ideas. It will help the trainer to determine whether trainees understand the content of the topic. On the other hand, there is a possibility of straying off topic under discussion and some trainees dominating others on their views.
- **Small Group Method:** Pairing trainees to help and learn from each other often results in faster knowledge/skill transfer than with the whole class. The physical arrangement of the classroom/workshop and individual assessment may be challenging.
- **Problem Solving Method:** This is a very popular teaching strategy for CBET. Trainees are challenged and are usually highly motivated when they gain new knowledge and skills by solving problems (Contingency skills). Trainees develop critical thinking skills and the ability to adapt to new learning situations (Transfer skills). It might be time consuming and because trainees sometimes work individually, they may not learn all the things that they are expected to learn.
- **Research Method:** This is used for workshops and laboratory tasks, field experiments, and case studies. It encourages trainees to investigate and find answers for themselves and to critically evaluate information. It however requires a lot of time and careful planning of research projects for the trainee.

1.7 Medium of instruction

Instructions will be provided in Urdu, local languages and/or English.

1.8 Sequence and delivery of the modules

The curriculum for **Micro Hydrel Power Plant operations (technician) – NVQF level 4**, consists of four (4) modules and should be delivered in the following sequence:

Module 1: Technical operation

Learning units within this module can be delivered interchangeably as stand-alone module or in a holistic approach

Module 2: Entrepreneurship

Learning units within this module can be delivered interchangeably as stand-alone module or in a holistic approach

Module 3: Planning and Design

Learning units within this module can be delivered interchangeably as stand-alone module or in a holistic approach

Module 4: Business operation

Learning units within this module can be delivered interchangeably as stand-alone module or in a holistic approach

All theoretical content related to the modules should be delivered, where possible, in an applied setting related to the **Micro Hydrel Power Plant operations (Technician) – NVQF level 4** work environments.

2. Overview about the programme: Curriculum for MHP operations (Technician) – NVQF Level 4

Module Title and Aim	Learning Units	Theory ¹ hours	Workplace ² hours	Timeframe of modules
<p><u>Module 1: Technical Operation</u></p> <p>Aim: To provide trainees with the knowledge and skills to safely shutdown an MHP plant for performing fault analysis.</p>	<p>LU-1: Prepare for emergency standby electrical systems.</p> <p>LU-2: Shut down plant for service</p>	50	150	200
<p><u>Module 2: Entrepreneurship</u></p> <p>Aim: To provide trainees with the knowledge and skills to develop entrepreneurial skills for future career.</p>	<p>LU-1: Plan for own business</p> <p>LU-2: Implement financial strategy</p> <p>LU-3: Develop marketing strategies</p>	50	30	80
<p><u>Module 3: Planning and Design</u></p> <p>Aim: To provide trainees with the knowledge and skills to assist in the basic design of MHP plants.</p>	<p>LU-1: Determine head measurement</p> <p>LU-2: Determine power demand and generating power potential</p> <p>LU-3: Prepare procurement process</p>	30	90	120

¹Learning hours in training provider premises

²Training workshop, laboratory and on-the-job workplace

<p><u>Module 4: Business operation</u></p> <p><i>Aim:</i> To provide trainees with the knowledge and skills to safely carry out corrective maintenance work required in MHP operations.</p>	<p>LU-1: Convey messages to staff</p> <p>LU-2: Enhance team effectiveness</p>	<p>30</p>	<p>20</p>	<p>50</p>
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3. Curriculum Contents: *Micro Hydel Power Plant operations (Technician) – NVQF level 4*

Module 1:	Technical Operations				
Objective of the Module:	On completion of this module the trainee will be able to demonstrate knowledge and skills according to the following competencies standards: <ul style="list-style-type: none"> • C: Control MHP plant shutdown for emergency standby electrical systems • D: Analyse faults in MHP operations 				
Duration:	Total: 200 hours	Theory: 50 hours	Practice: 150 hours		
Learning Unit	Learning Outcomes	Learning Elements	Duration (Hours)	Materials Required	Learning Place
LU-1: Prepare for emergency standby electrical systems <i>This learning unit addresses competency standard(s): C – C1* D – D1*</i> <i>* In absence of a national coding system, internal training provider codes are being used</i>	1.1 Demonstrate safe workplace practices	<ul style="list-style-type: none"> • Hazard identification • Safety signs, barricades and symbols • Isolation and lockout • Earthing methods • PPE • Manual handling • First aid procedures • Evacuation procedures • Fire safety, fire fighting procedures • Storage and stocking of tools and equipment 	Total 90 Theory 20 Practical 70	<ul style="list-style-type: none"> • Fire extinguisher • Fire blanket • Fire bucket • Safety signage • Personal protective equipment and clothing • Hand tools • Hand-held powered tools • Measuring and calibration tools and equipment • Teaching aids • Flip charts • Technical drawing equipment • Computer <i>(preferably with internet access)</i> 	<ul style="list-style-type: none"> • Classroom • Workplace
	1.2 Plan work activities	Drawings and symbol specifications <ul style="list-style-type: none"> • Sketches • Engineering drawings <ul style="list-style-type: none"> - line types - projection techniques 			

		<ul style="list-style-type: none">- dimensions- sections- symbols• Use and calibration of tools and equipment<ul style="list-style-type: none">- hand tools- hand-held powered tools- measuring instruments			
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Learning Unit	Learning Outcomes	Learning Elements	Duration (Hours)	Materials Required	Learning Place
LU-2: Shut down plant for service <i>This learning unit addresses competency standard(s): C – C2/3/4* D – D2/3/4*</i> <i>* In absence of a national coding system, internal training provider codes are being used</i>	2.1 Demonstrate procedures for shutdown and isolating standby electrical system	<ul style="list-style-type: none"> • Safety and regulatory requirements • Hazard identification • Procedures for pre-condition and shutdown • Procedures for isolating system • Documentation <ul style="list-style-type: none"> - Shutdown - Isolation 	Total 110 Theory 30 Practical 80	<ul style="list-style-type: none"> • Fire extinguisher • Fire blanket • Fire bucket • Safety signage • Personal protective equipment and clothing • Hand tools • Hand-held powered tools • Teaching aids • Flip charts • Technical drawing equipment • Computer <i>(preferably with internet access)</i> 	<ul style="list-style-type: none"> • Classroom • Workplace
	2.2 Demonstrate diagnostic procedure of plant and equipment	<ul style="list-style-type: none"> • Diagnostic procedures <ul style="list-style-type: none"> - Operational response - Corrective actions - Fault isolation and identification ➤ problem solving process ➤ energy conversion process ➤ application / interrelation of mechanical / electrical plant components ➤ function of instrumentation process • Service requirements <ul style="list-style-type: none"> - Actions to rectify faults • Document results 			

	2.3 Demonstrate procedures for re-starting plant	<ul style="list-style-type: none">• Start up procedures• Monitoring plant condition<ul style="list-style-type: none">- Check output value against requirements- Document results• Finalise reporting			
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Module 2:	Entrepreneurship				
Objective of the Module:	On completion of this module the trainee will be able to demonstrate the following competencies according to industry standards and/or requirements: <ul style="list-style-type: none"> • A: Apply entrepreneurial skills 				
Duration:	Total: 80 hours	Theory: 50 hours	Practice: 30 hours		
Learning Unit	Learning Outcomes	Learning Elements	Duration (Hours)	Materials Required	Learning Place
LU-1: Plan for own business <i>This learning unit addresses competency standard(s): A – A1/2*</i> <i>* In absence of a national coding system, internal training provider codes are being used</i>	1.1 Identify the importance of entrepreneurship	<ul style="list-style-type: none"> • History of entrepreneurship • Types of verbal and non-verbal messages 	Total 20 Theory 10 Practical 10	<ul style="list-style-type: none"> • Stationary • Relevant Book • Steel Scale • Pencil • Eraser • Pointers • Highlighter 	<ul style="list-style-type: none"> • Classroom • Workplace
	1.2 Identify challenges of being an entrepreneur	<ul style="list-style-type: none"> • Nature of challenges • Benefits of becoming an entrepreneur 			
	1.3 Confirm and implement strategies for improving personal entrepreneurship qualities	<ul style="list-style-type: none"> • Features of personal entrepreneurial assessment tools 			
	1.4(a) Explore business opportunities 1.4(b) Select and secure business premises	<ul style="list-style-type: none"> • Site selection • Business premises requirements • Size, Location, Cost, estimated generation capacity 			
	1.5 Secure business operating clearance	<ul style="list-style-type: none"> • Municipal guidelines and regulations • NOC's from local authorities 			

	1.6 Secure business support service (technical and financial assistance)	<ul style="list-style-type: none">• Application procedures<ul style="list-style-type: none">- loans- donations- grants- different schemes			
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Learning Unit	Learning Outcomes	Learning Elements	Duration (Hours)	Materials Required	Learning Place
<p>LU-2: Implement financial strategy</p> <p><i>This learning unit addresses competency standard(s): A – A3/5*</i></p> <p><i>* In absence of a national coding system, internal training provider codes are being used</i></p>	2.1 Estimate total cost of set up	<ul style="list-style-type: none"> • Estimation and calculation 	<p>Total 30</p> <p>Theory 20</p> <p>Practical 10</p>	<ul style="list-style-type: none"> • Stationary • Relevant Book • Steel Scale • Pencil • Eraser • Pointers • Highlighter • Calculator • Computer with internet connection • Relevant software 	<ul style="list-style-type: none"> • Classroom • Workplace
	2.2 Identify sources of funding and estimate business expenses	<ul style="list-style-type: none"> • Conditions for funding • Basic accounting principles 			
	2.3 Project profit and loss and cash flow	<ul style="list-style-type: none"> • Basic accounting principles 			
	2.4 Establish and follow bank requirements	<ul style="list-style-type: none"> • General bank requirements 			
	2.5 Implement financial control system	<ul style="list-style-type: none"> • Basic financial concepts 			
	2.6 Prepare financial statements and interpret results	<ul style="list-style-type: none"> • Basic financial concepts 			
	2.7 Prepare and implement periodic plans and budgets	<ul style="list-style-type: none"> • Basic financial concepts 			
	2.8 Maintain business cash and general liquidity	<ul style="list-style-type: none"> • Basic financial concepts 			

Learning Unit	Learning Outcomes	Learning Elements	Duration (Hours)	Materials Required	Learning Place
LU-3: Develop marketing strategies <i>This learning unit addresses competency standard(s): A – A4*</i> <i>* In absence of a national coding system, internal training provider codes are being used</i>	3.1 Identify potential profitable opportunities and target markets	<ul style="list-style-type: none"> Marketing research tools 	Total 30 Theory 20 Practical 10	<ul style="list-style-type: none"> Stationary Relevant Book Steel Scale Pencil Eraser Pointers Highlighter 	<ul style="list-style-type: none"> Classroom Workplace
	3.2 Plan service and product supply	<ul style="list-style-type: none"> Customer expectations and satisfaction 			
	3.3 Identify competitors operating in the industry	<ul style="list-style-type: none"> Principles of a competitive market 			
	3.4 Plan methods of promotion	<ul style="list-style-type: none"> Basic promotional and/or marketing concepts 			

Module 3:	Planning and Design				
Objective of the Module:	On completion of this module the trainee will be able to demonstrate the following competencies according to industry standards and/or requirements: <ul style="list-style-type: none"> E: Plan and design MHP plant 				
Duration:	Total: 120 hours	Theory: 30 hours	Practice: 90 hours		
Learning Unit	Learning Outcomes	Learning Elements	Duration (Hours)	Materials Required	Learning Place
LU-1: Determine head measurement <i>This learning unit addresses competency standard(s): E – E1*</i> <i>* In absence of a national coding system, internal training provider codes are being used</i>	1.1 Demonstrate site assessment procedures	Site data collection <ul style="list-style-type: none"> Basic head measurements Basic flow measurements Data recording after measurements 	Total 40 Theory 10 Practical 30	<ul style="list-style-type: none"> Stationary Relevant Book Steel Scale Pencil Eraser Pointers Highlighter Calculator 	<ul style="list-style-type: none"> Classroom Workplace
	1.2 Demonstrate calculating procedures for basic flow measurements				
	1.3 Collect relevant data for planning MHP plant				

Learning Unit	Learning Outcomes	Learning Elements	Duration (Hours)	Materials Required	Learning Place
<p>LU-2: Determine power demand and generating power potential</p> <p><i>This learning unit addresses competency standard(s): E – E2*</i></p> <p><i>* In absence of a national coding system, internal training provider codes are being used</i></p>	2.1 Demonstrate procedures for calculating electrical power	Calculation and estimates <ul style="list-style-type: none"> • Power calculation • Demand estimates for community • Use of electricity in community • Tariff calculations 	<p>Total 40</p> <p>Theory 10</p> <p>Practical 30</p>	<ul style="list-style-type: none"> • Stationary • Relevant Book • Steel Scale • Pencil • Eraser • Pointers • Highlighter • Calculator 	<ul style="list-style-type: none"> • Classroom • Workplace
	2.2 Demonstrate procedures for estimating the electricity demand of the community	<ul style="list-style-type: none"> • Demand estimates for community 			
	2.3 Demonstrate procedures for determining productive end-use of electricity	<ul style="list-style-type: none"> • Productive end-use in community • Line losses • Energy conservation methods 			
	2.4 Demonstrate procedures for calculating basic tariffs	<ul style="list-style-type: none"> • Basic tariffs calculation • Match power demand and hydropower potential 			

Learning Unit	Learning Outcomes	Learning Elements	Duration (Hours)	Materials Required	Learning Place
LU-3: Prepare procurement process <i>This learning unit addresses competency standard(s): E – E3/4*</i> <i>* In absence of a national coding system, internal training provider codes are being used</i>	3.1 Demonstrate procedures for dimensioning civil construction structure	<ul style="list-style-type: none"> • Basic MHP analysis and design • Civil construction structure 	Total 40 Theory 10 Practical 30	<ul style="list-style-type: none"> • Stationary • Relevant Book • Steel Scale • Pencil • Eraser • Pointers • Highlighter • Calculator 	<ul style="list-style-type: none"> • Classroom • Workplace
	3.2 Demonstrate procedures for estimating initial cost	<ul style="list-style-type: none"> • Cost estimations 			
	3.3 Identify procurement requirements for mechanical and electrical equipment	<ul style="list-style-type: none"> • Specification and application range of MHP equipment • Generator/Alternator • Turbine • Control system • Distribution network 			
	3.4 Carry out procedures for distribution network layout	<ul style="list-style-type: none"> • Design of LV community grid 			

Module 4:	Business Operation				
Objective of the Module:	On completion of this module the trainee will be able to demonstrate the following competencies according to industry standards and/or requirements: <ul style="list-style-type: none"> • B: Manage work and personnel in a MHP plant 				
Duration:	Total: 50 hours	Theory: 30 hours	Practice: 20 hours		
Learning Unit	Learning Outcomes	Learning Elements	Duration (Hours)	Materials Required	Learning Place
LU-1: Communicate with staff <i>This learning unit addresses competency standard(s): B – B1/2*</i> <i>* In absence of a national coding system, internal training provider codes are being used</i>	1.1 Demonstrate procedures for staff induction	<ul style="list-style-type: none"> • SOP's for induction of staff - Operational and safety procedures and policies - MHP design and structure - Technical operation requirements 	Total 20 Theory 10 Practical 10	<ul style="list-style-type: none"> • Stationary • Relevant Book • Steel Scale • Pencil • Eraser • Pointers • Highlighter • Calculator 	<ul style="list-style-type: none"> • Classroom • Workplace
	1.2 Demonstrate procedures for effectively conveying messages, information and instruction	<ul style="list-style-type: none"> • Means of communication • Roles and responsibilities of employees • Time and quality requirements • Follow up on conveyed messages, information and instructions 			

Learning Unit	Learning Outcomes	Learning Elements	Duration (Hours)	Materials Required	Learning Place
LU-2: Enhance team effectiveness <i>This learning unit addresses competency standard(s): B – B3/4*</i> <i>* In absence of a national coding system, internal training provider codes are being used</i>	2.1 Demonstrate procedures for maintaining conducive workplace environment	<ul style="list-style-type: none"> • Methods for motivation • Performance appraisal • Corrective actions according to need 	Total 30 Theory 20 Practical 10	<ul style="list-style-type: none"> • Stationary • Relevant Book • Steel Scale • Pencil • Eraser • Pointers • Highlighter • Calculator 	<ul style="list-style-type: none"> • Classroom • Workplace
	2.2 Demonstrate procedures for monitoring performance of employees and teams	<ul style="list-style-type: none"> - employee of the year - bonus - special increments - shields / certificates • Feedback • Identification of development needs 			
	2.3 Implement methods for effective teamwork	<ul style="list-style-type: none"> • Analyze feedback received from individual or team • Analyse problems or backlogs • Apply problem solving methods in collaboration with others 			

4. Assessment Guidance

Competency-based assessment is the process of gathering evidences to confirm the candidate's ability to perform according to specified outcomes articulated in the competency standard(s).

4.1 Types of Assessment

a) Sessional assessment

The goal of sessional assessment is to monitor student progress in order to provide constant feedback. This feedback can be used by the trainers to improve their teaching and by learners to improve their learning.

More specifically, sessional assessments help learners to identify their strengths and weaknesses and help trainers to recognize where learners are struggling and address problems immediately

Examples of sessional assessments include:

- Observations
- Presentations
- Activity sheets
- Project work
- Oral questions

b) Summative (final) assessment

The goal of summative (final) assessment is to evaluate learning progress at the end of a training programme by comparing it against, e.g. set of competency standards.

Examples of summative assessments include:

- Direct observation of work activities
- Final project
- Written questions

4.2 Principles of assessment

When conducting assessment or developing assessment tools, trainers/assessors need to ensure that the following principles of assessment are met:

Validity

- Indicates if the assessment outcome is supported by evidence. The assessment outcome is valid if the assessment methods and materials reflect the critical aspects of evidence required by the competency standards (Competency units, performance criteria, knowledge and understanding).

Reliability

- Indicates the level of consistency and accuracy of the assessment outcomes. The assessment is reliable if the assessment outcome will produce the same result for learners with equal competence at different times or places, regardless of the trainer or assessor conducting the assessment.

Flexibility

- Indicates the opportunity for learners to discuss certain aspects of their assessment with their trainer or assessor, such as scheduling the assessment. All learners should be made aware of the purpose of assessment, the assessment criteria, the methods and tools used, and the context and proposed timing of the assessment well in advance. This can be achieved by drawing up a plan for assessment.

Fair Assessment

- Fair assessment does not advantage or disadvantage particular learners because of status, race, beliefs, culture and/or gender. This also means that assessment methods may need to be adjusted for learners with disabilities or cultural differences. An assessment should not place unnecessary demands on learners that may prevent them from demonstrating competence.

4.3 Assessment Template – Sessional and Summative Assessment

Module 1: Technical Operation

Learning Units	Recommended form of assessment	
	Sessional	Summative
<p>LU-1: Prepare for emergency standby</p> <p><i>This learning unit addresses competency standard(s):</i> C – C1*; D – D1*</p> <p><i>* In absence of a national coding system, internal training provider codes are being used</i></p>	<ul style="list-style-type: none"> • Observation • Activity sheets • Simulation • Oral and written questions • Demonstration 	<p><u>Integrated Assessment:</u></p> <p>Practical demonstration/ Project work emergency standby and plant shut down</p>
<p>LU-2: Shut down plant for service</p> <p><i>This learning unit addresses competency standard(s):</i> C – C2/3/4*; D – D2/3/4*</p> <p><i>* In absence of a national coding system, internal training provider codes are being used</i></p>		<p>The assessment tasks have to include aspects of health and safety, use of tools, knowledge of MHP components, and documentation</p>

Module 2: Entrepreneurship

Learning Units	Recommended form of Assessment	
	Sessional	Summative
<p>LU-1: Plan for own business</p> <p><i>This learning unit addresses competency standard(s):</i> A – A1/2*</p> <p><i>* In absence of a national coding system, internal training provider codes are being used</i></p>	<ul style="list-style-type: none"> • Observation • Activity sheets • Role play • Oral and written questions 	<p>Oral and written questions</p> <p>It is recommended to assess Module 2 in conjunction with Module 3</p>
<p>LU-2: Implement financial strategy</p> <p><i>This learning unit addresses competency standard(s):</i> A – A3/5*</p> <p><i>* In absence of a national coding system, internal training provider codes are being used</i></p>		
<p>LU-3: Develop marketing strategies</p> <p><i>This learning unit addresses competency standard(s):</i> A – A4*</p> <p><i>* In absence of a national coding system, internal training provider codes are being used</i></p>		

Module 3: Planning and Design

Learning Units	Recommended form of Assessment	
	Sessional	Summative
<p>LU-1: Determine head measurement</p> <p><i>This learning unit addresses competency standard(s):</i> E – E1*</p> <p><i>* In absence of a national coding system, internal training provider codes are being used</i></p>	<ul style="list-style-type: none"> • Observation • Activity sheets • Role play • Oral and written questions 	<p>Oral and written questions</p> <p>It is recommended to assess Module 2 in conjunction with Module 3</p>
<p>LU-2: Determine power demand and generating power potential</p> <p><i>This learning unit addresses competency standard(s):</i> E – E2*</p> <p><i>* In absence of a national coding system, internal training provider codes are being used</i></p>		
<p>LU-3: Prepare procurement process</p> <p><i>This learning unit addresses competency standard(s):</i> E – E3/4*</p> <p><i>* In absence of a national coding system, internal training provider codes are being used</i></p>		

Module 4: Business Operation

Learning Units	Recommended form of Assessment	
	Sessional	Summative
<p>LU-1: Convey messages to staff</p> <p><i>This learning unit addresses competency standard(s):</i> B – B1/2*</p> <p><i>* In absence of a national coding system, internal training provider codes are being used</i></p>	<ul style="list-style-type: none"> • Observation • Activity sheets • Role play • Oral and written questions 	Practical demonstration/ Role play on business operations
<p>LU-2: Enhance team effectiveness</p> <p><i>This learning unit addresses competency standard(s):</i> B – B3/4*</p> <p><i>* In absence of a national coding system, internal training provider codes are being used</i></p>		

5. List of Tools, Machinery & Equipment

Occupational title		Micro Hydro Power operations (Technician) – Level 4	
Duration		6 months	
Sr. No.	Name of Item/ Equipment / Tools		Quantity
Mechanical			
1.	7 pieces screwdriver set		
2.	Adjustable wrench set		
3.	Allen Keys Set		
4.	Aluminum Spirit Level (leveling instrument)		
5.	Bastard File with wood handle (Flat)		
6.	Bastard File with wood handle (Round)		
7.	Bench Vice		
8.	Bench Workstation		
9.	Chisel		
10.	Clamp Meter		
11.	Claw hammer with wood handle		
12.	Combination Pliers		
13.	Crimping Tool		
14.	Hack Saw with Blades		
15.	Hand Drill [1/8" – 1/8"]		
16.	Hand Grease Gun		

17.	Hand Grinding Machine	
18.	Hot Air Blower	
19.	Measuring tape	
20.	Micro Meter [Screw Gauge]	
21.	Nose Plier	
22.	Oil Can	
23.	Pedestal Drill	
24.	Pen Grinder	
25.	Pipe Wrench [18" & 24"]	
26.	Portable Welding Plant [100 – 300 Amperes]	
27.	Puller	
28.	Punch Set	
29.	Retched Block with Grip	
30.	Screw Driver Set (-)[6"-18"]	
31.	Screw Driver Set (+) [6"-18"]	
32.	Side Cutting Plier	
33.	Spanner Set (Open)	
34.	Spanner Set (Ring)	
35.	Stainless Steel Slogging Ring Spanner	
36.	Thread Gauge	
37.	Tong/Monkey Plier	
38.	Vernier Calliper	

39.	Wheel Grinder	
40.	Wire Gauge	
41.	Welding Plant	
Electrical		
1.	Clamp Meter	
2.	Combination Plier	
3.	Earth Tester	
4.	Line Tester	
5.	Megger	
6.	Multi Meter	
7.	Nose Plier	
8.	Pin Plier	
9.	Screw Driver Set	
10.	Side Cutter	
Safety Tools		
1.	Fire Extinguisher	
2.	First Aid Box	
3.	Hand Gloves	
4.	Hard top Hat	
5.	Mask	
6.	Overall combination [Dress]	
7.	Safety Belt	

8.	Safety Goggles	
9.	Steel Toe Shoes	
EQUIPMENT		
Civil		
1.	Air Vent Pipe	
2.	Bell Mouth	
3.	Control Gates	
4.	Control Valves	
5.	Expansion Joint	
6.	Flanges	
7.	Flushing Gates	
8.	Flushing Pipe	
9.	Penstock	
10.	Reducer	
11.	Rubber Seal	
12.	Trash Rack	
Electrical		
1.	Ballast Tank with Heaters	
2.	Binding wire	
3.	Cable Shoe	
4.	Channel Iron	
5.	Conductors	

6.	D-Iron Set	
7.	Disc Insulator [With Tension Set]	
8.	Earth Wire	
9.	Earthing Plate	
10.	Electrical Panels	
11.	Electronic Load Controller	
12.	Energy Meter	
13.	Generator[Brushed and Brush-less]	
14.	Metal Clad Main Switch	
15.	Pin Insulator	
16.	Pole	
17.	Power Cable	
18.	Pressure Transducer	
19.	Shackle Insulator	
20.	Stay Insulator	
21.	Stay Plate	
22.	Stay Rod	
23.	Stay Wire	
24.	Thimble	
25.	Transformer	
26.	Turn Buckle	
27.	Ultra Sonic Flow Meter	

Mechanical		
1.	Angle Iron [Cross Arm]	
2.	Butterfly Valve	
3.	Coupling [Flexible/Rigid]	
4.	Crossflow Turbine	
5.	Flat Belt	
6.	Flat Pulleys	
7.	Fly Wheel	
8.	Francis Turbine	
9.	Gate Valve	
10.	Gear Box	
11.	Governor	
12.	Hydraulic Jack	
13.	Operating Rod	
14.	Pelton Turbine	
15.	Propeller/Kaplan Turbine	
16.	Single Phase Variac [Auto Transformer]	
17.	Tachometer	
18.	V Belt	
19.	V-Pulleys	

6. List of Consumable Supplies

Occupational title	Micro Hydro Power operations (Technician) – Level 4	
Duration	6 months	
Sr. No.	Name of Consumable Supplies	Quantity
1.	Notepad	
2.	Ball pens	
3.	Pencils	
4.	Erasers	
5.	Sharpener	
6.	White board markers in different colours	
7.	Stapler	
8.	Paper punch	
9.	Ruler	
10.	Compass	


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