



# INDUSTRIAL ELECTRICIAN CURRICULUM (LEVEL – 2/ G - II)

British Council “Skills for Employability Project”

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## Definition of Terms

### Assessment Criteria

The specification of the expected performance demonstrated by the student or earner at the conclusion of the learning experiences in a particular module or course. It is used to assess the necessary knowledge, skills and attitudes, reflecting the performance standard in the relevant industry or competency standards.

### Assessment method

Assessment methods may include observation, simulation, questioning, presentation/ demonstration and written assessment. The various methods or techniques used to gather evidence of sufficiency and quality in which to make a sound judgment on the competency student or learner

### Basic Competency

Basic competency is a cluster of related skills, knowledge and attitudes that is simple and fundamental in most jobs, occupation or responsibility in the same level of qualifications and that is expected of the individual in the world of work. For instance, all skilled workers are expected to “perform mensuration and calculation” or to “observe safety rules and practices”; or similarly, a technician is expected to “lead a team” or “prepare the scope of work” responsibilities

### Certification of Competency

This is the culmination of the CBT process in which the student or trainee is awarded a certificate on the level of competency that is usually based on a National Qualification Standard. For instance, after completion of a CBT course and the corresponding assessment conducted by a duly accredited assessor or assessment agency, a National or Federal Certificate of the student’s or candidate’s competency ( e.g.: Electrician – Federal Certificate II) is awarded if has the competency of a skilled Electrician.

### Common Competency

Common competency is a cluster of related skills, knowledge and attitudes that is similarly done across a cluster of jobs in a particular trade or occupation in the same level of qualifications that is expected of the individual in the world of work. While a basic competency is similarly required in most jobs, a common competency is usually restricted in one cluster of occupations. For instance, common competencies in measurements in the area of construction are essentially different from that of mechanical trades, or electronics.



## Competency

Competency is a cluster of related skills, knowledge and attitudes that forms part of one's job or occupation that correlates with and measured by the performance standards set by industry, and that can be developed and improved through training and development. Competency is based on performance of tasks identified by experts in the given occupation.

## Competency-Based Curriculum (CBC)

A competency-based curriculum is a framework or guide in the form of a **course design** for a particular field or occupation and a series of **modules** of instruction that are based on competency standards, with corresponding learning outcomes, assessment criteria, contents, conditions and methodologies of instruction, and assessment method. The competency-based curriculum specifies outcomes, which are consistent with the requirements of the workplace as agreed through the industry or community consultations. *Where competency standard do not exist, curriculum developers need to clearly identify workplace standards and requirements as a basis to identify the outcomes of the competency-based curriculum.*

## Competency-Based Training (CBT)

A training system that organizes instruction based on competency standards and evaluates how well the student performs after instruction according to a set of performance standard. It refers to a systematic approach to organizing instruction that focuses on defining in measurable terms what students are to learn and then evaluating how well they can perform designated tasks after instruction.

## Competency-based Technical Education and Vocational Training (CBTVET)

CBTVET or the application of CBT in TVET is a systematic approach in organizing and providing instruction in measurable terms what the student has to learn in a particular technical or professional skill, trade or occupation, and then evaluating how well the student perform/demonstrate the knowledge or skills that were taught. Performance in terms of technical knowledge and skills by various means is made to determine the mastery or level of competency.

## Competency Standard

The description of what individuals do in the workplace at various levels and the standard set by the workplace or the industry; defines or specifies how well the worker or trainee should perform a job or function. Likewise, it identifies the characteristics possessed by people that enable them to be either assessed or judged competent in a particular job or occupation.

## Course design



This is a major element of the CBC that defines the title of the course and its description, qualification level and units of competency, course outcomes, course structure and competency analysis, assessment and instructional delivery, and the list of resources and qualifications of instructors.

### **Course Title**

This refers to the title or name of the course design of a particular technology, industry, or occupation, reflecting employment needs as outlined in the competency standard.

### **Core Competency**

Core competencies are the main group of skills, knowledge and attitudes that are unique for a particular trade, occupation or technology. These are competencies that are used only on a particular trade, occupation or technology; or allied trades using similar material, such as wood technology or metal technology.

### **Curriculum**

In general, curriculum is a set of courses organized and offered by an educational institution with the purpose of attaining a set of learning objectives or goals or learning a set of knowledge, skills, and attitudes within a specified period. For instance, a TVET curriculum is a course or set of courses on a particular technical field, trade or occupation (e.g. automotive technology; civil or construction technology; electrical technology, or mechanical technology) for the purpose of preparing an individual for employment or promotion on the job.

### **Curriculum Development Team**

This is a group of people representing industry, curriculum developers and teachers or trainers experienced in the field/industry organized to develop a curriculum. The team may work as a group or assign each member a part to accomplish at their own phase and time until the curriculum is completed.

### **DACUM**

It simply means developing a curriculum. A method of occupational (or task) analysis, where occupational experts in a particular trade or technology come to a workshop led by a trained facilitator, to provide input on the specific tasks, knowledge and skills required to perform them.

### **Entry Requirements**

This is a list of requirements that the student must possess to be allowed to participate or attend the teaching-learning session of a particular module of instruction. It is distinct from the institutional requirements that are required of the student upon admission to the school.



## Industry

In this Manual, the term industry is used generally to include all the sectors of the economy or the community such as manufacturing firms, service shops, business establishments, government agencies, and NGOs that employs the mid-level technical manpower that are trained by TVET institutions as well as colleges and universities and other training institutions.

## Learning Conditions

The requirements under which the teaching-learning process and assessment will be performed. These may include a list of tools, equipment and materials, training facilities, learning resources such as books, manuals, multi-media and other resources. It also specifies the scope or range of the equipment and facilities to be assessed.

## Learning Outcomes

These are competencies (technical knowledge, skills and attitudes) learned or acquired by the student or trainee on a particular module, course, or curriculum. They are expected competencies developed under a particular unit or module of instruction.

## Module Contents

These are specific knowledge, skills and attitudes or learning experiences that are covered to be address expected learning outcomes.

## Module Description

This is a statement that describes what the module is all about, its scope and delimitation.

## Module Duration

This refers to the estimated or suggested length of time (in hours) spent teaching learning a particular module.

## Module (of Training)

Also known as *module of instruction*, it refers to the other element of the CBC that defines how the competency or elements of the competency is organized for instructional purposes based on a set of competency standards.

## Module Title

This refers to the competency or elements of the competency that is developed into a module or unit of instruction or training.



## National Qualification Framework

A structure of well defined and nationally accredited or recognized qualifications which are awarded in predetermined levels. It also refers to the structure or path through which formal, non-formal and informal education and training are all recognized and credited towards a particular qualification.

## Qualification

A set or package of standards considered to be worthy of recognition in a certificate issued by a duly recognized institution. It also refers to the possession or accomplishment of acquiring certain skills, knowledge and attitudes or experiences that are considered worthy and essential for entry, promotion or upgrading on the job.

## Semi-Skilled

This refers to the basic level of competency that are mostly routine, predictable, and uncomplicated tasks. Because of his basic level competency, the semi-skilled person usually needs somebody to oversee and direct his work activities. With diligence, hard-work and willingness to learn on-the-job, a semi-skilled person especially a graduate of at least one-year TVET program, can easily advance to the level of a skilled person.

## Skilled

This is the term for a highly trained or experienced person whose competency in a particular occupation or trade is carried out in a significant and broad scope in various context. A skilled person performs some tasks that are complex or that has some autonomy and individual responsibility and that often requires cooperation with other people in the work environment.



# Competency-Based TVET System

## A. Definition of the Competency Based TVET System

As defined earlier, Competency-Based TVET or the application of CBT in TVET sector is a systematic approach in organizing and providing instruction to develop technical knowledge, skills and attitudes based on industry or competency standards, and then evaluating how well the student demonstrate the knowledge or skills that were taught. The student's ability to demonstrate the technical knowledge and skills determines the mastery or level of competency.

As a system, Competency-based TVET (CBTVET) is a complex undertaking from National policy-making to the institutional level implementation of training, assessment, and awarding of appropriate National-level certification of competency. The system starts with the formulation of a National policy to standardized technical qualifications, and correspondingly based from a national standard of competency in various technological occupation. With the on set of globalization and the fast emerging knowledge-based economy coming-up, the competency-based TVET system has become a powerful training strategy for the country.

## B. The Elements of a Competency Based TVET System

The CBTVET system includes six (6) major elements, and each of these elements has to be undertaken and established to serve as the framework of implementation. These elements include the following:

- a) Establishing National Qualification Framework (NQF) for TVET;
- b) Developing competency standards;
- c) Developing competency-based curriculum;
- d) Developing modules of instruction;
- e) Implementing CBT in TVET institutions;
- f) Assessing the learning outcome, and
- g) Awarding appropriate level of Certification.

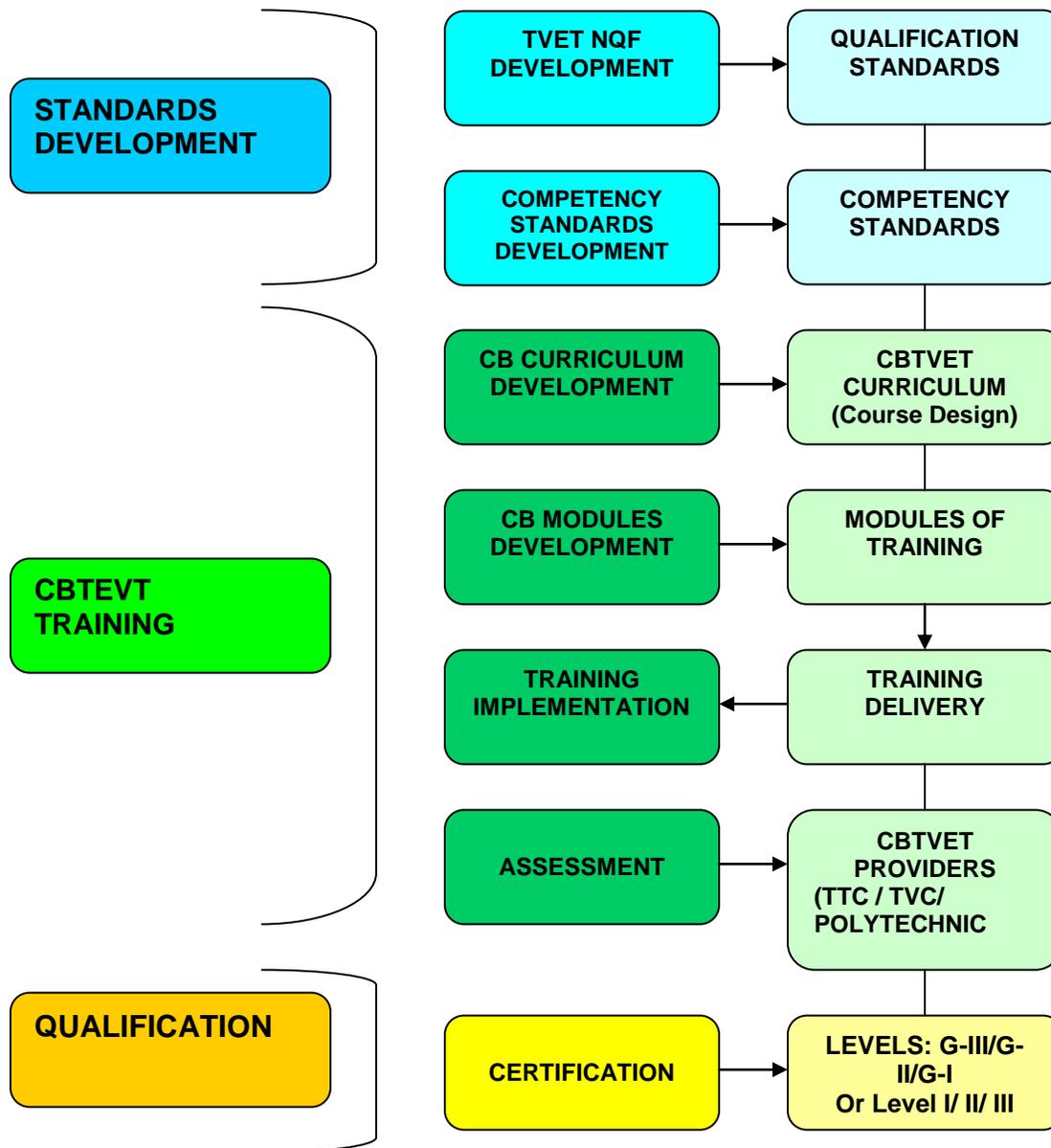
The first three elements are ideally undertaken at the National level since they serve as the bases for the country's policy on the classification and leveling of technical qualifications in the country. The technical or professional qualifications are standardized at the national level to ensure uniformity, stability and integrity of the standard. Likewise, national competency standard is imperative for all technical and professional qualifications to ensure the same characteristics and quality assurance in the country.

Similarly, the development of the CBT curriculum is undertaken at the National level to insure uniformity and common standard of coverage and quality assurance. Together with the curriculum are training regulations in the form of required hours of training; admission



standards; instructional facilities required; suggested approach and methodology of instruction; assessment and certification.

Figure 1 above is a conceptual framework that illustrates the competency-based TVET system.



**Figure 1. Conceptual Framework of Competency-Based TVET System**

Simultaneously considered at this time is the organizational arrangement at the national and regional or provincial levels with respect to the management and control of implementation. The ideal organizational set-up is to organize a new body to carry out the



planning and implementation of CBTVET. But since the provision for TVET has been in place long before the introduction of CBTVET system, it is often more practical to restructure and strengthen the existing National and Regional or provincial organizational structure.

The three other elements are undertaken after the establishment of the National policy on qualification and competency standards mostly at the local and institutional level implementation of the system.



## 1.1 Structure and Levels of Competency in U.K.

As cited in an ILO document, the Levels of Competency as defined in the United Kingdom are as follows:

- Level 1.

“Competency in the performance of a broad scope of labour activities, mostly routine and predictable ones”.

- Level 2

“Competency in a significant and broad scope of Labour activities, carried out in different context. Some of the activities are complex or not routine tasks and there is some autonomy and individual responsibility. It may often require the cooperation with other people, being part of a group or doing team work”.

- Level 3

“Competency in a broad scope of different labour activities developed in a great variety of contexts which are mostly complex and not routine like. There is great responsibility and autonomy and it often requires controlling and providing guidance to other people”.

- Level 4

“Competencies in a broad scope of professional and technically complex labour activities, carried out in a great variety of context and with substantial degree of autonomy and personal responsibility. It may often require being responsible for the work of others and the distribution of resource”.

- Level 5

“Competency which involves applying an important scope of fundamental principles and complex techniques in a broad and sometimes unpredictable variety of contexts. It requires a high degree of personal autonomy and frequently great responsibility regarding the work of others and the distribution of substantial resources. Furthermore, it requires personal responsibility regarding analyses, diagnosis, designing, planning, and implementation and assessment tasks”.

## 1.2 Structure and Levels of Competency in the Philippines

In the Philippines, the Technical Education and Skills Development Authority (TESDA), under the Office of the President, was mandated by law to “formulate a



comprehensive development plan for middle-level manpower; ...to ingrate, coordinate and monitor skills development program; and to restructure efforts to promote and develop middle-level manpower, among others. As part of this mandate, TESDA came up with four (4) levels of competencies for the determination of qualification and certification of technical workers. The four levels of competencies which also serve as National Certificate levels (better known as NC-1, NC-II, NC-III and NC-IV), are operationally defined as follows:

• National Certificate Level I:

- ◇ A worker at this level performs routine and predictable tasks involving little latitude for judgment;
- ◇ Adherence to appropriate standards or specifications are usually involved;
- ◇ Assignments are usually made by supervisors or a worker at a higher level who gives simple instructions and make clarifications or suggestions when necessary.

• National Certificate Level II:

- ◇ A worker at this level performs a prescribed range of functions involving known routines and procedures where clearly identified choices and limited complexities apply;
- ◇ Work involves some accountability for the quality of outputs;
- ◇ Applications at this level may involve individual responsibility or autonomy, or working with others as part of a team or group.

• National Certificate Level III:

- ◇ A worker at this level performs a wide range of skilled operations at a high level competence involving known routines and procedures. The work context involves some complexity in the extent and choice of options available;
- ◇ Work involves understanding the work process, contributing to problem solving, and making decisions to determine the processes, equipment and materials to be used;
- ◇ Applications at this level may involve individual responsibility or autonomy and/or may involve some responsibility for others. Participation in teams including team group coordination may be involved.

• National Certificate Level IV:

- ◇ A worker at this level performs a wide range of applications in a variety of contexts most of which are complex and nonroutine;
- ◇ Work involves some leadership and guidance when organizing activities of self and others as well as contributing to technical solutions of a non-routine or contingency nature. Work at this level also requires evaluation and analysis of current practices and the development of new criteria and procedures;



- ◇ Applications involve responsibility for the organization and performance of others.

### 1.3 Structure and Levels of Competency in New Zealand

The New Zealand Qualifications Authority website presented the following “level descriptors” of competencies adopted in the country’s National Qualifications Framework. The Website described the Level Descriptors as follows: “There are 10 levels involved in the qualification – 1 is the least complex and 10 the most. Levels depend on the complexity of learning. They do not equate to years spent learning, but reflect the content of the qualification”.

LEVEL	PROCESS	LEARNING DEMAND	RESPONSIBILITY
1	<p><b>Carry out processes that:</b></p> <ul style="list-style-type: none"> <li>• are limited in range</li> <li>• are repetitive and familiar</li> <li>• are employed within closely defined contexts</li> </ul>	<p><b>Employing:</b></p> <ul style="list-style-type: none"> <li>• recall</li> <li>• a narrow range of knowledge and cognitive skills</li> <li>• no generation of new ideas</li> </ul>	<p><b>Applied:</b></p> <ul style="list-style-type: none"> <li>• in directed activity</li> <li>• under close supervision</li> <li>• with no responsibility for the work or learning of others</li> </ul>
2	<p><b>Carry out processes that:</b></p> <ul style="list-style-type: none"> <li>• are moderate in range</li> <li>• are established and familiar</li> <li>• offer a clear choice of routine responses</li> </ul>	<p><b>Employing:</b></p> <ul style="list-style-type: none"> <li>• basic operational knowledge</li> <li>• readily available information</li> <li>• known solutions to familiar problems</li> <li>• little generation of new ideas</li> </ul>	<p><b>Applied:</b></p> <ul style="list-style-type: none"> <li>• in directed activity</li> <li>• under general supervision and quality control</li> <li>• with some responsibility for quantity and quality</li> <li>• with possible responsibility for guiding others</li> </ul>
3	<p><b>Carry out processes that:</b></p> <ul style="list-style-type: none"> <li>• require a range of well developed skills</li> <li>• offer a significant choice of procedures</li> <li>• are employed within a range of familiar contexts.</li> <li>• in directed activity with some autonomy</li> </ul>	<p><b>Employing:</b></p> <ul style="list-style-type: none"> <li>• some relevant theoretical knowledge</li> <li>• interpretation of available information</li> <li>• discretion and judgment</li> <li>• a range of known responses to familiar problems</li> </ul>	<p><b>Applied:</b></p> <ul style="list-style-type: none"> <li>• under general supervision and quality checking</li> <li>• with significant responsibility for the quantity and quality of output</li> <li>• with possible responsibility for the output of others</li> </ul>
4	<p><b>Carry out processes that:</b></p> <ul style="list-style-type: none"> <li>• require a wide range of technical or scholastic skills</li> <li>• offer a considerable choice of procedures</li> </ul>	<p><b>Employing:</b></p> <ul style="list-style-type: none"> <li>• a broad knowledge base incorporating some theoretical concepts</li> <li>• analytical interpretation of</li> </ul>	<p><b>Applied:</b></p> <ul style="list-style-type: none"> <li>• with complete responsibility for quantity and quality of output</li> <li>• with possible responsibility for</li> </ul>
LEVEL	PROCESS	LEARNING DEMAND	RESPONSIBILITY
	<ul style="list-style-type: none"> <li>• are employed in a variety of familiar and unfamiliar contexts</li> </ul>	<ul style="list-style-type: none"> <li>information</li> <li>• informed judgment</li> </ul>	the quantity and quality of the output of others



	<ul style="list-style-type: none"> <li>• in self-directed activity</li> <li>• under broad guidance and evaluation.</li> </ul>	<ul style="list-style-type: none"> <li>• a range of sometimes innovative responses to concrete but often unfamiliar problems</li> </ul>	
5	<p><i>Carry out processes that:</i></p> <ul style="list-style-type: none"> <li>• require a wide range of specialized technical or scholastic skills</li> <li>• involve a wide choice of standard and nonstandard procedures</li> <li>• are employed in a variety of routine and non-routine contexts</li> </ul>	<p><i>Employing:</i></p> <ul style="list-style-type: none"> <li>• a broad knowledge base with substantial depth in some areas</li> <li>• analytical interpretation of a wide range of data</li> <li>• the determination of appropriate methods and procedures in response to a range of concrete problems with some theoretical elements</li> </ul>	<p><i>Applied:</i></p> <ul style="list-style-type: none"> <li>• in self-directed and sometimes directive activity</li> <li>• within broad general guidelines or functions</li> <li>• with full responsibility for the nature, quantity and quality of outcomes</li> <li>• with possible responsibility for the achievement of group outcome.</li> </ul>
6	<p><i>Carry out processes that:</i></p> <ul style="list-style-type: none"> <li>• require a command of wide-ranging highly specialized technical or scholastic skills</li> <li>• involve a wide choice of standard and nonstandard procedures, often in non-standard combinations</li> <li>• are employed in highly variable routine and non routine contexts</li> </ul>	<p><i>Employing:</i></p> <ul style="list-style-type: none"> <li>• specialized knowledge with depth in more than one area</li> <li>• the analysis, reformatting and evaluation of a wide range of information</li> <li>• the formulation of appropriate responses to resolve both concrete and abstract problems</li> </ul>	<p><i>Applied:</i></p> <ul style="list-style-type: none"> <li>• in managing processes</li> <li>• within broad parameters for defined activities</li> <li>• with complete accountability for determining and achieving personal and/or group outcomes</li> </ul>
7	<p><i>Carry out processes that:</i></p> <ul style="list-style-type: none"> <li>• require a command of highly specialized technical or scholastic and basic research skills across a major discipline</li> <li>• involve the full range of procedures in a major discipline</li> <li>• are applied in complex, variable and specialized contexts</li> </ul>	<p><i>Requiring:</i></p> <ul style="list-style-type: none"> <li>• knowledge of a major discipline with areas of specialization in depth</li> <li>• the analysis, transformation and evaluation of abstract data and concepts</li> <li>• the creation of appropriate responses to resolve given or contextual abstract problems</li> </ul>	<p><i>Applied:</i></p> <ul style="list-style-type: none"> <li>• in planning, resourcing and managing processes</li> <li>• within broad parameters and functions</li> <li>• with complete accountability for determining, achieving and evaluating personal and/or group outcomes</li> </ul>
8	<p><i>Involves skills and knowledge that enable a learner to:</i></p> <ul style="list-style-type: none"> <li>• provide a systematic and coherent account of the key principles of a subject area; and</li> <li>• undertake self-directed study, research and scholarship in a subject area, demonstrating intellectual independence, analytic rigour and sound communication</li> </ul>		
9	<p><i>Involves knowledge and skills that enable a learner to:</i></p> <ul style="list-style-type: none"> <li>• demonstrate mastery of a subject area; and</li> <li>• plan and carry out - to internationally recognized standards - an original scholarship or research</li> </ul>		



LEVEL	PROCESS	LEARNING DEMAND	RESPONSIBILITY
	Project.		
	<ul style="list-style-type: none"> <li>The completion of a substantial research paper, dissertation or in some cases a series of papers.</li> </ul>		
10	<p><i>Involves knowledge and skills that enable a learner to:</i></p> <ul style="list-style-type: none"> <li>Provide an original contribution to knowledge through research or scholarship, as judged by independent experts, applying international standards.</li> </ul>		

#### 1.4 Levels of Competency in Pakistan

In Pakistan, the TVET sector has been using a three-level occupational skill standard for technical workers that is known simply as G-III, G-II, and G-I as the apex level. Developed by the National Training Board in the 1980s, the three-level occupational skills standard for Pakistan is described as follows:

- The Basic Level (Grade-III)

“The Basic level relates to the level of knowledge and skills expected from craftsmen who have undergone training in this trade conducted by a training institution or for those who already have to their credit at least four (4) years of recognized on the job experience”.

- The Intermediate Level (G-II)

“The Intermediate level falls approximately mid-way between the advance level and the basic level”.

- The Advance Level (G-I)

“The Advance level is based on the highest level of knowledge and skills expected from a craftsman in this trade”.

Analyzing the description of this occupational skill standard, it can be noted that the bases of the skill standard (G-III) are the “knowledge and skills expected from craftsmen” and the training provided; or experience in industry for at least four (4) years. The two more advanced levels are described in even more generic terms. In other words, there is a very critical need to review these skill standards in the light of the on-going modernization of the country, and in concert with the on-going restructuring of TVET System. There is a critical need for the skill standards to be operationally defined in terms of competencies that the workers at various levels should be able to perform or demonstrate.



## B. Developing a Competency Standard

### 1. Competency: Types and Elements

**Competency.** As defined earlier, competency is a cluster of related skills, knowledge and attitudes that form part of one's occupation or trade that correlates with and measured by the performance standards set by industry, and that can be developed and improved through training and development. Competencies are tasks performed by workers in industry or world of work in a particular job or occupation. The competency of a person involves his possession and the ability to apply knowledge, skills and attitudes in performing work according to the standard set by industry.

#### 1.1 Types of Competency

Competency experts observe that competencies can be classified into three (3) types, such as basic, common, and core.

**Basic competencies** are related skills, knowledge and attitudes that are simple and fundamental in most jobs, occupation or responsibility in the same level of qualifications. For instance, all G-II craftsmen are expected to “perform simple calculation” or to “prepare all the materials needed for a job”.

Similarly, a G-I worker is expected to “lead a team” or “prepare the scope of work” responsibilities.

**Common competencies** are clusters of related skills, knowledge and attitudes that are similarly performed across a cluster of jobs in a particular trade or occupation and in the same level of qualifications that is expected of the individual in the world of work. While a basic competency is similarly required in most jobs, a common competency is usually restricted in one cluster of occupations. For instance, common competencies in measurements in the area of construction are essentially different from that of mechanical trades, or electronics.

**Core competencies** are the major component of skills, knowledge and attitudes that are mostly applicable for a particular trade, occupation or technology. These are competencies that are applicable only on a particular trade, occupation or technology; or allied trades that are utilizing similar materials.

For CBTVET purposes, the competencies required for a particular technology or occupation and level of qualification are identified and classified into what is termed as “**unit of competencies**”. For each technology, trade or occupation, the unit of competencies are identified and listed under basic, common, and core competencies and each are further analyzed for their major “**elements**”.



## 1.2 The Elements of Competency

The elements of competency are further analyzed to determine the “**performance criteria**” which are useful in the assessment of learning outcomes. The four elements of a competency are as follows:

- **Task skill.** The element of competency that requires performance of the task(s) to the level of standard as prescribed in the unit of competency and expected on the job. In assessing the learning outcome, there is a need to gather evidence that the trainee or student can perform the specific as well as the whole task;
- **Task management skill.** This element captures the skills needed to plan and integrate a number of different tasks to achieve a complete work output. The trainee or student should provide evidence that he can work efficiently to meet deadlines, handle a interrelated tasks, and move on smoothly to complete the whole task;
- **Contingency management skill.** The element of competency that deals with irregularities and breakdowns on the job. The trainee or student must show evidence of managing with contingencies like: breakdowns, irregularities, imperfections, and other unexpected situations;
- **Job environment skills.** The element that deals with the challenges, responsibilities and expectations of the work environment. The trainee or student must demonstrate the ability to work with others and adapt to various situations at the workplace.

## 2. What is Competency Standard?

**Competency standard.** A competency standard is a document that defines or specifies in a well structured format how the student or trainee should perform a job or function. It describes what a people do in the workplace at various levels and the standard set by industry. Competency standards are formulated to capture the various dimensions that account for what is considered as 'competent' performance. It is a document that specifies in a structured format how a person should perform a job or work role.

Various organizations utilize competency standards as a frame of reference in defining or prescribing how they expect job or work roles to be performed. Likewise, the competency standard is commonly used to assess whether people are competent at their job or work role

The two common types of competency standards are: (1) standards that are recognized and adopted throughout the country as the basis for assessment, formal qualification and certification; and (2) standards that are develop for a specific organization, enterprise, or firm.



# Competency-Based TVET Curriculum for Industrial Electrician Level 2 / G-II (Skilled Worker)

**Course Title:** INDUSTRIAL ELECTRICIAN

**Qualification Level:** Level 2/ G-II, (Intermediate Level)

**Course Duration:** One School Year and One Summer<sup>4</sup>:

## COURSE DESCRIPTION

Industrial Electrician is an Intermediate Level program of study that is intended to prepare people to become Skilled Electrician who are competent in meeting the manpower demands of industry, particularly the electrical energy sector. It is intended for individuals who completed Industrial Electrician, G-III, Basic Level or a person who holds a G-III Certificate of Qualification in Industrial Electrician who is interested to pursue a study towards a higher level of certification in this field. The course covers basic competencies in safety, communication, and good housekeeping; common competencies on caring and servicing of hand tools, reading electrical symbols and diagrams and drawing interpreting electrical circuits; and core competencies such as performing work on domestic and commercial wiring, protective systems, and installation and maintenance of transformers, electric motors, low to medium size generators, low to medium voltage substation, and power rectifier circuits including maintenance of appliances and equipment.

The course is highlighted with **on-the-job training** of students in industry to provide actual experience in industry and to enhance their competencies and chances to enter the world of work

<sup>3</sup> Please refer to Footnote No. 1, in Appendix A.

<sup>4</sup> An additional 225 hours (or around 38 days at 6 work hours per day) is required to complete the on-the job (OJT) training of 400 hours.

## COURSE OUTCOMES

Upon completion of the course the students or trainees must be able to:

1. Observe personal safety and all safety rules and practices;



2. Communicate effectively in the work environment;
3. Maintain good housekeeping and clean work environment;
4. Maintain and service hand tools, measuring tools and equipment;
5. Read symbols and diagrams used for power and protective circuits;
6. Identify and use various types and sizes of cables;
7. Draw circuits and diagrams domestic and commercial installations;
8. Perform electrical wiring in domestic and industrial installations;
9. Perform work on protective system installations;
10. Perform maintenance and service on protective devices;
11. Select, install and maintain transformers;
12. Select, install and service batteries;
13. Install and operate motors.
14. Select, install, and main different types of electric motors
15. Identify and select portable electric generators
16. Install and maintain a low to medium size generating set
17. Install low and medium voltage substation

## ENTRY REQUIREMENTS

- Matriculation Class 10 (Preferably Science/ Matric Tech Electrician)
- Holder of Level -1/ G-III Certificate of Qualification
- 17 years old and above
- Good moral character
- Can communicate efficiently in urdu

## COURSE STRUCTURE (CONTENTS)

Units of Competency	Module Title (Elements of Competency)	Module Contents	No Hrs. 5
<b>BASIC COMPETENCIES</b>			
1. Observe personal safety and all safety rules and practices in installation work'	1.1. Observing personal safety and all safety rules and practices in installation work'	1.1.1 Safety rules and regulations 1.1.2 Emergency first aid 1.1.3 Artificial respiration in case of electric shock 1.1.4 Using safety equipment 1.1.5 Fire extinguishers and how to use them	20
2. Communicate effectively in the work environment	2.1. Communicating effectively in the work environment	2.1.1 Importance of effective communication 2.1.2 Elements of good communication 2.1.3 Barriers of communication 2.1.4 Active listening techniques 2.1.5 How to communicate with lower-level workers, peers and superiors effectively	20



3. Maintain a clean work environment and good workshop keeping	3.1 Maintaining a clean environment and good workshop keeping	3.1.1 The importance of cleanliness and good housekeeping in the workplace 3.1.2 Developing cleanliness as a personal and community habit 3.1.3 Organizing a housekeeping program in the workplace 3.1.4 Maintaining a clean work environment policy	30
Units of Competency	Module Title (Elements of Competency)	Module Contents	No Hrs. 5
COMMON COMPETENCIES			
1. Maintain and service common hand tools, measuring tools and instruments for industrial installation	1.1. Maintaining and servicing common hand tools, measuring tools and instruments for industrial installation	1.1.1 Common hand tools, measuring tools, different gauges, erecting tools and equipment used by Electricians 1.1.2 The advantages of well-maintained hand tools 1.1.3 Techniques of caring and maintaining hand tools 1.1.4 Effective tool management and improved productivity	25
2. Read symbols and diagrams used for power and protective circuits	2.1 Reading symbols and diagrams used for power and protective circuits	2.1.1 Symbols used in power and protective devices 2.1.2 Reading and interpreting diagrams 2.1.3 Power circuits, single phase and 3-phase four wire system 2.1.4 Protection devices and circuits	15

<sup>5</sup> As stated in Footnote No. 2, Appendix A, the No. of Hours is the estimated duration for teaching the competency (module, practice or hands-on activities of students to master the competency, and for assessing learning outcomes.

Units of Competency	Module Title (Elements of Competency)	Module Contents	No Hrs. 5
COMMON COMPETENCIES			
3. Identify and use various types and sizes of cables	3.1 Identifying and using various types and sizes of cables	3.1.1 Different types of cables 3.1.2 Sizes of cables and their appropriate application 3.1.3 Identifying and using cable for a particular function 3.1.4 Selecting appropriate type and size of cable	20
4. Draw circuit and diagrams of domestic and industrial installations	4. Drawing circuit and diagrams of domestic and industrial installations	4.1.1 Knowledge of electrical symbols 4.1.2 Electrical drawing techniques 4.1.3 Drawing domestic electrical wiring system 4.1.4 Drawing power supply system 4.1.5 Drawing industrial wiring installation	20



Units of Competency	Module Title (Elements of Competency)	Module Contents	No Hrs. 5
		4.1.6 Prepare cost estimates	
<b>CORE COMPETENCIES</b>			
1. Perform electrical wiring on domestic and commercial installation	1.1 Estimating electrical materials for industrial installation	1.1.1 Review and interpret electrical plans and diagram 1.1.2 Compute the length of wires and cables 1.1.3 Determine electrical accessories and electrical supplies 1.1.4 Control circuit with magnetic contactors, lift circuits and automatic doors circuits 1.1.5 Estimate the cost of materials	15
	1.2. Identifying and preparing standard accessories and components for domestic and industrial installation	1.2.1 Standard accessories for domestic and industrial installations 1.2.2 Standard components for domestic and industrial installations 1.2.3 Determining conduit size for a particular installation 1.2.4 Selecting equivalent dies and wire capacity conduit	15
	1.3 Jointing and terminating multi-core cables	1.3.1 Different types of cable joints and their uses 1.3.2 Selecting the appropriate type of cable for a particular function 1.3.3 Procedure in terminating multi-core cable 1.3.4 Procedures in making cable joints 1.3.5 Procedure in jointing by punching 1.3.6 Applying appropriate insulation	20
	1.4. Boring walls and mounting bracket and fixture of lighting and power fittings	1.4.1 Read and interpret electrical wiring diagram 1.4.2 Prepare tools and equipment 1.4.3 Layout job on the wall 1.4.4 Select proper size of concrete drill bits 1.4.5 Bore wall with electric drill	15
	1.5 Laying of wire in conduits, and replacing of parts as required	1.5.1 Estimate the wires need for the installation 1.5.2 Techniques in laying wire in the conduits 1.5.3 Drawing wires in conduit using pulling wires 1.5.4 Connecting the wiring with appropriate	20



Units of Competency	Module Title (Elements of Competency)	Module Contents	No Hrs. 5
		electrical joint 1.5.5 Checking and testing the conduit wiring 1.5.6 Checking and replacing defective parts of the electrical installation	
<b>CORE COMPETENCIES</b>			
	1.6 Connecting and tracing faults in single phase and 3-phase	1.6.1 Different types of testing equipment and their uses, e.g. Megger, earth tester, insulation tester, and tong tester (analog and digital) 1.6.2 Handling the testing equipment safely 1.6.3 Checking of open circuit or continuity 1.6.4 Checking and replacing of fuses 1.6.5 Checking and replacing of switches 1.6.6 Checking and replacing of lamps 1.6.7 Checking and replacing of holders 1.6.8 Removing and replacing burnt wires 1.6.9 Checking of polarity	20
	1.7 Measuring voltage, current, resistance, power factor frequency, power, and KWH	1.7.1 Ohm's Law and its advance application 1.7.2 Measuring voltage with Voltmeter 1.7.3 Measuring current with Ammeter 1.7.4 Measuring resistance with Ohmmeter 1.7.5 Measuring power with Power meter 1.7.6 Measuring KWH with energy meter 1.7.7 Use frequency meter, phase sequence meter and power factor meter 1.7.8 Use KVARH meter and MDI meter	15
2. Perform work on protective installations	2.1 .Selecting and performing work on different protective devices	2.1.1 The need for protective devices 2.1.2 Different types of protective devices 2.1.3 Fuses 2.1.4 Relays 2.1.5 Circuit Breakers	10
	2.2. Measuring and identifying low and medium voltage conductors	2.2.1 Types of conductors 2.2.2 Sizes and ratings of solid copper conductors 2.2.3 Sizes and ratings of stranded copper conductors 2.2.4 Sizes and ratings of solid aluminum conductors 2.2.5 Sizes and ratings of stranded aluminum conductors 2.2.6 Sizes and ratings of flexible cords and power cables	15



Units of Competency	Module Title (Elements of Competency)	Module Contents	No Hrs. 5
	2.3 Installing the correct protective devices	2.3.1 Selecting and installing fuses 2.3.2 Selecting and installing circuit breaker 2.3.3 Installing low volt and overload relays 2.3.4 Checking and testing installed protective devices 2.3.5 Observing safety measures	20
<b>CORE COMPETENCIES</b>			
	2.4 Installing and connecting earth wire to distribution panel and in power plugs circuits	2.4.1 Study schematic diagram 2.4.2 Determine where to install earth wire 2.4.3 Selecting size of earth continuity conductor 2.4.4 Connecting earth wire distribution panel 2.4.5 Checking and testing the connection	20
	2.5 Connecting and reading frequency phase sequence and power factor meters	2.5.1 Function of frequency phase sequence and power factor meters 2.5.2 Reading the frequency phase sequence meter 2.5.3 Reading the power factor meter 2.5.4 Analyzing interpreting meter readings	20
3. Perform maintenance and service on protective devices	3.1 Monitoring protective devices in domestic and industrial installations	3.1.1 Prepare maintenance plan or program for protective devices 3.1.2 Prepare a monitoring chart for all protective devices 3.1.3 Keep a record of regular inspection and monitoring activities for each equipment or device 3.1.4 Analyze records and rendering appropriate conclusion and action 3.1.5 Apply safety procedures during inspection	25
	3.2 Servicing circuit breaker, contactors, and relays	3.2.1 Review monitoring chart, particularly problems and recommendations 3.2.2 Apply safety precautions during servicing 3.2.3 Clean contacts following proper procedures 3.2.4 Test circuit breakers and relays 3.2.5 Replace defective components according to specifications	25
4 Select, Install, and maintain transformers	4.1 Selecting and using different types of transformers	4.1.1 Concept, and working principles of transformers 4.1.2 Different types of transformers and their application 4.1.3 Primary and secondary windings 4.1.4 Single-phase transformers and their working	20



Units of Competency	Module Title (Elements of Competency)	Module Contents	No Hrs. 5
		principles and construction 4.1.5 Three-phase transformers and their working principles and construction 4.1.6 Instrument transformers and their application 4.1.7 Types of transformers by type of connection, e.g. delta-star, etc. 4.1.8 Equipment used for installing and using transformers.	
<b>CORE COMPETENCIES</b>			
	4.2 Installing and maintaining low and high tension transformers	4.2.1 Determining the type and rating of transformer for a particular function 4.2.2 Planning and erecting high tension transformer 4.2.3 Installing high tension transformer 4.2.4 Checking and testing the installation 4.2.5 Short circuit tests, ground test, insulation test of transformer oil.	25
	4.3 Repairing all types of transformers	4.3.1 Determining the fault in the transformer 4.3.2 Checking primary and secondary windings for open circuit 4.3.3 Dismantling and removing damaged winding 4.3.4 Rewinding transformer based on gathered data 4.3.5 Finishing and curing the new winding 4.3.6 Checking and testing the transformer.	30
5. Select, install and maintain batteries	5.1 Selecting, installing and maintaining batteries	5.1.1 Concept of batteries, their composition and construction 5.1.2 Principles of Direct Current (DC) 5.1.3 Application of Ohms Law in DC 5.1.4 Different types of batteries 5.1.5 Rating and Testing the battery 5.1.6 Charging storage batteries; use of hydrometers and cell tester 5.1.7 Preparing electrolytes 5.1.8 Techniques battery maintenance. 5.1.9 Safety precautions in handling batteries	25
6. Select, install, and main different types of electric motors	6.1 Selecting and using AC motors Principles and of AC motors	6.1.1 Different types of AC motors 6.1.2 Construction of AC motors 6.1.3 Selecting AC motors for home and industrial application	15



		6.1.4 Domestic and industrial uses of AC motors 6.1.5 Selecting, installing and maintaining different type of electric motors and appliances 6.1.6 Motor starters and speed controllers	
	6.2 Selecting and using DC motors	6.2.1 Principles and of DC motors 6.2.2 Different types of DC motors 6.2.3 Construction of DC motors 6.2.4 Selecting DC motors for home and industrial application 6.2.5 Domestic and industrial uses of DC motors	15
Units of Competency	Module Title (Elements of Competency)	Module Contents	No Hrs. 5
CORE COMPETENCIES			
	6.3 Installing and operating various types of motors	6.3.1 Understanding the relation between mechanical and electrical power and efficiency 6.3.2 Laying out the motor according to plan or drawing 6.3.3 Mounting the motor to the base 6.3.4 Connecting the motor and the protective device according to schematic diagram 6.3.5 Checking and testing a mounted motor 6.3.6 Apply safety procedures during installation and operation	30
	6.4 Trouble shooting and servicing the electric motor	6.4.1 Installing and maintaining electric geaser, oven, refrigerator, computer, U.P.S, and inverters, etc. 6.4.2 Preparing a maintenance program for motors and other electrical devices 6.4.3 Maintaining a monitoring chart for all motors and equipment with motors 6.4.4 Checking for faults on the working condition of the motor 6.4.5 Dismantling, of motor parts and accessories 6.4.6 Overhauling or replacing of worn out or defective parts 6.4.7 Reassembling of motor and appliances 6.4.8 Testing motor with appropriate tests 6.4.9 Checking the performance and sound of the motor	30
7.Perform appliance	7.1 Performing	7.1.1 Different types of motor-driven appliances	40



or equipment maintenance and repair	appliance or equipment maintenance and repair	7.1.2 Checking appliance for open circuits 7.1.3 Checking appliance regulators or control system for defects and replacing the same according to specifications 7.1.4 Removing and checking motor part of appliance for defects 7.1.5 Replacing defective parts or rewinding motor if winding is damaged or defective 7.1.6 Basic knowledge on rewinding motors 7.1.7 Assembling and check motor performance 7.1.8 Assembling and testing the appliance	
Units of Competency	Module Title (Elements of Competency)	Module Contents	No Hrs. 5
CORE COMPETENCIES			
8..Select and maintain portable electric generators	8.1 Understanding the working principles, construction and types of electric generators	8.1.1 The generator and its working principles 8.1.2 Concept of DC, Single phase and 3-phase generators 8.1.3 Various types of generating electricity and generators 8.1.4 Parts and accessories of a generator 8.1.5 The excitation, and synchronization of DC with AC. Generators	15
	8.2 Identifying and selecting portable electric generators	8.2.1 Different types of portable generators 8.2.2 Selecting a portable generator as emergency source of electric power domestic and industrial installations 8.2.3 Determining the availability of expert services in the community 8.2.4 Checking and testing the generator	10
	8,3 Rating and repairing a portable generator	8.3.1 The rating of generators 8.3.2 Following manual of instruction, disassemble the generator 8.3.3 Identifying defective parts or trouble 8.3.4 Using testing and measuring instruments 8.3.5 Replacing defective components 8.3.6 Reassembling the portable generator 8.3.7 Testing generator as indicated in the manual of instruction	30
9. Install and maintain low to medium size	9.1 Installing and maintaining a low to medium size	9.1.1 Selecting the appropriate location of the generator 9.1.2 Fixing the generator set in place	25



generator set	generator set	9.1.3 Applying all safety rules and regulations 9.1.4 Fixing the generator earthing securely 9.1.5 Installing the power control panel 9.1.6 Connecting the generator to the power control panel 9.1.7 Checking and testing the generator	
	9.2 Maintaining and repairing generator starting system	9.2.1 Understanding the principle and function starter system 9.2.2 Disconnecting battery from the starting system 9.2.3 Using testing and measuring instruments to check for faults 9.2.4 Replacing defective components according to specification 9.2.5 Tests the starting system as per manual of instruction	20
Units of Competency	Module Title (Elements of Competency)	Module Contents	No Hrs. 5
CORE COMPETENCIES			
	9.3 Maintaining and repairing generator exciter	9.3.1 Understanding the principle and function of the generator exciter 9.3.2 Disconnecting exciter from the generator 9.3.3 Testing component parts 9.3.4 Repairing defective components 9.3.5 Replacing defective components 9.3.6 Checking and testing the exciter	20
	9.4 Maintaining and repairing generator's voltage regulator	9.4.1 Understanding the principle and function of the voltage regulator 9.4.2 Disconnecting the voltage regular 9.4.3 Testing the component parts 9.4.4 Repairing defective components 9.4.5 Knowledge about capacitors 9.4.6 Replacing defective components as per specification 9.4.7 Testing the voltage regulator	20
	9.5 Repairing capacitor bank	9.5.1 Understanding the principle and function of the capacitor bank 9.5.2 Isolating capacitor bank from the supply 9.5.3 Testing capacitor bank following manufacturer's instruction 9.5.4 Replacing defective capacitor bank according to specification 9.5.5 Testing capacitor bank accurately	20
10. Install low and	10.1. Installing and	10.1.1 Circuit breaker and other components of the	20



medium voltage substation	maintaining low and medium voltage substation	substation 10.1.2 Selecting cables, conductors (aluminum and copper) 10.1.3 Calculating the current carrying capacity of conductors 10.1.4 The clearance required for low and medium voltage conductors, and bus bars 10.1.5 Difference between ACB, OCB and VCB 10.1.6 The safety precautions to be followed on low and medium voltage gear	
11. Assemble and maintain power rectifier circuits	11.1 Assembling and maintaining power rectifier circuits	11.1.1 Understanding the principle and function of the rectifier circuits 11.1.2 Identifying and testing different types of silicon controlled rectifier, TRIAC and Diac, semi-conductors, diode and transistor, 11.1.3 Isolating rectifier circuit from the supply	30
<b>Units of Competency</b>	<b>Module Title (Elements of Competency)</b>	<b>Module Contents</b>	<b>No Hrs. 5</b>
<b>CORE COMPETENCIES</b>			
		11.1.4 Testing rectifier system following manufacturer's instruction 11.1.5 Replacing defective rectifier as per specification 11.1.6 Assembling and maintaining rectifier circuit 11.1.7 Testing the rectifier bank accurately	
12. Locate and repairing simple faults in cables	12.1 Locating and repairing simple faults in cables	12.1.1 Applying safety rules and regulations, and theories about bridges 12.1.2 Using wheat stone bridge and bridge Megger, and tone tester. 12.1.3 Disconnecting power connection 12.1.4 Replacing cable according to specification 12.1.5 Installation of underground cables. 12.1.6 Checking and testing the cables	20
13. Install and operate motors with drum switch	13.1 Understanding the working principles of motors	13.1.1 Concept and construction of motors 13.1.2 Inductors and capacitors 13.1.3 Principles of single phase motors, capacitor non-capacitor types 13.1.4 Three-phase motors and their faults rectification	20
	13.2 Installing	13.2.1 Identifying single phase and 3-phase	25



	and operating single-phase and 3-phase motors	motors 13.2.2 Identifying different types of drum witches 13.2.3 Installing main switch 13.2.3 Drawing wires 13.2.4. Wiring from main switch to drum switch 13.2.4 Wiring from drum switch to motor 13.2.4 Adjusting current according to motor 13.2.5 Testing and operating the motor starter and motor	
	13.3 Installing and operating capacitor-type motor, induction motor, or slip-ring motor	13.3.1 Identifying capacitor type motors, induction motors, and slip-ring motors 13.3.2 Identifying different types of drum switches 13.3.3 Installing main switch 13.3.3 Drawing wires 13.3.4. Wiring from main switch to drum switch	20
Units of Competency	Module Title (Elements of Competency)	Module Contents	No Hrs. 5
CORE COMPETENCIES			
		13.3.4 Wiring from drum switch to motor 13.3.4 Adjusting current according to motor 13.3.5 Testing and operating the motor starter and motor	
14. Conduct special project in electrical technology	14.1 Conducting special project in electrical technology	14.1.1 Identify special project with the help of the instructor and or experts 14.1.2 Conduct a review and background information regarding special project 13.1.3 Prepare the design of the project 14.1.3 Prepare plan and schedule of work on the project 14.1.4. Prepare the resources needed to conduct the project 14.1.5 Conduct the project according to design and schedule of work 14.1.6 Prepare write-up of the project 14.1.7 Conduct testing and evaluation of the project (by the instructor or Committee' created for this purpose. 14.1.7 Implement changes and/or improvement of the project as 14.1.8 Finalize and submit special project.	50



Units of Competency	Module Title (Elements of Competency)	Module Contents	No Hrs. 5
<b>ON-THE-JOB TRAINING</b>			
15. Placement of students in industry for on-the-job training	15.1 Placing student in industry for on-the-job training	15.1.1 Conducting a survey of industry willing to cooperate in the on-the-job training program 15.1.2 Establishing a MOA with industry for on-the-job training 15.1.3 Preparing the training program for on the job training 15.1.4 Assigning an industry-training coordinator to supervise on the job training in cooperation with industry. 15.1.5 Placing students on the job 15.1.6 Supervising the students on the job training 15.1.7 Evaluating student's performance	400 hours*

\* It is suggested that the On-the-job training (OJT) in relevant industrial firms should not be less than 400 hours 66 days of full time placement in industry for at least six (6) hours per day. The OJT may start during the last month of the Academic Year or after 945 contact hours in school until 400 hours is completed in the summer term.

## COMPETENCY ANALYSIS

Competency analysis summarizes the number of Units of Competency and the total number of modules of instruction that composes the coverage of the course.

Units of Competency	Number of Modules	Total
<b>BASIC COMPETENCIES</b>		<b>3</b>
1. Observe personal safety and all safety rules and practices in installation work'	1	
2. Communicate effectively in the work environment	1	
3. Maintain a clean work environment and good housekeeping	1	
<b>COMMON COMPETENCIES</b>		<b>4</b>
1. Maintain and service common hand tools, measuring tools and instruments for industrial installation	1	
2. Read symbols and diagrams used for power and protective circuits	1	
3. Identify and use various types and sizes of cables	1	
4. Draw circuit and diagrams of domestic and industrial installations	1	



<b>CORE COMEPTENCIES</b>		<b>35</b>
1. Perform electrical wiring on domestic and commercial installations	7	
2. Perform work on protective installations	5	
3. Perform maintenance and service on protective devices	2	
4 Select, Install, and maintain transformers	3	
5. Select, install and maintain batteries	1	
6. Select, install, and main different types of electric motors	4	
<b>Units of Competency</b>	<b>Number of Modules</b>	<b>Total</b>
7. Perform appliance or equipment maintenance and repair	1	
8..Select and maintain portable electric generators	3	
9. Install and maintain low to medium size generator set	5	
10. Install low and medium voltage substation	1	
11. Assemble and maintain power rectifier circuits	1	
12. Locate and repairing simple faults in cables	1	
13. Placement of students in industry for on-the-job training	1	
<b>TOTALS</b>		<b>42</b>
<b>METHODOLOGY OF COURSE DELIVERY</b>		

**1. Modular approach.** The course contains a series of modules of instruction that requires a combination of student-focused and teacher-centered approaches, and that culminates with assessment of learning outcomes.

**2. Demonstration .method.** New skills lessons must be demonstrated to show the right way or procedure of doing things that will be followed by repeated practice to develop mastery of the skills.

**3. Lecture method.** The Lecture method combined with questioning and discussion will be used in teaching the theories and principles or the technical knowledge portion of each module.

**4. Discussion method.** The lecture method should be extensively used to develop the ability to articulate one's ideas and to explain theories and principles clearly.

**5. Project method.** It will be used to develop mastery of skills by giving assignment to students to make a useful project that will require the execution of practical lessons and problem solving.

**6. Assignment method.** This will be used to give opportunity for students to carry out additional study the Learning Resource Center, and through on-line search.

**7. On-site practice.** Whenever possible, students will be assigned to work on-site, to develop competency on domestic or industrial wiring installation.

**8. Industry visit.** Industry visit will be used also to give students the opportunity to see and have a feel of the actual work environment.

**9. On-the-Job Training (OJT).** This is actual placement of students in industry for at least three (3) months or 400 working hours. The OJT will provide actual work experience in a real



work environment to apply what is learned in school and to learn new knowledge, skills and attitudes that can be learned only in industry.

## ASSESSMENT METHOD

- 1. Written examination.** A written test will be administered at the end of every module and at the end of the course, to evaluate learning outcomes on the theoretical aspects of the course.
- 2. Demonstration of practical skills** This assessment method will be used to determine whether or not the student can perform the competencies according to industry standard. This will be used also to check if remedial or additional inputs are required for the student to develop a mastery of the lesson taught.
- 3. Direct observation.** Observation is an important approach in assessing the attitude of the students toward work, observance of safety rules and regulations, and how they interact and relate with other students and teachers.
- 4. Interview.** Interview may be also used to verify their knowledge of principles and theories; or to check if they could explain the working principles of some job processes or equipment or machines.

## QUALIFICATION OF INSTRUCTORS

- Bachelor's degree in Electrical Engineering or Bachelor of Technology, major in Electrical Technology, with units in education.
- 5 Years of TVET teaching experience.
- With G-1 Certificate of Competency
- Good Moral Character

## TRAINING RESOURCES

### A. List of Hand Tools Added to G-III Level Hand Tools (for a Class of 20)

QTY	UNIT	NAME/DESCRIPTION
20	Pcs.	Hammer, "Plastic Face
20	Pcs.	Scriber, Steel"
20	Pcs.	Scissors, 180 mm
20	Pcs.	Center Punch"
20	Pcs.	Circlip, Internal
20	Pcs.	Circlip External
20	Pcs.	Goggles, Eye
10	Sets	Allen Key Set, Metric and Imperial
6	Sets	Tap and Die Metric and Imperial



8	Sets	Spanner, Adjustable 250mm
8	Sets	Spanner, Adjustable, 150mm
8	Sets	Socket Wrench, ½ Drive
8	Pcs.	Vise grips
8	Pcs.	Growler, Internal
8	Pcs.	Growler External
8	Pcs.	Puller, Bearing
5	Pcs.	Caliper, Vernier
5	Pcs.	Wire Gauge, AWG
6	Pcs.	Puncher, Knock-out, ½", ¾", and 1" dia
5	Pcs.	Hand Shear
5	Pcs.	Grease Gun
5	Pcs.	Oil Gun
8	Pcs.	Fuse Puller, Insulated

### B. List of Testing Instruments Added to G-III Level Instruments (for a Class of 20)

QTY	UNIT	NAME/DESCRIPTION
10	Pcs.	Motor, Electric, Single Phase, Capacitor Start, 220-240 Volts
10	Pcs.	Motor, Electric, 3-Phase, Capacitor start, ½ HP 220-240 V
4	Pcs	Motor, Electric, ½ Synchronous Wound Rotor Type, 220-240 Volts, 4-pole
10	Pcs	Motor, Electric, ½ HP, Induction type, 3-phase 220-240 volts, 4-pole
4	Pcs.	Motor, Electric, Compound motor, ½ HP, 180-220 Volt, DC 4-Poler
6	Pcs.	Motor, Electric Single Phase, Univ. 2-pole, ½ HP, 220 Volts
6	Pcs	Transformer, SKVA, Induction Type, 110 – 220 Volt
6	Pcs	Transformer, Variable Output Type, 50, 75, 100, 150 Volts output to 220 Volts input.
10	Pcs	Alternator, Vehicular, 12 Volts
10	Pcs	Contactora, Magnetic 3 KW, 220 Volts, 60 Hz with 2-NO, 2-NC, Auxiliary Contact, Overload Unit, DIN RIL Mounted
10	Pcs.	Contactora, Magnetic, 1.5 KW, 220 Volts, 60 Hz with 2-NO, 2-NC, Auxiliary Contact DIN RIL Mounted
20	Pcs.	Relay, Timing on Delay 10 Sec. Max , 220 Volts, 60 Hz, Socketed
5	Pcs	Rewinder, Hand
1	Unit	Generator, AC
2	Unit	Portable Generator



## MEMBERS OF THE REVIEW COMMITTEE

Grateful acknowledgement is hereby extended to the following members of the Committee of Experts created by the Skills for Employability SFE Project, for converting GCT Nowshera into Centre of Vocational Excellence & Restructuring of Technical Education and Vocational Training Systems , Ministry of Industries, Labor and Manpower, Government of K.P.K., who reviewed and suggested improvements of the Contents (competency elements) of this Model CBT curriculum during the SFE Project held at the Government College of Technology, Nowshera, K.P.K., Pakistan:

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