# **COMPETENCY STANDARDS**

# INTERNET OF THINGS (IOT) NETWORK AND CABLING LEVEL II



## **ELECTRICAL & ELECTRONICS SECTOR**

TECHNICAL EDUCATION AND SKILLS DEVELOPMENT AUTHORITY TESDA Complex East Service Road, South Luzon Expressway (SLEX), Fort Bonifacio, Taguig City

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#### COMPETENCY STANDARDS FOR INTERNET OF THINGS (IOT) NETWORK AND CABLING LEVEL II

#### SECTION 1 DEFINITION

The **INTERNET OF THINGS (IOT) NETWORK AND CABLING LEVEL II** qualification consists of competencies that a person must achieve to Install Internet of Things (IoT) devices and structured network, configure Internet of Things (IoT) systems, and maintain Internet of Things (IoT) systems.

The units of competency comprising this qualification include the following:

Unit Code	BASIC COMPETENCIES
400311210	Participate in workplace communication
400311211	Work in team environment
400311212	Solve/address general workplace problems
400311213	Develop career and life decisions
400311214	Contribute to workplace innovation
400311215	Present relevant information
400311216	Practice occupational safety and health policies and procedures
400311217	Exercise efficient and effective sustainable practices in the workplace
400311218	Practice entrepreneurial skills in the workplace
Unit Code	COMMON COMPETENCIES
ELC315202	Apply quality standards
ELC311203	Perform computer operations
ELC311201	Perform mensuration and calculation
ELC311202	Prepare and interpret technical drawing
ELC724201	Use hand tools
ELC724202	Terminate and connect electrical wiring and electronic circuits
ELC724205	Test electronic components
Unit Code	CORE COMPETENCIES
AB-ELC1381100742301	Install Internet of Things (IoT) devices and structured network
AB-ELC1381100742302	Configure Internet of Things (IoT) systems
AB-ELC1381100742303	Maintain Internet of Things (IoT) systems

#### A person who has achieved this qualification is competent to be:

- Network Cabling Technician
- IoT Technical Support Specialist

#### SECTION 2 COMPETENCY STANDARD

This section gives the details of the contents of the units of competency required in **INTERNET OF THINGS (IOT) NETWORK AND CABLING LEVEL II.** 

#### **BASIC COMPETENCIES**

UNIT OF COMPETENCY	: PARTICIPATE IN WORKPLACE COMMUNICATION	
UNIT CODE	: 400311210	
UNIT DESCRIPTOR	: This unit covers the knowledge, skills	5

**TOR** : This unit covers the knowledge, skills and attitudes required to gather, interpret, and convey information in response to workplace requirements.

	ELEMENTS	PERFORMANCE CRITERIA Italicized terms are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1.	Obtain and convey workplace information	1.1 Specific and relevant information is accessed from	1.1 Effective verbal and nonverbal communication	<ul><li>1.1 Following simple spoken language</li><li>1.2 Performing routine</li></ul>
	mornation	appropriate sources	<ul><li>1.2 Different modes of communication</li><li>1.3 Medium of</li></ul>	workplace duties following simple written notices
		questioning, active listening and speaking skills are used to gather and	<ul> <li>1.3 Medium of communication in the workplace</li> <li>1.4 Organizational policies</li> </ul>	<ul><li>1.3 Participating in workplace meetings and discussions</li><li>1.4 Preparing work-</li></ul>
		convey information 1.3 Appropriate	1.5 Communication procedures and systems	related documents 1.5 Estimating, calculating and
		to transfer information and ideas	1.6 Lines of Communication	recording routine workplace measures 1.6 Relating/ Interacting
		1.4 Appropriate non- verbal communication is used	1.7 Technology relevant to the enterprise and the individual's	with people of various levels in the workplace

	PERFORMANCE CRITERIA Italicized terms	REQUIRED	REQUIRED
ELEMENTS	are elaborated in the Range of Variables	KNOWLEDGE	SKILLS
	<ul> <li>1.5 Appropriate lines of communication with supervisors and colleagues are identified and followed</li> <li>1.6 Defined workplace procedures for the location and <i>storage</i> of information are used</li> </ul>	work responsibilities 1.8 Workplace etiquette	<ul> <li>1.7 Gathering and providing basic information in response to workplace requirements</li> <li>1.8 Basic business writing skills</li> <li>1.9 Interpersonal skills in the workplace.</li> <li>1.10 Active-listening skills</li> </ul>
	1.7 Personal interaction is carried out clearly and concisely		
2. Perform duties following workplace instructions	<ul> <li>2.1 Written notices and instructions are read and interpreted in accordance with organizational guidelines</li> <li>2.2 Routine written instruction is followed based on established procedures</li> <li>2.3 Feedback is given to workplace supervisor- based instructions/</li> </ul>	<ul> <li>2.1 Effective verbal and non-verbal communication</li> <li>2.2 Different modes of communication</li> <li>2.3 Medium of communication in the workplace</li> <li>2.4 Organizational/ Workplace policies</li> <li>2.5 Communication procedures and systems</li> <li>2.6 Lines of communication</li> </ul>	<ul> <li>2.1 Following simple spoken instructions</li> <li>2.2 Performing routine workplace duties following simple written notices</li> <li>2.3 Participating in workplace meetings and discussions</li> <li>2.4 Completing work- related documents</li> <li>2.5 Estimating, calculating and recording routine workplace measures</li> <li>2.6 Relating/ Responding to people</li> </ul>

ELEMENTS	PERFORMANCE CRITERIA Italicized terms are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
	<ul> <li>information received.</li> <li>2.4 Workplace interactions are conducted in a courteous manner</li> <li>2.5 Where necessary, clarifications about routine workplace procedures and matters concerning conditions of employment are sought and asked from appropriate sources</li> <li>2.6 Meetings outcomes are interpreted and implemented</li> </ul>	<ul> <li>2.7 Technology relevant to the enterprise and the individual's work responsibilities</li> <li>2.8 Effective questioning techniques (clarifying and probing)</li> <li>2.9 Workplace etiquette</li> </ul>	of various levels in the workplace 2.7 Gathering and providing information in response to workplace requirements 2.8 Basic questioning/querying 2.9 Skills in reading for information 2.10 Skills in locating
3. Complete relevant work- related documents	<ul> <li>3.1 Range of <i>forms</i> relating to conditions of employment are completed accurately and legibly</li> <li>3.2 Workplace data is recorded on standard workplace forms and documents</li> </ul>	<ul> <li>3.1 Effective verbal and non-verbal communication</li> <li>3.2 Different modes of communication</li> <li>3.3 Workplace forms and documents</li> <li>3.4 Organizational/ Workplace policies</li> </ul>	<ul> <li>3.1 Completing work-related documents</li> <li>3.2 Applying operations of addition, subtraction, division and multiplication</li> <li>3.3 Gathering and providing information in response to workplace requirements</li> </ul>

ELEMENTS	PERFORMANCE CRITERIA Italicized terms are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
	<ul> <li>3.3 Errors in recording information on forms/ documents are identified and acted upon</li> <li>3.4 Reporting requirements to supervisor are completed according to organizational quidelines</li> </ul>	<ul> <li>3.5 Communication procedures and systems</li> <li>3.6 Technology relevant to the enterprise and the individual's work responsibilities</li> </ul>	3.4 Effective record keeping skills

VARIABLES	RANGE		
1. Appropriate	May include:		
sources	1.1. Team members		
	1.2. Supervisor/Department Head		
	1.3. Suppliers		
	1.4. Trade personnel		
	1.5. Local government		
	1.6. Industry bodies		
2. Medium	May include:		
	2.1. Memorandum		
	2.2. Circular		
	2.3. Notice		
	2.4. Information dissemination		
	2.5. Follow-up or verbal instructions		
	2.6. Face-to-face communication		
	2.7. Electronic media (disk files, cyberspace)		
3. Storage	May include:		
	3.1. Manual filing system		
	3.2. Computer-based filing system		

4. Workplace	May include:		
interactions	4.1. Face-to-face		
	4.2. Telephone		
	4.3. Electronic and two-way radio		
	4.4. Written including electronic means, memos, instruction and forms		
	4.5. Non-verbal including gestures, signals, signs and diagrams		
5. Forms	May include:		
	5.1 HR/Personnel forms, telephone message		
	forms, safety reports		

1.	Critical aspects of	Assessment requires evidence that the candidate:		
	Competency	1.1. Prepared written communication following		
		standard format of the organization.		
		1.2. Accessed information using workplace		
		communication equipment/systems.		
		1.3. Made use of relevant terms as an aid to		
		transfer information effectively.		
		1.4. Conveyed information effectively adopting formal		
		or informal communication		
2.	Resource	The following resources should be provided:		
	Implications	2.1. Fax machine		
		2.2. Telephone		
		2.3. Notebook		
		2.4. Writing materials		
		2.5. Computer with Internet connection		
3.	Methods of	Competency in this unit may be assessed through:		
	Assessment	3.1. Demonstration with oral questioning		
		3.2. Interview		
		3.3. Written test		
		3.4. Third-party report		
4.	Context for	4.1 Competency may be assessed individually in the		
	Assessment	actual workplace or through an accredited		
		institution		

UNIT OF COMPETENCY

: WORK IN A TEAM ENVIRONMENT

UNIT CODE : 400311211

UNIT DESCRIPTOR

This unit covers the skills, knowledge and attitudes to : identify one's roles and responsibilities as a member of a team.

ELEMENTS	PERFORMANCE CRITERIA Italicized terms are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Describe team role and scope	<ul> <li>1.1 The role and objective of the team is identified from available sources of information</li> <li>1.2 Team parameters, reporting relationships and responsibilities are identified from team discussions and appropriate external sources</li> </ul>	<ul> <li>1.1 Group structure</li> <li>1.2 Group development</li> <li>1.3 Sources of information</li> </ul>	<ul> <li>1.1 Communicating with others, appropriately consistent with the culture of the workplace</li> <li>1.2 Developing ways in improving work structure and performing respective roles in the group or organization</li> </ul>
2. Identify one's role and responsibility within a team	<ul> <li>2.1 Individual roles and responsibilities within the team environment are identified</li> <li>2.2 Roles and objectives of the team are identified from available <i>sources of</i></li> </ul>	<ul> <li>2.1 Team roles and objectives</li> <li>2.2 Team structure and parameters</li> <li>2.3 Team Development</li> <li>2.4 Sources of information</li> </ul>	<ul> <li>2.1 Communicating with others, appropriately consistent with the culture of the workplace</li> <li>2.2 Developing ways in improving work structure and performing respective roles in the group or</li> </ul>

ELEMENTS	PERFORMANCE CRITERIA Italicized terms are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
	2.3 Team parameters, reporting relationships and responsibilities are identified based on team discussions and appropriate external sources		organization
3. Work as a team member	<ul> <li>3.1 Effective and appropriate forms of communications are used and interactions undertaken with team members based on company practices.</li> <li>3.2 Effective and appropriate contributions made to complement team activities and objectives, based on <i>workplace context</i></li> </ul>	<ul> <li>3.1 Communication Process</li> <li>3.2 Workplace communication protocol</li> <li>3.3 Team planning and decision making</li> <li>3.4 Team thinking</li> <li>3.5 Team roles</li> <li>3.6 Process of team development</li> <li>3.7 Workplace context</li> </ul>	<ul> <li>3.1 Communicating appropriately, consistent with the culture of the workplace</li> <li>3.2 Interacting effectively with others</li> <li>3.3 Deciding as an individual and as a group using group think strategies and techniques</li> <li>3.4 Contributing to Resolution of issues and concerns</li> </ul>
	<ul> <li>3.3 Protocols in reporting are observed based on standard company practices</li> <li>3.4 Contribute to the development of team work plans</li> </ul>		

ELEMENTS	PERFORMANCE CRITERIA Italicized terms are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
	based on an understanding of team's role and objectives		

VARIABLE	RANGE		
1. Role and objective	May include:		
of team	1.1. Work activities in a team environment		
	with enterprise or specific sector		
	1.2. Limited discretion, initiative and		
	judgement maybe demonstrated on the		
	job, either individually or in a team		
	environment		
2. Sources of	May include:		
information	2.1. Standard operating and/or other		
	workplace procedures		
	2.2. Job procedures		
	2.3. Machine/equipment		
	manufacturer's specifications		
	and instructions		
	2.4. Organizational or external personnel		
	2.5. Client/supplier instructions		
	2.6. Quality standards		
	2.7. OHS and environmental standards		
3. Workplace context	May include:		
	3.1. Work procedures and practices		
	3.2. Conditions of work environments		
	3.3. Legislation and industrial agreements		
	3.4. Standard work practice including the		
	storage, safe handling and disposal of		
	chemicals		
	3.5. Safety, environmental, housekeeping		
	and quality guidelines		

1. Critical aspects of	Assessment requires evidence that the candidate:
Competency	1.1. Worked in a team to complete workplace activity
	1.2. Worked effectively with others
	1.3. Conveyed information in written or oral form
	1.4. Selected and used appropriate workplace language
	1.5. Followed designated work plan for the job
2. Resource	The following resources should be provided:
Implications	2.1. Access to relevant workplace or appropriately
	simulated environment where assessment can take
	place
	2.2. Materials relevant to the proposed activity or tasks
3. Methods of	Competency in this unit may be assessed through:
Assessment	3.1 Role play involving the participation of individual
	member to the attainment of organizational goal
	3.2 Case studies and scenarios as a basis for
	discussion of issues and strategies in teamwork
	3.3 Socio-drama and socio-metric methods
	3.4 Sensitivity techniques
	3.5 Written Test
4. Context for	4.1. Competency may be assessed in workplace or in a
Assessment	simulated workplace setting
	4.2. Assessment shall be observed while task are being
	undertaken whether individually or in group

UNIT OF COMPETENCY

#### : SOLVE/ADDRESS GENERAL WORKPLACE PROBLEMS

#### UNIT CODE : 400311212

UNIT DESCRIPTOR

This unit covers the knowledge, skills and attitudes required to apply problem-solving techniques to : determine the origin of problems and plan for their resolution. It also includes addressing procedural problems through documentation, and referral.

ELEMENTS	PERFORMANCE CRITERIA Italicized terms are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Identity routine problems	<ul> <li>1.1 Routine problems or procedural problem areas are identified</li> <li>1.2Problems to be investigated are defined and determined</li> <li>1.3Current conditions of the problem are identified and documented</li> </ul>	<ul> <li>1.1 Current industry hardware and software products and services</li> <li>1.2 Industry maintenance, service and helpdesk practices, processes and procedures</li> <li>1.3 Industry standard diagnostic tools</li> <li>1.4 Malfunctions and resolutions</li> </ul>	<ul> <li>1.1 Identifying current industry hardware and software products and services</li> <li>1.2 Identifying current industry maintenance, services and helpdesk practices, processes and procedures.</li> <li>1.3 Identifying current industry standard diagnostic tools</li> <li>1.4 Describing common malfunctions and resolutions.</li> <li>1.5 Determining the root cause of a routine malfunction</li> </ul>

ELEMENTS	PERFORMANCE CRITERIA Italicized terms are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
2. Look for	2.1 Potential	2.1 Current industry	2.1 Identifying
solutions to routine	solutions to problem are	hardware and software products	current industry
problems	identified	and services	software
	2.2 Recommendations about possible	2.2 Industry service and helpdesk	products and services
	solutions are developed,	practices, processes and	2.2 Identifying services and
	documented, ranked and	procedures	helpdesk practices.
	presented to appropriate person	2.3 Operating systems	processes and
	for decision	2.4 Industry standard	procedures.
		diagnostic tools	2.3 Identifying
		2.5 Malfunctions and resolutions.	system
			2.4 Identifying
		2.6 Root cause	current industry
		analysis	diagnostic tools
			2.5 Describing
			common
			and resolutions.
			2.6 Determining the
			root cause of a
			malfunction

ELEMENTS	PERFORMANCE CRITERIA Italicized terms are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
3. Recommen d solutions to problems	<ul> <li>3.1 Implementation of solutions are <i>planned</i></li> <li>3.2 Evaluation of implemented solutions are planned</li> <li>3.3 Recommended solutions are documented and submit to appropriate person for confirmation</li> </ul>	<ul><li>3.1 Standard procedures</li><li>3.2 Documentation produce</li></ul>	<ul> <li>3.1 Producing documentation that recommends solutions to problems</li> <li>3.2 Following established procedures</li> </ul>

VARIABLE	RANGE	
1. Problems/Procedural	May include:	
Problem	<ol> <li>Routine/non – routine processes and quality problems</li> </ol>	
	1.2 Equipment selection, availability and failure	
	1.3 Teamwork and work allocation problem	
	1.4 Safety and emergency situations and incidents	
	1.5 Work-related problems outside of own	
	work area	
2. Appropriate person	May include:	
	2.1 Supervisor or manager	
	2.2 Peers/work colleagues	
	2.3 Other members of the organization	
3. Document	May include:	
	3.1 Electronic mail	
	3.2 Briefing notes	
	3.3 Written report	
	3.4 Evaluation report	
4. Plan	May include:	
	4.1 Priority requirements	
	4.2 Co-ordination and feedback requirements	
	4.3 Safety requirements	
	4.4 Risk assessment	
	4.5 Environmental requirements	

1. Critical aspects	Assessment requires evidence that the candidate:
of Competency	1.1 Determined the root cause of a routine problem
	1.2 Identified solutions to procedural problems.
	1.3 Produced documentation that recommends
	solutions to problems.
	1.4 Followed established procedures.
	1.5 Referred unresolved problems to support persons.
2. Resource	2.1 Assessment will require access to a workplace over
Implications	an extended period, or a suitable method of
	gathering evidence of operating ability over a range
	of situations.
3. Methods of	Competency in this unit may be assessed through:
Assessment	3.1 Case Formulation
	3.2 Life Narrative Inquiry
	3.3 Standardized test
	The unit will be assessed in a holistic manner as is practical and may be integrated with the assessment of other relevant units of competency. Assessment will occur over a range of situations, which will include disruptions to normal, smooth operation. Simulation may be required to allow for timely assessment of parts of this unit of competency. Simulation should be based on the actual workplace and will include walk through of the relevant competency components.
4. Context for	4.1 Competency may be assessed individually in the
Assessment	actual workplace or simulation environment in TESDA
	accredited institutions.

UNIT OF COMPETENCY	: DEVELOP CAREER AND LIFE DECISIONS
UNIT CODE	<sup>:</sup> 400311213
UNIT DESCRIPTOR	This unit covers the knowledge, skills, and attitudes in managing one's emotions, developing reflective practice, and boosting self-confidence and developing self-regulation.

	PERFORMANCE		
	CRITERIA	REQUIRED	REQUIRED
ELEMENT	Italicized terms are	KNOWLEDGE	SKILLS
	elaborated in the		
	Range of Variables		
1. Manage one's	1.1 Self-	1.1 Self-	1.1 Managing
emotion	management	management	properly one's
	strategies are	strategies that	emotions and
	identified	assist in	recognizing
		hehavior and	cannot be
	1.2 Skills to work	achieving	changed and
	Independently and	personal and	accept them and
	to show initiative,	learning goals	remain
		(e.g. Nine self-	professional
	conscientious, and	management	
	face of cotbacks	strategies	1.2 Developing self-
	and frustrations	according to	discipline, working
	and inditiations	Robert Kelley)	independently and
	are developed	1.2 Enchlore and	showing initiative
	1.3 Techniques for	1.2 Enablers and	to achieve
	effectively		personal and
	handling	nersonal and	career goals
	negative	career goals	
	emotions and	Saleer geale	1.3 Showing
	unpleasant	1.3Techniques in	resilience in the
	situation in the	handling	face of setbacks
	workplace are	negative	and frustrations
	examined	emotions and	and other negative
		unpleasant	emotions and
		situation in the	unpleasant
		workplace such	situations in the
		as frustration,	workplace
		anger, worry,	
		anxiety, etc.	

		PERFORMANCE		
		CRITERIA	REQUIRED	REQUIRED
	ELEMENT	<i>Italicized terms</i> are	KNOWLEDGE	SKILLS
		elaborated in the		
		Range of Variables		
2.	Develop	2.1 Personal	2.1 Basic SWOT	2.1 Using the basic
	reflective	strengths and	analysis	SWOT analysis
	practice	achievements,		as self-
		based on self-	2.2 Strategies to	assessment
		assessment	improve one's	strategy
		strategies and	attitude in the	
		teacher	workplace	2.2 Developing
		feedback are		reflective practice
		contemplated	2.3 Gibbs'	through
			Reflective	realization of
		2.2 Progress when	Cycle/Model	limitations, likes/
		seeking and	(Description,	dislikes; through
		responding to	Feelings,	showing of self-
		feedback from	Evaluation,	confidence
		teachers to assist	Analysis,	
		them in	Conclusion, and	2.3 Demonstrating
		consolidating	Action plan)	self-acceptance
		strengths.		and being able to
		addressing		accept challenges
		weaknesses and		
		fulfilling their		
		potential are		
		monitored		
		2.3 Outcomes of		
		personal and		
		academic		
		challenges by		
		reflecting on		
		previous problem		
		solving and		
		decision making		
		strategies and		
		feedback from		
		peers and		
		teachers are		
		predicted		

3.	Boost self-	3.1 Efforts for	3.1 Four	3.1 Performing effective
	confidence and develop self- regulation	continuous self- improvement are demonstrated	components of self-regulation based on Self- Regulation Theory (SRT)	communication skills – reading, writing, conversing skills
		productive tendencies at work are eliminated	3.2 Personality development concepts	3.2Showing affective skills – flexibility, adaptability, etc.
		3.3 Positive outlook in life are maintained.	3.3 Self-help concepts (e. g., 7 Habits by Stephen Covey, transactional analysis, psycho-spiritual concepts)	3.3 Self-assessment for determining one's strengths and weaknesses

VARIABLE	RANGE		
1. Self-	May include:		
management	1.1 Seeking assistance in the form of job coaching or		
strategies	mentoring		
	1.2 Continuing dialogue to tackle workplace grievances		
	1.3 Collective negotiation/bargaining for better		
	working conditions		
	1.4 Share your goals to improve with a trusted co- worker or supervisor		
	1.5 Make a negativity log of every instance when you		
	catch yourself complaining to others		
	1.6 Make lists and schedules for necessary activities		
2. Unpleasant	May include:		
situation	2.1 Job burn-out		
	2.2 Drug dependence		
	2.3 Sulking		

1. (	Critical aspects of	Assessment requires evidence that the candidate:		
C	Competency	1.1	Express emotions appropriately	
		1.2	Work independently and show initiative	
		1.3	Consistently demonstrate self-confidence and	
			self- discipline	
2. F	Resource	The	following resources should be provided:	
I	Implications	2.1.	Access to workplace and resource s	
		2.2.	Case studies	
3. N	Methods of	Com	petency in this unit may be assessed through:	
F	Assessment	3.1.	Demonstration or simulation with oral questioning	
		3.2.	Case problems involving work improvement	
			and sustainability issues	
		3.3.	Third-party report	
4. 0	Context for	4.1	Competency assessment may occur in workplace or	
A	Assessment		any appropriately simulated environment	

UNIT OF COMPETENCY	: CONTRIBUTE TO WORKPLACE INNOVATION
UNIT CODE	: 400311214
UNIT DESCRIPTOR	<ul><li>This unit covers the knowledge, skills and attitudes</li><li>required to make a pro-active and positive contribution to workplace innovation.</li></ul>

ELEMENTS	PERFORMANCE CRITERIA Italicized terms are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
<ol> <li>Identify opportunities to do things better</li> </ol>	1.1 <b>Opportunities</b> for improvement are identified proactively in own area of work.	1.1 Roles of individuals in suggesting and making improvements.	<ol> <li>1.1 Identifying opportunities to improve and to do things better. Involvement.</li> </ol>
	1.2 <i>Information</i> are gathered and reviewed which may be relevant to ideas and which might assist in gaining	<ul><li>1.2 Positive impacts and challenges in innovation.</li><li>1.3 Types of changes and responsibility.</li></ul>	1.2 Identifying the positive impacts and the challenges of change and innovation.
	support for idea.	1.4 Seven habits of highly effective people.	1.3 Identifying examples of the types of changes that are within and outside own scope of responsibility
2. Discuss and develop ideas with others	2.1 People who could provide input to ideas for improvements are identified.	2.1 Roles of individuals in suggesting and making improvements.	2.1 Identifying opportunities to improve and to do things better.
	<ul> <li>2.2 Ways of approaching people to begin sharing ideas are selected.</li> <li>2.3 Meeting is set</li> </ul>	<ul> <li>2.2 Positive impacts and challenges in innovation.</li> <li>2.3 Types of changes and</li> </ul>	2.2 Identifying the positive impacts and the challenges of change and

ELEMENTS	PERFORMANCE CRITERIA Italicized terms are elaborated in the	REQUIRED KNOWLEDGE	REQUIRED SKILLS
	Range of Variables with relevant	responsibility.	innovation.
	<ul> <li>people.</li> <li>2.4 Ideas for follow up are review and selected based on feedback.</li> <li>2.5 <i>Critical inquiry method</i> is used to discuss and develop ideas with others.</li> </ul>	2.4 Seven habits of highly effective people.	<ul> <li>2.3 Providing examples of the types of changes that are within and outside own scope of responsibility</li> <li>2.4 Communicating ideas for change through small group discussions and meetings.</li> </ul>
<ol> <li>Integrate ideas for change in the workplace.</li> </ol>	3.1 Critical inquiry method is used to integrate different ideas for change of key people.	3.1 Roles of individuals in suggesting and making improvements.	3.1 Identifying opportunities to improve and to do things better. Involvement.
	3.2 Summarizing, analyzing and generalizing skills are used to extract salient points in the pool of ideas.	<ul> <li>3.2 Positive impacts and challenges in innovation.</li> <li>3.3 Types of changes and responsibility.</li> </ul>	3.2 Identifying the positive impacts and the challenges of change and innovation.
	3.3 <i>Reporting skills</i> are likewise used to communicate results.	3.4 Seven habits of highly effective people.	3.3 Providing examples of the types of changes that are within and outside own
	3.4 Current Issues and concerns	3.5 Basic research skills.	scope of responsibility.
	on the systems, processes and procedures, as well as the need for simple innovative		3.4 Communicating ideas for change through small group discussions and meetings.

ELEMENTS	PERFORMANCE CRITERIA Italicized terms are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
	practices are identified.		3.5 Demonstrating skills in analysis and interpretation of data.

VARIABLES	RANGE	
1. Opportunities for improvement	May include: 1.1 Systems. 1.2 Processes. 1.3 Procedures. 1.4 Protocols. 1.5 Codes. 1.6 Practices.	
2. Information	<ul> <li>May include:</li> <li>2.1 Workplace communication problems.</li> <li>2.2 Performance evaluation results.</li> <li>2.3 Team dynamics issues and concerns.</li> <li>2.4 Challenges on return of investment</li> <li>2.5 New tools, processes and procedures.</li> <li>2.6 New people in the organization.</li> </ul>	
3. People who could provide input	<ul> <li>May include:</li> <li>3.1 Leaders.</li> <li>3.2 Managers.</li> <li>3.3 Specialists.</li> <li>3.4 Associates.</li> <li>3.5 Researchers.</li> <li>3.6 Supervisors.</li> <li>3.7 Staff.</li> <li>3.8 Consultants (external)</li> <li>3.9 People outside the organization in the same field or similar expertise/industry.</li> <li>3.10 Clients</li> </ul>	
4. Critical inquiry method	<ul> <li>May include:</li> <li>4.1 Preparation.</li> <li>4.2 Discussion.</li> <li>4.3 Clarification of goals.</li> <li>4.4 Negotiate towards a Win-Win outcome.</li> <li>4.5 Agreement.</li> <li>4.6 Implementation of a course of action.</li> <li>4.7 Effective verbal communication. See our pages: Verbal Communication and Effective Speaking.</li> <li>4.8 Listening.</li> <li>4.9 Reducing misunderstandings is a key part of effective negotiation.</li> <li>4.10 Rapport Building.</li> </ul>	

	<ul> <li>4.11 Problem Solving.</li> <li>4.12 Decision Making.</li> <li>4.13 Assertiveness.</li> <li>4.14 Dealing with Difficult Situations.</li> </ul>
5. Reporting skills	May include:
	<ul> <li>5.1 Data management.</li> <li>5.2 Coding.</li> <li>5.3 Data analysis and interpretation.</li> <li>5.4 Coherent writing.</li> <li>5.5 Speaking.</li> </ul>

1 Critical aspects of	Assessment requires evidence that the		
Competency	candidato:		
Competency	1.1 Identified opportunition to do things better		
	1.1 Identified opportunities to do trings better.		
	1.2 Discussed and developed ideas with others		
	on now to contribute to workplace		
	Innovation.		
	1.3 Integrated ideas for change in the workplace.		
	1.4 Analyzed and reported rooms for		
	innovation and learning in the workplace.		
2. Resource	The following resources should be provided:		
Implications	2.1 Pens, papers and writing implements.		
	2.2 Cartolina.		
	2.3 Manila papers.		
3. Methods of	Competency in this unit may be assessed		
Assessment	through:		
	3.1 Psychological and behavioral Interviews.		
	3.2 Performance Evaluation.		
	3.3 Life Narrative Inquiry.		
	3.4 Review of portfolios of evidence and third-		
	party workplace reports of on-the-job		
	performance.		
	3.5 Sensitivity analysis.		
	3.6 Organizational analysis.		
	3.7 Standardized assessment of character		
	strengths and virtues applied.		
4. Context for	4.1 Competency may be assessed individually in		
Assessment	the actual workplace or simulation		
	environment in TESDA accredited		
	institutions.		

UNIT OF COMPETENCY

#### : PRESENT RELEVANT INFORMATION

#### UNIT CODE : 400311215

UNIT DESCRIPTOR

This unit covers the knowledge, skills and attitudes Required to present data/information appropriately.

ELEMENTS	PERFORMANCE CRITERIA Italicized terms are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Gather data/ information	1.1 Evidence, facts and information are collected	<ul><li>1.1 Organisational protocols</li><li>1.2 Confidentiality</li></ul>	1.1 Describing organisational protocols relating to client liaison
	1.2 Evaluation, terms of reference and conditions are reviewed to determine	<ul><li>1.3 Accuracy</li><li>1.4 Business mathematics and statistics</li></ul>	<ul><li>1.2 Protecting Confidentiality</li><li>1.3 Describing Accuracy</li></ul>
	whether data/informatio n falls within project scope	<ul> <li>1.5 Data analysis techniques/proc edures</li> <li>1.6 Reporting requirements to</li> </ul>	1.4 Computing business mathematics and statistics
		a range of audiences 1.7 Legislation, policy and	1.5 Describing data analysis techniques/ procedures
		procedures relating to the conduct of evaluations	1.6 Reporting requirements to a range of audiences
		1.8 Organisational values, ethics and codes of conduct	1.7 Stating legislation, policy and procedures relating to the conduct of

ELEMENTS	PERFORMANCE CRITERIA Italicized terms are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
			evaluations 1.8 Stating organisational values, ethics and codes of conduct
2. Assess gathered data/ information	2.1 Validity of data/ information is assessed	2.1 Business mathematics and statistics	2.1 Computing business mathematics and statistics
	2.2 Analysis techniques are applied to assess data/ information.	<ul> <li>2.2 Data analysis techniques/ procedures</li> <li>2.3 Reporting requirements to</li> </ul>	2.2 Describing data analysis techniques/ procedures
	2.3 Trends and anomalies are identified	a range of audiences 2.4 Legislation,	2.3 Reporting requirements to a range of audiences
	2.4 <b>Data analysis</b> <b>techniques</b> and procedures are documented	policy and procedures relating to the conduct of evaluations	2.4 Stating legislation, policy and procedures
	2.5 Recommendatio n s are made on areas of	2.5 Organisational values, ethics	relating to the conduct of evaluations
	improvement	conduct	2.5 Stating organisational values, ethics and codes of conduct
3. Record and present information	3.1 Studied data/information are recorded.	3.1 Data analysis techniques/ procedures	3.1 Describing data analysis techniques/ procedures
	3.2 Recommendatio ns are analysed for action to	3.2 Reporting requirements to a range of	3.2 Reporting requirements

ELEMENTS	PERFORMANCE CRITERIA Italicized terms are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
	<ul> <li>ensure they are compatible with the project's scope and terms of reference.</li> <li>3.3 Interim and final reports are analysed and outcomes are compared to the criteria established at the outset.</li> <li>3.4 Findings are presented to the criteria terms of the criteria terms of the criteria terms of terms o</li></ul>	<ul> <li>audiences</li> <li>3.3 Legislation, policy and procedures relating to the conduct of evaluations</li> <li>3.4 Organisational values, ethics and codes of conduct</li> </ul>	to a range of audiences 3.3 Stating legislation, policy and procedures relating to the conduct of evaluations 3.4 Stating organisationa I values, ethics and codes of conduct practices
	stakeholders.		practices

VARIABLES	RANGE
1. Data analysis techniques	May include:
	1.1. Domain analysis
	1.2. Content analysis
	1.3. Comparison technique

4 Oritical concete of	According to a state of the conditions
	Assessment requires evidence that the candidate:
Competency	1.1 Determine data / information
	1.2 Studied and applied gathered data/information
	1.3 Recorded and studied studied data/information
	These aspects may be best assessed using a range of scenarios what ifs as a stimulus with a walk through forming part of the response. These assessment activities should include a range of problems, including new, unusual and improbable situations that may have happened.
2. Resource	Specific resources for assessment
Implications	2.1. Evidence of competent performance should be obtained by observing an individual in an information management role within the workplace or operational or simulated environment.
3. Methods of	Competency in this unit may be assessed through:
Assessment	3.1. Written Test
	3.2. Interview
	3.3. Portfolio
	The unit will be assessed in a holistic manner as is practical and may be integrated with the assessment of other relevant units of competency. Assessment will occur over a range of situations, which will include disruptions to normal, smooth operation. Simulation may be required to allow for timely assessment of parts of this unit of competency. Simulation should be based on the actual workplace and will include walk through of the relevant competency components.
4. Context for Assessment	4.1. In all workplace, it may be appropriate to assess this unit concurrently with relevant teamwork or operation units.

#### UNIT OF COMPETENCY : PRACTICE OCCUPATIONAL SAFETY AND HEALTH POLICIES AND PROCEDURES

#### UNIT CODE : 400311216

# UNIT DESCRIPTOR This unit covers the knowledge, skills and attitudes required to identify OSH compliance requirements, prepare OSH requirements for compliance, perform tasks in accordance with relevant OSH policies and procedures

ELEMENTS	PERFORMANCE CRITERIA Italicized terms are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Identify OSH compliance requirements	<ul> <li>1.1 Relevant OSH requirements, regulations, policies and procedures are identified in accordance with workplace policies and procedures</li> <li>1.2 OSH activity non- conformities are conveyed to appropriate personnel</li> </ul>	<ol> <li>1.1 OSH preventive and control requirements</li> <li>1.2 Hierarchy of Controls</li> <li>1.3 Hazard Prevention and Control</li> <li>1.4 General OSH principles</li> <li>1.5 Work standards and procedures</li> </ol>	<ul> <li>1.1. Communicatio n skills</li> <li>1.2. Interpersonal skills</li> <li>1.3. Critical thinking skills</li> <li>1.4. Observation skills</li> </ul>
	1.3 <b>OSH</b> preventive and control requirements are identified in accordance with OSH work policies and procedures	<ul> <li>1.6 Safe handling procedures of tools, equipment and materials</li> <li>1.7 Standard emergency plan and</li> </ul>	

ELEMENTS	PERFORMANCE CRITERIA Italicized terms are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
		procedures in the workplace	
2. Prepare OSH requirement s for compliance	<ul> <li>2.1 OSH work activity material, tools and equipment requirements are identified in accordance with workplace policies and procedures</li> <li>2.2 Required OSH materials, tools and equipment are acquired in accordance with workplace policies and procedures</li> <li>2.3 Required OSH materials, tools and equipment are arranged/ placed in accordance with OSH work</li> </ul>	<ul> <li>2.1 Resources necessary to execute hierarchy of controls</li> <li>2.2 General OSH Principles</li> <li>2.3 Work standards and procedures</li> <li>2.4 Safe handling procedures of tools, equipment and materials</li> <li>2.5 Different OSH control measures</li> </ul>	<ul> <li>2.1. Communication skills</li> <li>2.2. Estimation skills</li> <li>2.3. Interpersonal skills</li> <li>2.4. Critical thinking skills</li> <li>2.5. Observation skills</li> <li>2.6. Material, tool and equipment identification skills</li> </ul>
3. Perform tasks in accordance with relevant OSH policies and procedures	standards 3.1 Relevant OSH work procedures are identified in accordance with workplace policies and	<ul> <li>3.1. OSH work standards</li> <li>3.2. Industry related work activities</li> </ul>	<ul> <li>3.1. Communication skills</li> <li>3.2. Interpersonal skills</li> <li>3.3. Troubleshooting</li> </ul>

ELEMENTS	PERFORMANCE CRITERIA Italicized terms are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
	procedures 3.2 Work Activities are executed in accordance with OSH work	<ul> <li>3.3. General OSH principles</li> <li>3.4. OSH Violations Non- compliance</li> </ul>	skills 3.4. Critical thinking skills 3.5. Observation skills
	3.3 <i>Non-</i> <i>compliance</i> <i>work activities</i> are reported to appropriate personnel	activities	

VARIABLE	RANGE	
1. OSH Requirements,	May include:	
Regulations, Policies	1.1 Clean Air Act	
and Procedures	1.2 Building code	
	1.3 National Electrical and Fire Safety Codes	
	1.4 Waste management statutes and rules	
	1.5 Permit to Operate	
	1.6 Philippine Occupational Safety and Health	
	Standards	
	1.7 Department Order No. 13 (Construction Safety	
	and Health)	
	1.8 ECC regulations	

2. Appropriate Personnel	May include:
	2.1 Manager
	2.2 Safety Officer
	2.3 EHS Offices
	2.4 Supervisors
	2.5 Team Leaders
	2.6 Administrators
	2.7 Stakeholders
	2.8 Government Official
	2.9 Key Personnel
	2.10 Specialists
	2.11 Himself
3. OSH Preventive and	May include:
Control Requirements	3.1 Resources needed for removing hazard
	effectively
	3.2 Resources needed for substitution or
	replacement
	3.3 Resources needed to establishing
	engineering controls
	3.4 Resources needed for enforcing administrative
	controls
	3.5 Personal Protective equipment
4. Non OSH-	May include non-compliance or observance of the
Compliance Work	following safety measures:
Activities	4.1 Violations that may lead to serious
	physical harm or death
	4.2 Fall Protection
	4.3 Hazard Communication
	4.4 Respiratory Protection
	4.5 Power Industrial Trucks
	4.6 Lockout/Tag-out
	4.7 Working at heights (use of ladder, scaffolding)
	4.8 Electrical Wiring Methods
	4.9 Machine Guarding
	4.10 Electrical General Requirements
	4.11 Asbestos work requirements
	4.12 Excavations work requirements
1. Critical aspects of	Assessment requires evidence that the
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Competency	candidate:
	1.1. Convey OSH work non-conformities
	to appropriate personnel
	1.2. Identify OSH preventive and control
	requirements in accordance with OSH
	work policies and procedures
	1.3. Identify OSH work activity material, tools
	and equipment requirements in
	accordance with workplace policies and
	procedures
	1.4. Arrange/Place required OSH materials, tools
	and equipment in accordance with OSH work
	standards
	1.5. Execute work activities in accordance with
	OSH work standards
	1.6. Report OSH activity non-compliance
	work activities to appropriate personnel
2. Resource Implications	The following resources should be provided:
	2.1 Facilities, materials tools and
	equipment necessary for the activity
3. Methods of Assessment	Competency in this unit may be assessed
	through:
	3.1 Observation/Demonstration with oral
	3.2 I hird party report
4. Context for Assessment	4.1 Competency may be assessed in the
	work place or in a simulated work place
	setting

# UNIT OF COMPETENCYEXERCISE EFFICIENT AND EFFECTIVE<br/>SUSTAINABLE PRACTICES IN THE WORKPLACEUNIT CODE: 400311217<br/>This unit covers knowledge, skills and attitude to identify<br/>the efficiency and effectiveness of resource utilization,<br/>: determine causes of inefficiency and/or ineffectiveness<br/>of resource utilization, and convey inefficient and<br/>ineffective environmental practices.

		REQUIRED	REQUIRED
ELEMENTS	Italicized terms	KNOWLEDGE	SKILLS
_	are elaborated in		
	the Range of		
	Variables		
1. Identify the	1.1 Required resource	1.1. Importance of	1.1 Recording Skills
efficiency	utilization in the	Environmental	1 OM/riting Chille
effectivene	workplace is	Literacy	1.2 Writing Skills
ss of		1.2 Environmontal	1.3 Innovation
resource	techniques	Work Procedures	Skills
utilization			
	1.2 Data are recorded	1.3. Waste Minimization	
	in accordance with		
	workplace protocol	1.4. Efficient Energy	
		Consumptions	
	1.3 Recorded data are		
	compared to		
	officiency and		
	effectiveness of		
	resource utilization		
	according to		
	established		
	environmental		
	work procedures		

ELEMENTS	PERFORMANCE CRITERIA Italicized terms are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
2. Determine causes of inefficiency and/or ineffectiven ess of resource utilization	<ul> <li>2.1 Potential causes of inefficiency and/or ineffectiveness are listed</li> <li>2.2 Causes of inefficiency and/or ineffectiveness are identified through deductive reasoning</li> <li>2.3 Identified causes of inefficiency and/or ineffectiveness are</li> </ul>	2.1 Causes of environmental inefficiencies and ineffectiveness	<ul> <li>2.1 Deductive Reasoning Skills</li> <li>2.2 Critical thinking</li> <li>2.3 Problem Solving</li> <li>2.4 Observation Skills</li> </ul>
3. Convey inefficient and ineffective environment al practices	<ul> <li>validated thru         established         environmental         procedures</li> <li>3.1 Efficiency and         effectiveness of         resource utilization         are reported to         <i>appropriate         personnel</i></li> <li>3.2 Concerns related         resource         utilization are</li> </ul>	<ul> <li>3.1 Appropriate Personnel to address the environmental hazards</li> <li>3.2 Environmental corrective actions</li> </ul>	<ul> <li>3.1 Written and Oral Communication Skills</li> <li>3.2 Critical thinking</li> <li>3.3 Problem Solving</li> <li>3.4 Observation Skills</li> </ul>
	discussed with appropriate personnel 3.3 Feedback on information/ concerns raised are clarified with appropriate personnel		3.5 Practice Environmental Awareness

VARIABLE	RANGE
1. Environmental	May include:
Work Procedures	1.1 Utilization of Energy, Water,
	Fuel Procedures
	1.2 Waster Segregation Procedures
	1.3 Waste Disposal and Reuse Procedures
	1.4 Waste Collection Procedures
	1.5 Usage of Hazardous
	Materials Procedures
	1.6 Chemical Application Procedures
	1.7 Labeling Procedures
2. Appropriate Personnel	May include:
	2.1 Manager
	2.2 Safety Officer
	2.3 EHS Offices
	2.4 Supervisors
	2.5 Team Leaders
	2.6 Administrators
	2.7 Stakeholders
	2.8 Government Official
	2.9 Key Personnel
	2.10 Specialists
	2.11 Himself

1. Critical aspects of	Assessment requires evidence that the candidate:
Competency	1.1. Measured required resource utilization in the
	workplace using appropriate techniques
	1.2. Recorded data in accordance with workplace protocol
	1.3. Identified causes of inefficiency and/or
	ineffectiveness through deductive reasoning
	1.4. Validate the identified causes of inefficiency
	and/or ineffectiveness thru established
	environmental procedures
	1.5. Report efficiency and effectives of resource
	utilization to appropriate personnel
	1.6. Clarify feedback on information/concerns raised
	with appropriate personnel
2. Resource	The following resources should be provided:
2. Resource Implications	The following resources should be provided: 2.1 Workplace
2. Resource Implications	<ul><li>The following resources should be provided:</li><li>2.1 Workplace</li><li>2.2 Tools, materials and equipment relevant to the tasks</li></ul>
2. Resource Implications	<ul> <li>The following resources should be provided:</li> <li>2.1 Workplace</li> <li>2.2 Tools, materials and equipment relevant to the tasks</li> <li>2.3 PPE</li> </ul>
2. Resource Implications	<ul> <li>The following resources should be provided:</li> <li>2.1 Workplace</li> <li>2.2 Tools, materials and equipment relevant to the tasks</li> <li>2.3 PPE</li> <li>2.4 Manuals and references</li> </ul>
<ol> <li>Resource Implications</li> <li>3. Methods of</li> </ol>	The following resources should be provided:2.1Workplace2.2Tools, materials and equipment relevant to the tasks2.3PPE2.4Manuals and referencesCompetency in this unit may be assessed through:
<ul> <li>2. Resource Implications</li> <li>3. Methods of Assessment</li> </ul>	The following resources should be provided:2.1Workplace2.2Tools, materials and equipment relevant to the tasks2.3PPE2.4Manuals and referencesCompetency in this unit may be assessed through:3.1Demonstration
<ul><li>2. Resource Implications</li><li>3. Methods of Assessment</li></ul>	The following resources should be provided:2.1Workplace2.2Tools, materials and equipment relevant to the tasks2.3PPE2.4Manuals and referencesCompetency in this unit may be assessed through:3.1Demonstration3.2Oral questioning
<ul> <li>2. Resource Implications</li> <li>3. Methods of Assessment</li> </ul>	The following resources should be provided:2.1Workplace2.2Tools, materials and equipment relevant to the tasks2.3PPE2.4Manuals and referencesCompetency in this unit may be assessed through:3.1Demonstration3.2Oral questioning3.3Written examination
<ul> <li>2. Resource Implications</li> <li>3. Methods of Assessment</li> <li>4. Context for</li> </ul>	The following resources should be provided:2.1Workplace2.2Tools, materials and equipment relevant to the tasks2.3PPE2.4Manuals and referencesCompetency in this unit may be assessed through:3.1Demonstration3.2Oral questioning3.3Written examination4.1Competency assessment may occur in workplace or
<ul> <li>2. Resource Implications</li> <li>3. Methods of Assessment</li> <li>4. Context for Assessment</li> </ul>	The following resources should be provided:2.1Workplace2.2Tools, materials and equipment relevant to the tasks2.3PPE2.4Manuals and referencesCompetency in this unit may be assessed through:3.1Demonstration3.2Oral questioning3.3Written examination4.1Competency assessment may occur in workplace or any appropriately simulated environment
<ul> <li>2. Resource Implications</li> <li>3. Methods of Assessment</li> <li>4. Context for Assessment</li> </ul>	The following resources should be provided:2.1Workplace2.2Tools, materials and equipment relevant to the tasks2.3PPE2.4Manuals and referencesCompetency in this unit may be assessed through:3.1Demonstration3.2Oral questioning3.3Written examination4.1Competency assessment may occur in workplace or any appropriately simulated environment4.2Assessment shall be observed while task are

UNIT OF COMPETENCY	PRACTICE ENTREPRENEURIAL SKILLS IN THE WORKPLACE
UNIT CODE	<sup>:</sup> 400311218
UNIT DESCRIPTOR	<ul><li>This unit covers the outcomes required to apply</li><li>entrepreneurial workplace best practices and implement cost-effective operations</li></ul>

ELEMENTS	PERFORMANCE CRITERIA Italicized terms are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Apply entrepreneurial workplace best practices	<ul> <li>1.1 Good practices relating to workplace operations are observed and selected following workplace policy.</li> <li>1.2 Quality procedures and practices are complied with according to workplace requirements</li> <li>1.3 Cost-conscious habits in <i>resource</i> <i>utilization</i> are applied based on industry standards.</li> </ul>	<ol> <li>1.1 Workplace best practices, policies and criteria</li> <li>2 Resource Utilization</li> <li>3 Ways in fostering entrepreneurial attitudes:         <ul> <li>Patience</li> <li>Honesty</li> <li>Quality- consciousness</li> <li>Safety- consciousness</li> <li>Resourcefulness</li> </ul> </li> </ol>	<ul> <li>1.1 Communication skills</li> <li>1.2 Complying with quality procedures</li> </ul>

ELEMENTS	PERFORMANCE CRITERIA Italicized terms are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
2. Communicate entrepreneurial workplace best practices	<ul> <li>2.1 Observed good practices relating to workplace operations are communicated to <i>appropriate</i> <i>person</i>.</li> <li>2.2 Observed quality procedures and practices are communicated to appropriate person</li> <li>2.3 Cost-conscious habits in resource utilization are communicated based on industry standards.</li> </ul>	<ul> <li>2.1 Workplace best practices, policies and criteria</li> <li>2.2 Resource Utilization</li> <li>2.3 Ways in fostering entrepreneurial attitudes: <ul> <li>Patience</li> <li>Honesty</li> <li>Quality-consciousness</li> <li>Safety-consciousness</li> <li>Resourcefulness</li> </ul> </li> </ul>	<ul> <li>2.1 Communication skills</li> <li>2.2 Complying with quality procedures</li> <li>2.3 Following workplace communication protocol</li> </ul>
3. Implement cost- effective operations	<ul> <li>3.1 Preservation and optimization of workplace resources is implemented in accordance with enterprise policy</li> <li>3.2 Judicious use of workplace tools, equipment and materials are observed according to manual and work requirements.</li> <li>3.3 Constructive contributions to</li> </ul>	<ul> <li>3.1 Optimization of workplace resources</li> <li>3.2 5S procedures and concepts</li> <li>3.3 Criteria for cost- effectiveness</li> <li>3.4 Workplace Productivity</li> <li>3.5 Impact of entrepreneurial mindset to workplace productivity</li> <li>3.6 Ways in</li> </ul>	<ul> <li>3.1 Implementing preservation and optimizing workplace resources</li> <li>3.2 Observing judicious use of workplace tools, equipment and materials</li> <li>3.3 Making constructive contributions to office operations</li> <li>3.4 Sustaining</li> </ul>

ELEMENTS	PERFORMANCE CRITERIA Italicized terms are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
	office operations are made according to enterprise requirements.	entrepreneurial attitudes: Quality- consciousness Safety- consciousness	ability to work within allotted time and finances
	3.4 Ability to work within one's allotted time and finances is sustained.		

VARIABLE	RANGE
1.Good practices	May include:
	1.2 Documentation of quality practices
2.Resources utilization	<ul> <li>May include:</li> <li>2.1 Consumption/ use of consumables</li> <li>2.2Use/Maintenance of assigned equipment and furniture</li> <li>2.3 Optimum use of allotted /available time</li> </ul>

1. Critical aspects of	Assessment requires evidence that the candidate:
competency	1.1 Demonstrated ability to identify and sustain
	cost- effective activities in the workplace
	1.2 Demonstrated ability to practice
	entrepreneurial knowledge, skills and
	attitudes in the workplace.

2. Resource	The following resources should be provided:
Implications	2.1 Simulated or actual workplace
	2.2 Tools, materials and supplies needed
	to demonstrate the required tasks
	2.3 References and manuals
	2.3.1 Enterprise procedures manuals
	2.3.2 Company quality policy
3. Methods of	Competency in this unit should be assessed
Assessment	through:
	3.1 Interview
	3.1 Interview 3.2 Third-party report
4.Context of	<ul><li>3.1 Interview</li><li>3.2 Third-party report</li><li>4.1 Competency may be assessed in workplace or</li></ul>
4.Context of Assessment	<ul> <li>3.1 Interview</li> <li>3.2 Third-party report</li> <li>4.1 Competency may be assessed in workplace or in a simulated workplace setting</li> </ul>
4.Context of Assessment	<ul> <li>3.1 Interview</li> <li>3.2 Third-party report</li> <li>4.1 Competency may be assessed in workplace or in a simulated workplace setting</li> <li>4.2 Assessment shall be observed while tasks are</li> </ul>
4.Context of Assessment	<ul> <li>3.1 Interview</li> <li>3.2 Third-party report</li> <li>4.1 Competency may be assessed in workplace or in a simulated workplace setting</li> <li>4.2 Assessment shall be observed while tasks are being undertaken whether individually or in-group</li> </ul>
4.Context of Assessment	<ul> <li>3.1 Interview</li> <li>3.2 Third-party report</li> <li>4.1 Competency may be assessed in workplace or in a simulated workplace setting</li> <li>4.2 Assessment shall be observed while tasks are being undertaken whether individually or in-group</li> </ul>

## **COMMON COMPETENCIES**

## UNIT OF COMPETENCY : APPLY QUALITY STANDARDS

#### UNIT CODE

UNIT DESCRIPTOR

#### : ELC315202

This unit covers the knowledge, skills, attitudes and values needed to apply quality standards in the
workplace. The unit also includes the application of relevant safety procedures and regulations, organization procedures and customer requirements.

ELEMENT	PERFORMANCE CRITERIA Italicized terms are elaborated in the Range of Variable	REQUIRED KNOWLEDGE	REQUIRED SKILLS
<ol> <li>Assess quality of received materials</li> </ol>	<ul> <li>1.1 Work instruction is obtained and work is carried out in accordance with standard operating procedures.</li> <li>1.2 Received <i>materials</i> are checked against</li> </ul>	<ul> <li>1.1 Relevant production processes, materials and products</li> <li>1.2 Characteristics of materials, software and hardware used</li> </ul>	<ul> <li>1.1 Reading skills required to interpret work instruction</li> <li>1.2 Communication skills needed to interpret and apply defined work procedures</li> </ul>
	workplace standards and specifications. 1.3 Faulty materials related to work are identified and isolated.	in production processes 1.3 Quality checking procedures 1.4 Workplace procedures	<ul> <li>1.3 Carry out work in accordance with OHS policies and procedures</li> <li>1.4 Critical thinking</li> <li>1.5 Solution providing</li> </ul>
	1.4 <i>Faults</i> and any identified causes are recorded and/or reported to the supervisor concerned in accordance with workplace procedures.	<ul> <li>1.5 Safety and environmental aspects of production processes</li> <li>1.6 Fault identification and reporting</li> </ul>	and decision- making
	1.5 Faulty materials are replaced in accordance with workplace procedures.	1.7 Quality improvement processes	

ELEMENT	PERFORMANCE CRITERIA Italicized terms are elaborated in the Range of Variable	REQUIRED KNOWLEDGE	REQUIRED SKILLS
2. Assess own work	<ul> <li>2.1 Documentation relative to quality within the company is identified and used.</li> <li>2.2 Completed work is checked against workplace standards relevant to the task undertaken.</li> <li>2.3 Errors are identified and isolated <ul> <li>.</li> </ul> </li> <li>2.4 Information on the quality and other indicators of production performance are recorded in accordance with workplace procedures.</li> <li>2.5 In cases of deviations from specific quality standards, causes are documented and reported in accordance with the workplace's standards</li> </ul>	<ul> <li>2.1 Relevant production processes, materials and products</li> <li>2.2 Characteristics of materials, software and hardware used in production processes</li> <li>2.3 Quality checking procedures</li> <li>2.4 Workplace procedures</li> <li>2.5 Safety and environmental aspects of production processes</li> <li>2.6 Fault identification and reporting</li> <li>2.7 Quality improvement processes</li> </ul>	<ul> <li>2.1 Reading skills required to interpret work instruction</li> <li>2.2 Communication skills needed to interpret and apply defined work procedures</li> <li>2.3 Carry out work in accordance with OHS policies and procedures</li> <li>2.4 Critical thinking</li> <li>2.5 Solution providing and decision- making</li> </ul>
3. Engage in quality improvement	operating procedures. 3.1 Process improvement procedures are participated in	3.1 Relevant production processes, materials and	3.1 Reading skills required to interpret work instruction

ELEMENT	PERFORMANCE CRITERIA Italicized terms are elaborated in the Range of Variable	REQUIRED KNOWLEDGE	REQUIRED SKILLS
	relative to workplace assignment. 3.2 Work is carried out in accordance with process improvement procedures.	<ul> <li>products</li> <li>3.2 Characteristics of materials, software and hardware used in production processes</li> <li>3.3 Quality checking procedures</li> </ul>	<ul> <li>3.2 Communication skills needed to interpret and apply defined work procedures</li> <li>3.3 Carry out work in accordance with OHS policies and procedures</li> </ul>
	3.3 Performance of operation or quality of product of service to ensure <i>customer</i> satisfaction is monitored.	<ul> <li>3.4 Workplace procedures</li> <li>3.5 Safety and environmental aspects of production processes</li> <li>3.6 Fault identification and reporting</li> <li>3.7 Quality</li> </ul>	<ul><li>3.4 Critical thinking</li><li>3.5 Solution providing and decision- making</li></ul>
		improvement processes	

VARIABLE	RANGE
1. Materials	<ul> <li>1.1 Materials may include but not limited to:</li> <li>1.1.1. Manuals</li> <li>1.1.2. Job orders</li> <li>1.1.3. Instructional videos</li> </ul>
2. Faults	<ul> <li>2.1 Faults may include but not limited to:</li> <li>2.1.1. Materials not to specification</li> <li>2.1.2Materials contain incorrect/outdated information</li> <li>2.1.3. Hardware defects</li> <li>2.1.4. Materials that do not conform with any regulatory agencies</li> </ul>

3. Documentation	<ul> <li>3.1 Organization work procedures</li> <li>3.2 Manufacturer's instruction manual</li> <li>3.3 Customer requirements</li> <li>3.4 Forms</li> </ul>
4. Errors	<ul> <li>4.1 Errors may be related but not limited to the following:</li> <li>4.1.1. Deviation from the requirements of the Client 4.1.2. Deviation from the requirement of the organization</li> </ul>
5. Quality standards	<ul> <li>5.1 Quality standards may be related but not limited to the following:</li> <li>5.1.1. Materials</li> <li>5.1.2. Hardware</li> <li>5.1.3. Final product</li> <li>5.1.4. Production processes</li> <li>5.1.5. Customer service</li> </ul>
6. Customer	<ul> <li>6.1 Co-worker</li> <li>6.2 Supplier/Vendor</li> <li>6.3 Client</li> <li>6.4 Organization receiving the product or service</li> </ul>

1.	Critical Aspects of Competency	<ul> <li>Assessment must show that the candidate:</li> <li>1.1 Carried out work in accordance with the company's standard operating procedures</li> <li>1.2 Performed task according to specifications</li> <li>1.3 Reported defects detected in accordance with standard operating procedures</li> <li>1.4 Carried out work in accordance with the process improvement procedures</li> </ul>
2.	Resource Implications	2.1 Materials, software and hardware to be used in a real or simulated situation
3.	Methods of Assessment	The assessor must select two of the following to objectively evaluate the candidate: 3.1 Observation and oral questioning 3.2 Third party report 3.3 Portfolio 3.4 Practical demonstration
4.	Context of Assessment	4.1 Assessment may be conducted in the workplace or in a simulated environment

#### UNIT OF COMPETENCY

## : PERFORM COMPUTER OPERATIONS

## UNIT CODE

#### : ELC311203

UNIT DESCRIPTOR

This unit covers the knowledge, skills, attitudes and values needed to perform computer operations which

: include inputting, accessing, producing and transferring data using the appropriate hardware and software.

ELEMENT	PERFORMANCE CRITERIA Italicized terms are elaborated in the Range of Variable	REQUIRED KNOWLEDGE	REQUIRED SKILLS
<ol> <li>Plan and prepare for task to be taken undertaken</li> </ol>	<ul> <li>1.1 Requirements of task are determined in accordance with the required output.</li> <li>1.2 Appropriate <i>hardware</i> and <i>software</i> are selected according to task assigned and required outcome.</li> <li>1.3 Task is planned to ensure that <i>OH &amp; S guidelines</i> and procedures are followed.</li> <li>1.4 Client -specific guidelines and procedures are followed.</li> <li>1.5 Required data security guidelines are applied in accordance with existing procedures.</li> </ul>	<ol> <li>1.1 Basic ergonomics of keyboard and computer user</li> <li>1.2 Main types of computers and basic features of different operating systems</li> <li>1.3 Main parts of a computer</li> <li>1.4 Storage devices and basic categories of memory</li> <li>1.5 Relevant types of software</li> <li>1.6 General security, privacy legislation and copyright</li> <li>1.7 Viruses</li> <li>1.8 OH &amp; S principles and responsibilities</li> </ol>	<ul> <li>1.1 Reading and comprehension skills required to interpret work instruction and to interpret basic user manuals.</li> <li>1.2 Communication skills to identify lines of communication, request advice, follow instructions and receive feedback.</li> <li>1.3 Technology skills to use equipment safely including keyboard skills</li> </ul>

	PERFORMANCE		
ELEMENT	<b>CRITERIA</b> <i>Italicized</i> terms are elaborated in the Range of Variable	REQUIRED KNOWLEDGE	REQUIRED SKILLS
		1.9 Calculating computer capacity	
		1.10 Productivity Application	
		1.11 Business Application	
		1.12 System Software	
2. Input data into computer	<ul> <li>2.1 Data are entered into the computer using appropriate program/application in accordance with company procedures.</li> <li>2.2 Accuracy of information is checked and information is saved in accordance with standard operating procedures.</li> <li>2.3 Inputted data is stored in <i>storage</i> <i>media</i> according to requirements.</li> <li>2.4 Work is performed within <i>ergonomic</i> <i>guidelines</i></li> </ul>	<ul> <li>2.1 Basic ergonomics of keyboard and computer user</li> <li>2.2 Main types of computers and basic features of different operating systems</li> <li>2.3 Main parts of a computer</li> <li>2.4 Storage devices and basic categories of memory</li> <li>2.5 Relevant types of software</li> <li>2.6 General security, privacy legislation and copyright</li> <li>2.7 Viruses</li> </ul>	<ul> <li>2.1 Reading and comprehension skills required to interpret work instruction and to interpret basic user manuals.</li> <li>2.2 Communication skills to identify lines of communication, request advice, follow instructions and receive feedback.</li> <li>2.3 Technology skills to use equipment safely including keyboard skills</li> </ul>
		2.8 OH & S	

ELEMENT	PERFORMANCE CRITERIA Italicized terms are elaborated in the Range of Variable	REQUIRED KNOWLEDGE	REQUIRED SKILLS
3. Access information	3.1 Correct program/application	<ul> <li>principles and responsibilitie s</li> <li>2.9 Calculating computer capacity</li> <li>2.10 Productivity Application</li> <li>2.11 Business Application</li> <li>2.12 System Software</li> <li>3.1 Basic ergonomics of leave part of leav</li></ul>	3.1 Reading and comprehension skills
using computer	<ul> <li>is selected based on job requirements.</li> <li>3.2 Program/application containing the information required is accessed according to company procedures.</li> <li>3.3 <b>Desktop icons</b> are correctly selected, opened and closed for navigation purposes.</li> <li>3.4 Keyboard techniques are carried out in line with OH &amp; S requirements for safe use of keyboards</li> </ul>	of keyboard and computer user 3.2 Main types of computers and basic features of different operating systems 3.3 Main parts of a computer 3.4Storage devices and basic categories of memory 3.5Relevant types of software 3.6General security, privacy legislation and copyright	required to interpret work instruction and to interpret basic user manuals. 3.2 Communication skills to identify lines of communication, request advice, follow instructions and receive feedback. 3.3 Technology skills to use equipment safely including keyboard skills

ELEMENT	PERFORMANCE CRITERIA Italicized terms are elaborated in the Range of Variable	REQUIRED KNOWLEDGE	REQUIRED SKILLS
		<ul> <li>3.7 Viruses</li> <li>3.8 OH &amp; S principles and responsibilities</li> <li>3.9 Calculating computer capacity</li> <li>3.10 Productivity Application</li> <li>3.11 Business Application</li> <li>3.12 System Software</li> </ul>	
4. Produce output/ data using computer system	<ul> <li>4.1 Entered data are processed using appropriate software commands.</li> <li>4.2 Data are printed out as required using computer <i>hardware</i> /<i>peripheral devices</i> in accordance with standard operating procedures.</li> <li>4.3 Files and data are transferred between compatible systems using computer software, hardware/peripheral devices in accordance with standard operating procedures.</li> </ul>	<ul> <li>4.1 Basic ergonomics of keyboard and computer user</li> <li>4.2 Main types of computers and basic features of different operating systems</li> <li>4.3 Main parts of a computer</li> <li>4.4 Storage devices and basic categories of memory</li> <li>4.5 Relevant types of software</li> <li>4.6 General security, privacy legislation and copyright</li> <li>4.7 Viruses</li> </ul>	<ul> <li>5.1 Reading and comprehension skills required to interpret work instruction and to interpret basic user manuals.</li> <li>5.2 Communication skills to identify lines of communication, request advice, follow instructions and receive feedback.</li> <li>5.3 Technology skills to use equipment safely including keyboard skills</li> </ul>

ELEMENT	PERFORMANCE CRITERIA <i>Italicized</i> terms are elaborated in the Range of Variable	REQUIRED KNOWLEDGE	REQUIRED SKILLS
5. Use basic	5.1 Information	<ul> <li>4.8OH &amp; S principles and responsibilities</li> <li>4.9Calculating computer capacity</li> <li>4.10 Productivity Application</li> <li>4.11 Business Application</li> <li>4.12 System Software</li> <li>5 1 Basic</li> </ul>	5.1 Reading and
5. Use basic functions of a www-browser to locate information	<ul> <li>5.1 Information requirements for internet search are established.</li> <li>5.2 Browser is launched.</li> <li>5.3 Search engine is loaded.</li> <li>5.4 Appropriate search criteria/or URL of site is entered.</li> <li>5.5 Relevant links are followed to locate required information.</li> <li>5.6 Useful pages are bookmarked or printed as required.</li> </ul>	<ul> <li>5.1 Basic ergonomics of keyboard and computer user</li> <li>5.2 Main types of computers and basic features of different operating systems</li> <li>5.3 Main parts of a computer</li> <li>5.4 Storage devices and basic categories of memory</li> <li>5.5 Relevant types of software</li> <li>5.6 General security, privacy legislation and copyright</li> <li>5.7 Viruses</li> </ul>	<ul> <li>5.1 Reading and comprehension skills required to interpret work instruction and to interpret basic user manuals.</li> <li>5.2 Communication skills to identify lines of communication, request advice, follow instructions and receive feedback.</li> <li>5.3 Technology skills to use equipment safely including keyboard skills</li> </ul>

ELEMENT	PERFORMANCE CRITERIA Italicized terms are elaborated in the Range of Variable	REQUIRED KNOWLEDGE	REQUIRED SKILLS
6. Maintain computer	6.1 Procedures for ensuring security of	<ul> <li>5.80H &amp; S principles and responsibilities</li> <li>5.9Calculating computer capacity</li> <li>5.10 Productivity Application</li> <li>5.11 Business Application</li> <li>5.12 System Software</li> <li>6.1 Basic ergonomics of</li> </ul>	6.1 Reading and comprehension skills
equipment and systems	<ul> <li>ensuring security of data, including regular back-ups and virus checks are implemented in accordance with standard operating procedures.</li> <li>6.2 Basic file <i>maintenance</i> procedures are implemented in line with the standards operating procedures.</li> </ul>	<ul> <li>6.2 Main types of computer user</li> <li>6.2 Main types of computers and basic features of different operating systems</li> <li>6.3 Main parts of a computer</li> <li>6.4 Storage devices and basic categories of memory</li> <li>6.5 Relevant types of software</li> <li>6.6 General security, privacy legislation and copyright</li> <li>6.7 Viruses</li> <li>6.8 OH &amp; S</li> </ul>	<ul> <li>comprehension skills required to interpret work instruction and to interpret basic user manuals.</li> <li>6.2 Communication skills to identify lines of communication, request advice, follow instructions and receive feedback.</li> <li>6.3 Technology skills to use equipment safely including keyboard skills</li> </ul>

ELEMENT	PERFORMANCE CRITERIA Italicized terms are elaborated in the Range of Variable	REQUIRED KNOWLEDGE	REQUIRED SKILLS
		principles and responsibilities	
		6.9Calculating computer capacity	
		6.10 Productivity Application	
		6.11 Business Application	
		6.12 System Software	

VARIABLE	RANGE
1. Hardware and peripheral devices	1.1 Personal computers
	1.3 Communication equipment
	1.4 Printers
	1.5 Scanners
	1.6 Keyboard
	1.7 Mouse
	1.8 Voice/Data logger
2. Software	Software includes the following but not limited to:
	2.1 Word processing packages
	2.2 Database packages
	2.3 Internet
	2.4 Spreadsheets
	2.5 Client Specific Software
3. OH & S guidelines	3.1 OHS guidelines
	3.2 Enterprise procedures
4. Storage media	Storage media include the following but not limited
	to:
	4.1 Diskettes
	4.2 CDs
	4.3 Zip disks
	4.4 hard disk drives, local and remote
	4.5 Optical drives

5. Ergonomic guidelines	<ul> <li>5.1 Types of equipment used</li> <li>5.2 Appropriate furniture</li> <li>5.3 Seating posture</li> <li>5.4 Lifting posture</li> <li>5.5 Visual display unit screen brightness</li> </ul>
6. Desktop icons	<ul> <li>Icons include the following but not limited to:</li> <li>6.1 Directories/folders</li> <li>6.2 Files</li> <li>6.3 Network devices</li> <li>6.4 Recycle bin</li> <li>6.5 Program icons</li> </ul>
7. Maintenance	<ul> <li>7.1 Creating and managing more space in the hard disk and other peripherals</li> <li>7.2 Reviewing programs</li> <li>7.3 Deleting unwanted files</li> <li>7.4 Backing up files</li> <li>7.5 Checking hard drive for errors</li> <li>7.6 Using up to date anti-virus programs</li> <li>7.7 Cleaning dust from internal and external surfaces</li> </ul>

1. Critical Aspects of	Assessment must show that the candidate:			
Competency	1.1 Selected and used hardware components correctly and according to the task requirement			
	1.2 used basic software applications to create new files and documents			
	1.3 Produced accurate and complete data in accordance with the requirements			
	1.4 Used appropriate devices and procedures to transfer files/data accurately			
	1.5 Used basic functions of a www-browser to locate information.			
2. Resource	2.1 Computer hardware with peripherals			
Implications	2.2 Appropriate software			
3. Methods of	The assessor may select two of the following assessment methods to			
Assessment	objectively assess the candidate:			
	3.1 Direct Observation and Oral Questioning			
	3.2 Practical demonstration			
	4.1 Assessment may be conducted in the workplace or in a			
4. Context of	simulated environment			
Assessment				

#### UNIT OF COMPETENCY

#### : PERFORM MENSURATION AND CALCULATION

#### UNIT CODE : ELC311201

UNIT DESCRIPTOR

This unit covers the knowledge, skills and attitudes and : values needed identify, care, handle and use measuring instruments

ELEMENT	PERFORMANCE CRITERIA Italicized terms are elaborated in the Range of Variable	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Select measuring instruments	1.1 Object or component to be measured is identified	1.1 Types of measuring instruments and their uses	1.1 Reading skills required to interpret work instruction
	<ul><li>1.2 Correct specifications are obtained from relevant source</li><li>1.3 Measuring tools are selected in line with job requirements</li></ul>	<ul> <li>1.2 Safe handling procedures in using measuring instruments</li> <li>1.3 Four fundamental operation of mathematics</li> <li>1.4 Formula for volume, area, perimeter and other geometric figures</li> </ul>	<ol> <li>1.2 Communication skills</li> <li>1.3 Handling measuring instruments</li> <li>1.4 Performing mathematical calculations using the four fundamental operations</li> <li>1.5 Visualizing objects and shapes</li> <li>1.6 Interpreting formulae</li> </ol>
2. Carry out measurements and calculation	2.1 Appropriate measuring instrument is selected to achieve required	2.1 Types of measuring instruments and their uses	2.1 Reading skills required to interpret work instruction
	outcome 2.2 Accurate measurements are obtained for job	<ul><li>2.2 Safe handling procedures in using measuring instruments</li><li>2.3 Four</li></ul>	<ul><li>2.2 Communication skills</li><li>2.3 Handling measuring instruments</li></ul>

	2.3 <b>Calculation</b> needed to complete work tasks are performed using the four basic process of addition (+), subtraction (-), multiplication (x), and division (/)	fundamental operation of mathematics 2.4 Formula for volume, area, perimeter and other geometric figures	<ul> <li>2.4 Performing mathematical calculations using the four fundamental operations</li> <li>2.5 Visualizing objects and shapes</li> <li>2.6 Interpreting</li> </ul>
	2.4 Calculation involving fractions, percentages and mixed numbers are used to complete workplace tasks.		formulae
	2.5 Numerical computation is self-checked and corrected for accuracy		
	2.6 Instruments are read to the limit of accuracy of the tool.		
<ol> <li>Maintain measuring instruments</li> </ol>	3.1 Measuring instruments are not dropped to avoid damage	3.1 Types of measuring instruments and their uses	3.1 Reading skills required to interpret work instruction
	3.2 Measuring instruments are cleaned before and after using.	3.2 Safe handling procedures in using measuring instruments	<ul><li>3.2 Communicatio n skills</li><li>3.3 Handling measuring instruments</li></ul>
	3.3 Proper storage of instruments undertaken according to manufacturer's specifications and standard operating	<ul> <li>3.3 Four fundamental operation of mathematics</li> <li>3.4 Formula for volume area</li> </ul>	3.4 Performing mathematical calculations using the four fundamental operations
	procedures.	perimeter and other geometric	3.5 Visualizing objects and

	figures	shapes
		3.6 Interpreting formulae

VARIABLE	RANGE
1. Measuring instruments	<ul> <li>1.1 Straight edge</li> <li>1.2 Torque gauge</li> <li>1.3 Try square</li> <li>1.4 Protractor</li> <li>1.5 Combination gauge</li> <li>1.6 Steel rule</li> </ul>
2. Calculation	Kinds of part mensuration includes the following but not limited to 2.1 Volume 2.2 Area 2.3 Displacement 2.4 Inside diameter 2.5 Circumference 2.6 Length 2.7 Thickness 2.8 Outside diameter 2.9 Taper 2.10 Out of roundness

1. Critical Aspects of Competency	Assessment must show that the candidate: 1.1. selected proper measuring instruments according to tasks 1.2. carried out measurement and calculations 1.3. maintained and stores instruments
2. Resource	2.1 Place of assessment
Implications	2.2 Measuring instruments
	2.3 Straight edge
	2.4 Torque gauge
	2.5 Try square
	2.6 Protractor
	2.7 Combination gauge
	2.8 Steel rule
3. Methods of	Competency in this unit must be assessed through:
Assessment	3.1 Observation
	3.2 Oral questioning
4. Context of	4.1 Assessment may be conducted in the workplace or in a
Assessment	simulated environment

#### UNIT OF COMPETENCY : PREPARE AND INTERPRET TECHNICAL DRAWING

## UNIT CODE : ELC311202

	This unit covers the knowledge, skills and attit	udes and
	values needed to prepare/interpret c	liagrams,
UNIT DESCRIPTOR	engineering abbreviation and drawings,	symbols,
	dimension.	

ELEMENT	PERFORMANC E CRITERIA Italicized terms are elaborated in the Range of Variable	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Identify different kinds of technical drawings	<ul> <li>1.1 Correct technical drawing is selected according to job requirements.</li> <li>1.2 Technical drawings are segregated in accordance with the types and kinds of drawings</li> </ul>	<ol> <li>1.1 Drawing conventions</li> <li>1.2 Symbols</li> <li>1.3 Dimensioning Conventions</li> <li>1.4 Mark up/Notation of Drawings</li> <li>1.5 Mathematics         <ul> <li>Four fundamental operations</li> <li>Percentage</li> <li>Fraction</li> <li>Trigonometric Functions</li> <li>Algebra</li> <li>Geometry</li> </ul> </li> </ol>	<ul> <li>1.1 Reading skills required to interpret work instruction</li> <li>1.2 Communicatio n skills</li> <li>1.3 Interpreting electrical/elect ronic signs and symbols</li> </ul>
2. Interpret technical drawing	2.1 Components, assemblies or objects are recognized as required.	<ul><li>2.1 Drawing conventions</li><li>2.2 Symbols</li><li>2.3 Dimensioning</li></ul>	<ul> <li>2.1 Reading skills required to interpret work instruction</li> <li>2.2 Communicatio</li> </ul>
	2.2 <b>Dimensions</b> of the key features of the objects depicted in the drawing are correctly	Conventions 2.4 Mark up/Notation of Drawings 2.5 Mathematics	n skills 2.3 Interpreting electrical/electr onic signs and symbols

	PERFORMANC		
ELEMENT	E CRITERIA Italicized terms are elaborated in the Range of Variable	REQUIRED KNOWLEDGE	REQUIRED SKILLS
3. Prepare/	<ul> <li>2.3 <i>Symbols</i> used in the drawing are identified and interpreted correctly.</li> <li>2.4 Drawing is checked and validated against job requirements or equipment in accordance with standard operating procedures.</li> <li>3.1 Electrical/electro</li> </ul>	<ul> <li>Four fundamental operations</li> <li>Percentage</li> <li>Fraction</li> <li>Trigonometric Functions</li> <li>Algebra</li> <li>Geometry</li> </ul>	3.1 Reading skills
make changes to electrical /electron ic schemati cs and drawings	nic schematic is drawn and correctly identified. 3.2 Correct drawing is identified, <i>equipment</i> are selected and used in accordance with job requirements	conventions 3.2 Symbols 3.3 Dimensioning Conventions 3.4 Mark up/Notation of Drawings 3.5 Mathematics • Four fundamental operations • Percentage • Fraction • Trigonometric Functions • Algebra • Geometry	required to interpret work instruction 3.2 Communicatio n skills 3.3 Interpreting electrical/electr onic signs and symbols
4. Store technical drawings and equipment /instruments	4.1 Care and maintenance of drawings are undertaken according to company procedures.	<ul> <li>4.1 Drawing conventions</li> <li>4.2 Symbols</li> <li>4.3 Dimensioning Conventions</li> </ul>	<ul> <li>4.1 Reading skills required to interpret work instruction</li> <li>4.2 Communicatio n skills</li> </ul>

ELEMENT	PERFORMANC E CRITERIA Italicized terms are elaborated in the Range of Variable	REQUIRED KNOWLEDGE	REQUIRED SKILLS
	<ul> <li>4.2 Technical drawings are recorded and inventory is prepared in accordance with company procedures.</li> <li>4.3 Proper storage of <i>instruments</i> is undertaken according to company procedures.</li> </ul>	<ul> <li>4.4 Mark up/Notation of Drawings</li> <li>4.5 Mathematics <ul> <li>Four fundamental operations</li> <li>Percentage</li> <li>Fraction</li> <li>Trigonometric Functions</li> <li>Algebra</li> <li>Geometry</li> </ul> </li> </ul>	4.3 Interpreting electrical/electr onic signs and symbols

VARIABLE	RANGE
1. Technical drawings	May include the following but not limited to:
	1.1. Schematic diagrams
	1.2. Charts
	1.3. Block diagrams
	1.4. Lay-out plans
	1.5. Location plans
	1.6. Process and instrumentation diagrams
	1.7. Loop diagrams
	1.8. System Control Diagrams
2. Dimensions	May include but not limited to:
	2.1. Length
	2.2. Width
	2.3. Height
	2.4. Diameter
	2.5. Angles

3. Symbols	May include but not limited to: 3.1. NEC- National Electric Code 3.2. IEC -International Electrotechnical Commission 3.3. ASME - American Society of Mechanical Engineers 3.4. IEEE - Institute of Electrical and Electronics Engineers 3.5. ISA - Instrumentation System and Automation Society
4. Instruments/Equipment	<ul> <li>4.1. Components/dividers</li> <li>4.2. Drawing boards</li> <li>4.3. Rulers</li> <li>4.4. T-square</li> <li>4.5. Calculator</li> </ul>

1. Critical Aspects	Assessment must show that the candidate:
of Competency	1.1. selected correct technical drawing in line with job requirements
	1.2. correctly identified the objects represented in the drawing
	1.3. identified and interpreted symbols used in the drawing correctly
	1.4. prepared/produced electrical/electronic drawings including all relevant specifications
	1.5. stored diagrams/equipment
2. Resource	2.1 Drawings
Implications	2.2 Diagrams
	2.3 Charts
	2.4 Plans
3. Methods of	Competency in this unit must be assessed through:
Assessment	3.1 Practical tasks involving interpretation of a range of technical drawings
	3.2 Oral questioning
4. Context of	4.1 Assessment may be conducted in the workplace or in
Assessment	a simulated environment

#### UNIT OF COMPETENCY : USE HAND TOOLS

#### UNIT CODE : ELC724201

## UNIT DESCRIPTOR

This unit covers the knowledge, skills and attitudes on the safe use, handling and maintenance of tools

ELEMENT	PERFORMANCE CRITERIA Italicized terms are elaborated in the Range of Variable	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Plan and prepare for tasks to be undertaken	<ul> <li>1.1 Tasks to be undertaken are properly identified</li> <li>1.2 Appropriate <i>hand</i> <i>tools</i> are identified and selected according to the task requirements</li> </ul>	<ul> <li>1.1 Safety <ul> <li>Safety</li> <li>requirements</li> <li>in handling</li> <li>tool</li> </ul> </li> <li>1.2 Tools : <ul> <li>Function,</li> <li>Operation,</li> <li>Common</li> <li>faults</li> </ul> </li> <li>1.3 Processes,</li> <li>Operations,</li> <li>Systems <ul> <li>Maintenance</li> <li>of tools</li> <li>Storage of</li> <li>Tools</li> </ul> </li> </ul>	<ul> <li>1.1 Reading skills required to interpret work instruction and numerical skills</li> <li>1.2 Communication skills</li> <li>1.3 Problem solving in emergency situation</li> </ul>
2. Prepare hand tools	<ul> <li>2.1 Appropriate hand tools are checked for proper operation and safety</li> <li>2.2 Unsafe or faulty tools are identified and marked for repair according to standard company procedure</li> </ul>	<ul> <li>2.1 Safety <ul> <li>Safety</li> <li>requirements</li> <li>in handling</li> <li>tool</li> </ul> </li> <li>2.2 Tools : <ul> <li>Function,</li> <li>Operation,</li> <li>Common</li> <li>faults</li> </ul> </li> <li>2.3 Processes,</li> <li>Operations,</li> <li>Systems <ul> <li>Maintenance</li> </ul> </li> </ul>	<ul> <li>2.1 Reading skills required to interpret work instruction and numerical skills</li> <li>2.2 Communication skills</li> <li>2.3 Problem solving in emergency situation</li> </ul>

		of tools • Storage of Tools	
3. Use appropriate hand tools and test equipment	<ul> <li>3.1 Tools are used according to tasks undertaken</li> <li>3.2 All safety procedures in using tools are observed at all times and appropriate <i>personal protective equipment</i> (PPE) are used</li> <li>3.3 Malfunctions, unplanned or</li> </ul>	<ul> <li>3.1 Safety <ul> <li>Safety</li> <li>requirements</li> <li>in handling</li> <li>tool</li> </ul> </li> <li>3.2 Tools : <ul> <li>Function,</li> <li>Operation,</li> <li>Common</li> <li>faults</li> </ul> </li> <li>3.3 Processes,</li> <li>Operations,</li> <li>Systems <ul> <li>Maintenance</li> <li>of tools</li> </ul> </li> </ul>	<ul> <li>3.1 Reading skills required to interpret work instruction and numerical skills</li> <li>3.2 Communication skills</li> <li>3.3 Problem solving in emergency situation</li> </ul>
	unusual events are reported to the supervisor	Storage of Tools	
4. Maintain hand tools	<ul> <li>4.1 Tools are not dropped to avoid damage</li> <li>4.2 Routine <i>maintenance</i> of tools undertaken according to standard operational procedures, principles and techniques</li> <li>4.3 Tools are stored safely in appropriate locations in accordance with manufacturer's specifications or standard operating procedures</li> </ul>	<ul> <li>4.1Safety <ul> <li>Safety</li> <li>requirements</li> <li>in handling</li> <li>tool</li> </ul> </li> <li>4.2 Tools : <ul> <li>Function,</li> <li>Operation,</li> <li>Common</li> <li>faults</li> </ul> </li> <li>4.3 Processes,</li> <li>Operations,</li> <li>Systems <ul> <li>Maintenance</li> <li>of tools</li> <li>Storage of</li> <li>Tools</li> </ul> </li> </ul>	<ul> <li>4.1Reading skills required to interpret work instruction and numerical skills</li> <li>4.2Communicatio n skills</li> <li>4.3Problem solving in emergency situation</li> </ul>

VARIABLE	RANGE
1. Hand tools	1.1 Hand tools for adjusting, dismantling, assembling, finishing, cutting. Tool set includes the following but not limited to: screw drivers, pliers, punches, wrenches, files
2. Personal Protective Equipment (PPE)	<ul><li>2.1 Gloves</li><li>2.2 Protective eyewear</li><li>2.3 Apron/overall</li></ul>
3. Maintenance	<ul> <li>3.1 Cleaning</li> <li>3.2 Lubricating</li> <li>3.3 Tightening</li> <li>3.4 Simple tool repairs</li> <li>3.5 Hand sharpening</li> <li>3.6 Adjustment using correct procedures</li> </ul>

1. Critical Aspects of	Assessment must show that the candidate:		
Competency			
	1.1 Demonstrated safe working practices at all times		
	1.2 Communicated information about processes, events or		
	tasks being undertaken to ensure a safe and efficient working environment		
	1.3 Planned tasks in all situations and reviewed task		
	requirements as appropriate		
	1.4 Performed all tasks to specification		
	1.5 Maintained and stored tools in appropriate location		
2. Resource	2.1 Tools may include the following but not limited to:		
Implications	2.1.1. screw drivers		
	2.1.2. pliers		
	2.1.3. punches		
	2.1.4. wrenches, files		
3. Methods of	Competency in this unit must be assessed through:		
Assessment	3.1 Observation		
	3.2 Oral questioning		
4. Context of	Assessment may be conducted in the workplace or in a		
Assessment	simulated environment		

UNIT OF COMPETENCY	. TERMINATE AND CONNECT ELECTRICAL WIRING AND ELECTRONICS CIRCUIT
UNIT CODE	: ELC724202
UNIT DESCRIPTOR	This unit covers the knowledge, skills, (and) attitudes and values needed to terminate and connect electrical wiring and electronic circuits

ELEMENT	PERFORMANCE CRITERIA Italicized terms are elaborated in the Range of Variable	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Plan and prepare for termination/ connection of electrical wiring/elect ronics circuits	<ul> <li>1.1 <i>Materials</i> are checked according to specifications and tasks</li> <li>1.2 Appropriate <i>tools and equipment</i> are selected according to tasks requirements</li> <li>1.3 Task is planned to ensure OH &amp; S guidelines and procedures are followed</li> <li>1.4 Electrical wiring/electronic circuits are correctly prepared for connecting/termin ation in accordance with instructions and work site procedures</li> </ul>	<ul> <li>1.1 Use of tools</li> <li>1.2 Use of test instruments/equip ment</li> <li>1.3 Electrical theory</li> <li>1.4 Single phase AC principles</li> <li>1.5 Wiring techniques DC power supplies</li> <li>1.6 Soldering</li> </ul>	<ul> <li>1.1 Reading skills required to interpret work instruction</li> <li>1.2 Communication skills</li> <li>1.3 Soldering techniques</li> </ul>

ELEMENT	PERFORMANCE CRITERIA Italicized terms are elaborated in the Range of Variable	REQUIRED KNOWLEDGE	REQUIRED SKILLS
2. Terminate/ connect electrical wiring/elect ronic circuits	2.1 Safety procedures in using tools are observed at all times and appropriate <i>personal</i> <i>protective</i> <i>equipment</i> are used	<ul> <li>2.1 Use of tools</li> <li>2.2 Use of test instruments/equi pment</li> <li>2.3 Electrical theory</li> <li>2.4 Single phase AC principles</li> </ul>	<ul> <li>2.1 Reading skills required to interpret work instruction</li> <li>2.2 Communication skills</li> <li>2.3 Soldering techniques</li> </ul>
	2.2 All work undertaken safely in accordance with the workplace and standard procedures	<ul><li>2.5 Wiring techniques</li><li>2.6 DC power supplies</li><li>2.7 Soldering</li></ul>	
	2.3 Appropriate range of <i>methods</i> in termination/conn ection are used according to specifications, manufacturer's requirements and safety		
	2.4 Correct sequence of operation is followed		
	2.5 Accessories used are adjusted, if necessary		
	2.6 Confirm termination/conn ection undertaken successfully in accordance with		
ELEMENT	PERFORMANCE CRITERIA Italicized terms are elaborated in the Range of Variable	REQUIRED KNOWLEDGE	REQUIRED SKILLS
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3. Test termination/ connection s of electrical wiring/elect ronics circuits	<ul> <li>3.1 Testing of all completed termination/ connections of electric wiring/electronic circuits is conducted for compliance with specifications and regulations using appropriate procedures and equipment</li> <li>3.2 Wiring and circuits are checked using specified testing procedures</li> <li>3.3 Unplanned events or conditions are responded to in accordance with established procedures</li> </ul>	<ul> <li>3.1 Use of tools</li> <li>3.2 Use of test instruments/equip ment</li> <li>3.3 Electrical theory</li> <li>3.4 Single phase AC principles</li> <li>3.5 Wiring techniques</li> <li>3.6 DC power supplies</li> <li>3.7 Soldering</li> </ul>	<ul> <li>3.1 Reading skills required to interpret work instruction</li> <li>3.2 Communication skills</li> <li>3.3 Soldering techniques</li> </ul>

VARIABLE	RANGE
1. Materials	<ul> <li>1.1 Materials included the following but not limited to:</li> <li>1.1.1 Soldering lead</li> <li>1.1.2 Cables</li> <li>1.1.3 Wires</li> </ul>
2. Tools and equipment	<ul> <li>2.1 Tools for measuring, cutting, drilling, assembling/disassembling. Tool set includes the following but not limited to:</li> <li>2.1.1 Pliers</li> <li>2.1.2 Cutters</li> <li>2.1.3 Screw drivers</li> </ul> 2.2 Equipment <ul> <li>2.2.1 Soldering gun</li> <li>2.2.2 Multi-tester</li> </ul>
3. Personal protective equipment	<ul><li>3.1 goggles</li><li>3.2 gloves</li><li>3.3 apron/overall</li></ul>
4. Methods	<ul><li>4.1 Clamping</li><li>4.2 Pin connection</li><li>4.3 Soldered joints</li><li>4.4 Plugs</li></ul>
5. Accessories	<ul><li>5.1 Accessories may include the following but not limited to:</li><li>5.1.1 brackets</li><li>5.1.2 clamps</li></ul>

1. Critical Aspects of Competency	<ul> <li>Assessment must show that the candidate:</li> <li>1.1. Undertook work safely and according to workplace and standard procedures</li> <li>1.2. used appropriate termination/ connection methods</li> <li>1.3. followed correct sequence in termination / connection process</li> <li>1.4. conducted testing of terminated connected electrical wiring/electronic circuits using appropriate procedures and standards</li> </ul>
2. Resource Implications	<ul> <li>2.1 Tools for measuring, cutting, drilling, assembling/disassembling, connecting. Tool set includes the following but not limited to:</li> <li>2.1.1. screw drivers</li> <li>2.1.2. pliers</li> <li>2.1.3. cutters</li> </ul>
3. Methods of Assessment	<ul> <li>3.1 The assessor may select two (2) of the following assessment methods to objectively assess the candidate:</li> <li>3.1.1. Observation</li> <li>3.1.2. Oral Questioning</li> <li>3.1.3. Practical demonstration</li> </ul>
4. Context of Assessment	4.1 Assessment may be conducted in the workplace or in a simulated environment

UNIT OF COMPETENCY	
UNIT CODE	: ELC724205
UNIT DESCRIPTOR	This unit covers the knowledge, skills and attitudes required to test electronic components. It includes competencies in determining the criteria for testing electronics components, planning an approach for component testing, testing the components and evaluating the testing process.

ELEMENT	PERFORMANCE CRITERIA Italicized terms are elaborated in the Range of Variable	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Determine criteria for testing electronics components	<ul> <li>1.1 Work instructions are obtained and clarified based on job order or client requirements</li> <li>1.2 <i>Responsible</i> <i>person</i> is consulted for effective and proper work coordination</li> <li>1.3 Data sheets/Applicatio n notes are obtained and interpreted based on manufacturer's specifications</li> <li>1.4 <i>Testing criteria</i> are defined to ensure that components meet technical and quality requirements</li> <li>1.5 Document and communicate testing criteria to relevant personnel</li> </ul>	<ul> <li>1.1 Mensuration/Mat hematics <ul> <li>Conversion of Units</li> <li>Applied Mathematics</li> </ul> </li> <li>1.2 Safety <ul> <li>Work Safety requirements and economy of materials with durability</li> <li>Knowledge in 5S application and observation of required timeframe</li> <li>Knowledge of proper handling and disposal of chemicals</li> </ul> </li> <li>1.3 Materials, tools and equipment uses and specifications <ul> <li>Identification of hand and power tools</li> </ul> </li> </ul>	<ul> <li>1.1 Work efficiently &amp; systematically</li> <li>1.2 Communication skills</li> <li>1.3 Use and maintenance of tools and equipment</li> <li>1.4 Skills in testing electronic components</li> <li>1.5 Work safety practices and time management</li> <li>1.6 Problem solving skills</li> <li>1.7 Reading skills</li> </ul>

ELEMENT	PERFORMANCE CRITERIA Italicized terms are elaborated in the Range of Variable	REQUIRED KNOWLEDGE	REQUIRED SKILLS
		<ul> <li>Proper care and use of tools</li> <li>1.4 Systems and Processes</li> <li>Principles of electrical/elec tronic circuits</li> <li>Identifying sources of electricity</li> <li>Identifying conductors and insulators</li> <li>Describing resistance and identify resistors</li> <li>Supplying different voltage using variable power supply</li> <li>Measuring resistance using VOM</li> <li>Testing resistors</li> <li>Measuring current and voltage using VOM</li> <li>Analyzing simple circuit using ohms and power law</li> <li>Analyzing series/parallel circuits using ohms and power law</li> </ul>	

PERFORMANCE CRITERIA		
<i>Italicized</i> terms		
are elaborated in		REQUIRED
the	KNOWLEDGE	SKILLS
Range of Variable		
	<ul> <li>Describing</li> </ul>	
	alternating	
	current	
	circuits	
	Observing	
	waveform	
	using	
	oscilloscope	
	• generating	
	wavelorm in	
	frequency	
	generator	
	Measuring	
	frequency	
	usina	
	oscilloscope	
	Measuring	
	capacitance	
	using VOM	
	<ul> <li>Describing</li> </ul>	
	capacitance	
	and	
	identifying	
	capacitors	
	<ul> <li>Testing</li> </ul>	
	capacitors	
	<ul> <li>Analyzing</li> </ul>	
	series/parallel	
	capacitances	
	Describing	
	inductance	
	and identifying	
	inductors	
	Testing	
	inductore	
	series narallel	
	inductors	
	Describina	

	ELEMENT	PERFORMANCE CRITERIA Italicized terms are elaborated in the Range of Variable	REQUIRED KNOWLEDGE	REQUIRED SKILLS
			the characteristic of transformers Describing and identifying semiconducto r diode Testing semiconducto r diode Analyzing rectifier circuits Describing and identifying bipolar transistor Describing and identifying bipolar transistor transistor testing bipolar transistor analyzing amplifier circuit analyzing multi-vibrator circuit describing and analyzing digital gate testing logic gates analyzing logic networks analyzing sequence circuits	
2.	Plan an approach for component	2.1 Various <b>testing</b> <i>methods</i> are Identified based	<ul> <li>2.1 Mensuration/Mat hematics</li> <li>Conversion of</li> </ul>	2.1 Work efficiently & systematically

ELEMENT	PERFORMANCE CRITERIA Italicized terms are elaborated in	REQUIRED KNOWLEDGE	REQUIRED
	the Range of Variable		SKILLS
testing	on types of electronic components	Units <ul> <li>Applied</li> <li>Mathematics</li> </ul>	<ul><li>2.2 Communication skills</li><li>2.3 Use and</li></ul>
	<ul> <li>2.2 Characteristics and appropriateness of testing methods to be used during development and on completion is determined</li> <li>2.3 Testing methods are considered/selec ted in relation to appropriate <i>testing strategy</i></li> </ul>	<ul> <li>2.2 Safety</li> <li>Work Safety requirements and economy of materials with durability</li> <li>Knowledge in 5S application and observation of required timeframe</li> <li>Knowledge of proper handling and disposal of chemicals</li> </ul>	<ul> <li>maintenance of tools and equipment</li> <li>2.4 Skills in testing electronic components</li> <li>2.5 Work safety practices and time management</li> <li>2.6 Problem solving skills</li> <li>2.7 Reading skills</li> </ul>
	2.4 Plan for testing components is developed at specified points during development and on completion	<ul> <li>2.3 Materials, tools and equipment uses and specifications</li> <li>Identification of hand and power tools</li> <li>Proper care</li> </ul>	
	<ul> <li>2.5 Required test &amp; measuring instruments and tools are prepared and checked in accordance with established procedures</li> <li>2.6 Records system is established to document testing</li> </ul>	<ul> <li>and use of tools</li> <li>2.4 Systems and Processes <ul> <li>Principles of electrical/elec tronic circuits</li> <li>Identifying sources of electricity</li> <li>Identifying conductors and insulators</li> </ul> </li> </ul>	

ELEMENT	PERFORMANCE CRITERIA Italicized terms are elaborated in the Bango of Variable	REQUIRED KNOWLEDGE	REQUIRED SKILLS
	results, including problems and faults	<ul> <li>Describing resistance and identify resistors</li> <li>Supplying different voltage using variable power supply</li> <li>Measuring resistance using VOM</li> <li>Testing resistors</li> <li>Measuring current and voltage using VOM</li> <li>Analyzing simple circuit using ohms and power law</li> <li>Analyzing series/parallel circuits using ohms and power law</li> <li>Describing alternating current circuits</li> <li>Observing waveform using oscilloscope</li> <li>generating waveform in various frequency using function generator</li> </ul>	

	PERFORMANCE		
	are eleborated in	REQUIRED	PEOLIPED
ELEMENT		KNOWLEDGE	SKILLS
	Range of Variable		ORIEEO
		Measuring	
		frequency	
		using	
		oscilloscope	
		Measuring	
		capacitance	
		using VOM	
		Describing	
		capacitance	
		and	
		identifying	
		capacitors	
		<ul> <li>Testing</li> </ul>	
		capacitors	
		<ul> <li>Analyzing</li> </ul>	
		series/parallel	
		capacitances	
		<ul> <li>Describing</li> </ul>	
		inductance	
		and	
		identifying	
		inductors	
		Testing	
		Inductors	
		Analyzing	
		series parallel	
		characteristic	
		of	
		transformers	
		Describing	
		and	
		identifvina	
		semiconducto	
		r diode	
		<ul> <li>Testing</li> </ul>	
		semiconducto	
		r diode	
		Analyzing	
		rectifier	

ELEMENT	PERFORMANCE CRITERIA Italicized terms are elaborated in the Range of Variable	REQUIRED KNOWLEDGE	REQUIRED SKILLS
		<ul> <li>circuits</li> <li>Describing and identifying bipolar transistor</li> <li>testing bipolar transistor</li> <li>testing bipolar transistor</li> <li>analyzing amplifier circuit</li> <li>analyzing multi-vibrator circuit</li> <li>describing and analyzing digital gate</li> <li>testing logic gates</li> <li>analyzing logic networks</li> <li>analyzing sequence circuits</li> </ul>	
3. Test components	<ul> <li>3.1 Testing methods are applied to ensure that products meet creative, production and technical requirements</li> <li>3.2 Problems and faults detected by testing are recorded and remedial steps taken in records system is documented</li> </ul>	<ul> <li>4.1 Mensuration/Mat hematics</li> <li>Conversion of Units</li> <li>Applied Mathematics</li> <li>4.2 Safety</li> <li>Work Safety requirements and economy of materials with durability</li> <li>Knowledge in 5S application and observation of</li> </ul>	<ul> <li>3.1 Work efficiently &amp; systematically</li> <li>3.2 Communication skills</li> <li>3.3 Use and maintenance of tools and equipment</li> <li>3.4 Skills in testing electronic components</li> <li>3.5 Work safety practices and time management</li> <li>3.6 Problem solving</li> </ul>

ELEMENT	PERFORMANCE CRITERIA Italicized terms are elaborated in the Range of Variable	REQUIRED KNOWLEDGE	REQUIRED SKILLS
	<ul> <li>3.3 Problems and faults detected during testing are resolved in accordance with agreed project or industry practice</li> <li>3.4 Evaluate final products against the previously determined criteria</li> <li>3.5 Testing process is documented and summarized evaluation report is submitted to relevant personnel</li> </ul>	<ul> <li>required timeframe</li> <li>Knowledge of proper handling and disposal of chemicals</li> <li>4.3 Materials, tools and equipment uses and specifications</li> <li>Identification of hand and power tools</li> <li>Proper care and use of tools</li> <li>4.4 Systems and Processes</li> <li>Principles of electrical/elec tronic circuits</li> <li>Identifying sources of electricity</li> <li>Identifying conductors and insulators</li> <li>Describing resistance and identify resistors</li> <li>Supplying different voltage using variable power supply</li> <li>Measuring resistance using VOM</li> <li>Testing resistors</li> </ul>	3.7 Reading skills

	PERFORMANCE		
	Italicized terms		
	are elaborated in	REQUIRED	REQUIRED
ELEMENT	the	KNOWLEDGE	SKILLS
	Range of Variable		011120
		<ul> <li>Measuring</li> </ul>	
		current and	
		voltage using	
		VOM	
		<ul> <li>Analyzing</li> </ul>	
		simple circuit	
		usina ohms	
		and power	
		law	
		<ul> <li>Analyzing</li> </ul>	
		series/parallel	
		circuits using	
		ohms and	
		power law	
		<ul> <li>Describing</li> </ul>	
		alternating	
		current	
		circuits	
		<ul> <li>Observing</li> </ul>	
		waveform	
		using	
		oscilloscope	
		<ul> <li>generating</li> </ul>	
		waveform in	
		various	
		frequency	
		using function	
		generator	
		<ul> <li>Measuring</li> </ul>	
		frequency	
		using	
		oscilloscope	
		Measuring	
		capacitance	
		Describing	
		capacitance	
		and identifier	
		identifying	
		capacitors	

ELEMENT	PERFORMANCE CRITERIA Italicized terms are elaborated in the Range of Variable	REQUIRED KNOWLEDGE	REQUIRED SKILLS
		<ul> <li>Analyzing series/parallel capacitances</li> <li>Describing inductance and identifying inductors</li> <li>Testing inductors</li> <li>Testing series parallel inductors</li> <li>Analyzing series parallel inductors</li> <li>Describing the characteristic of transformers</li> <li>Describing and identifying semiconducto r diode</li> <li>Testing semiconducto r diode</li> <li>Testing semiconducto r diode</li> <li>Testing semiconducto r diode</li> <li>Testing semiconducto r diode</li> <li>Testing semiconducto r diode</li> <li>Testing semiconducto r diode</li> <li>Analyzing rectifier circuits</li> <li>Describing and identifying bipolar transistor</li> <li>testing bipolar transistor</li> <li>testing bipolar transistor</li> <li>analyzing amplifier circuit</li> <li>analyzing multi-vibrator circuit</li> </ul>	

ELEMENT	PERFORMANCE CRITERIA <i>Italicized</i> terms are elaborated in the Range of Variable	REQUIRED KNOWLEDGE	REQUIRED SKILLS
		<ul> <li>describing and analyzing digital gate</li> <li>testing logic gates</li> <li>analyzing logic networks</li> <li>analyzing sequence circuits</li> </ul>	
4. Evaluate the testing process	<ul> <li>4.1 Testing methods that were successful and those that led to difficulties are identified based on industry standards</li> <li>4.2 Testing process and records system are evaluated based on standard procedures</li> <li>4.3 Test results/findings are documented for subsequent components testing.</li> </ul>	<ul> <li>4.1 Mensuration/Mat hematics <ul> <li>Conversion of Units</li> <li>Applied Mathematics</li> </ul> </li> <li>4.2 Safety <ul> <li>Work Safety requirements and economy of materials with durability</li> <li>Knowledge in 5S application and observation of required timeframe</li> <li>Knowledge of proper handling and disposal of chemicals</li> </ul> </li> <li>4.3 Materials, tools and equipment uses and specifications <ul> <li>Identification of hand and</li> </ul> </li> </ul>	<ul> <li>4.1 Work efficiently &amp; systematically</li> <li>4.2 Communication skills</li> <li>4.3 Use and maintenance of tools and equipment</li> <li>4.4 Skills in testing electronic components</li> <li>4.5 Work safety practices and time management</li> <li>4.6 Problem solving skills</li> <li>4.7 Reading skills</li> </ul>

	PERFORMANCE CRITERIA		
	Italicized terms		
	are elaborated in		REQUIRED
ELEMENI	the	KNOWLEDGE	SKILLS
	Range of Variable		
		<ul> <li>Proper care</li> </ul>	
		and use of	
		tools	
		4.4 Systems and	
		Processes	
		<ul> <li>Principles of</li> </ul>	
		electrical/elec	
		tronic circuits	
		<ul> <li>Identifying</li> </ul>	
		sources of	
		electricity	
		<ul> <li>Identifying</li> </ul>	
		conductors	
		and insulators	
		Describing	
		resistance	
		and identify	
		resistors	
		Supplying     different	
		voltage using	
		power supply	
		Measuring	
		resistance	
		using VOM	
		Testing	
		resistors	
		Measuring	
		current and	
		voltage using	
		VOM	
		Analyzing	
		simple circuit	
		using ohms	
		and power	
		Analyzing     Analyzing	
		series/parallel	
		ohme and	
		nower law	

ELEMENT	PERFORMANCE CRITERIA Italicized terms are elaborated in the	REQUIRED KNOWLEDGE	REQUIRED SKILLS
		<ul> <li>Describing alternating current circuits</li> <li>Observing waveform using oscilloscope</li> <li>generating waveform in various frequency using function generator</li> <li>Measuring frequency using oscilloscope</li> <li>Measuring capacitance using VOM</li> <li>Describing capacitance and identifying capacitors</li> <li>Testing capacitors</li> <li>Testing capacitances</li> <li>Describing capacitors</li> <li>Testing capacitances</li> <li>Describing capacitors</li> <li>Testing capacitors</li> <li>Testing series/parallel capacitances</li> <li>Describing inductance and identifying inductors</li> <li>Testing inductors</li> <li>Testing inductors</li> <li>Testing inductors</li> <li>Testing inductors</li> <li>Testing inductors</li> <li>Testing inductors</li> <li>Testing inductors</li> <li>Describing</li> <li>Describing</li> <li>inductors</li> <li>Testing inductors</li> </ul>	

	PERFORMANCE CRITERIA Italicized terms	REQUIRED	
ELEMENT	the Range of Variable	KNOWLEDGE	SKILLS
		the characteristic of transformers Describing and identifying semiconducto r diode Testing semiconducto r diode Analyzing rectifier circuits Describing and identifying bipolar transistor transistor transistor transistor transistor analyzing amplifier circuit analyzing multi-vibrator circuit analyzing and analyzing digital gate testing logic gates analyzing logic networks analyzing sequence circuits	

VARIABLE	RANGE
1. Responsible person	Relevant personnel may include: 1.1. Immediate supervisor 1.2. Manager
2. Testing criteria	Testing criteria may include: 2.1. controls 2.2. effectiveness 2.3. efficiency 2.4. bug detection 2.5. functionality, including flow 2.6. interoperability 2.7. performance 2.8. reliability 2.9. operating parameters
3. Testing methods	Testing methods may include: 3.1. automated 3.2. debugging 3.3. inspection 3.4. platform testing 3.5. prototyping
4. Types of electronic components	<ul><li>4.1 Passive components</li><li>4.2 Active components</li><li>4.3 Dynamic components</li><li>4.4 Hybrid components</li></ul>
5. Testing strategy	Testing strategy may be determined by: 5.1 Passive testing 5.2 Dynamic testing 5.3 In-circuit testing
6. Test and measuring instruments	Test and measuring instruments may include: 6.1. Variable DC power supply 6.2. Digital VOM 6.3. analog VOM 6.4. dual trace triggered oscilloscope 6.5. function generator
7. Tools	Tools may include: 7.1. set of pliers 7.2. set of screw drivers 7.3. set of wrenches 7.4. Hand drills, 7.5. Hack saw 7.6. set of files 7.7. tin snip

	7.8. hammer
8. Records system	Records system may include:
	8.1. metadata that includes:
	8.1.1. description of fault
	8.1.2. identification of code
	8.1.3. user responses
	8.1.4. written or verbal comments
	8.1.5. quantitative data
	8.1.6. remedial action taken
	8.1.7. retest result
	8.1.8. date
	8.1.9. tester's details
	8.2. questionnaire
	8.3. survey

1. Critical Aspects of Competency	Assessment requires evidence that the candidate: 1.1 Determined criteria for testing electronics components 1.2 Planned an approach for component testing 1.3 Tested components 1.4 Evaluated the testing process
2. Resource Implications	The following resources must be provided: 5.1 Tools and equipment (see range of variables) 5.2 Working area/bench 5.3 Electronic components 5.4 Testing instruments and equipment 5.5 Assessment rating sheet 5.6 Reporting forms
3. Methods of Assessment	<ul> <li>Competency may be assessed through two or more of the following methods:</li> <li>3.1 Direct observation of application to tasks and questions related to required knowledge</li> <li>3.2 Demonstration with oral questioning</li> <li>3.3 Third party report</li> <li>3.4 Written test</li> <li>3.5 Portfolio</li> </ul>
4. Context of Assessment	4.1 Assessment maybe conducted in the workplace or in a simulated workplace setting

## **CORE COMPETENCIES**

UNIT OF COMPETENCY	INSTALL INTERNET OF THINGS (IOT) DEVICES AND STRUCTURED NETWORK
UNIT CODE	: AB-ELC1381100742301
UNIT DESCRIPTOR	<ul> <li>This unit covers the knowledge, skills and attitudes required to interpret network plan, prepare Internet of Things (IoT)</li> <li>system for installation, set-up network Internet of Things (IoT) devices and software, and set-up network Internet of Things (IoT) devices and software.</li> </ul>

ELEMENT	PERFORMANCE CRITERIA Italicized terms are elaborated in the Range of Variable	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Interpret network plan	<ul> <li>1.1 Network plan is obtained based on company policies and procedures</li> <li>1.2 Internet of Things (IoT) <i>hardware components</i> needed are identified based on network plan</li> <li>1.3 Internet of Things (IoT) <i>software components</i> needed are identified based on network plan</li> </ul>	<ul> <li>1.1 Network plan</li> <li>1.2 IoT hardware component</li> <li>1.3 IoT software components</li> <li>1.4 Cabling and power supply connection</li> <li>1.5 Software dependencies</li> <li>1.6 Tools, equipment and materials</li> </ul>	<ol> <li>1.1 Interpreting network plan</li> <li>1.2 Identifying IoT hardware components</li> <li>1.3 Identifying IoT software components</li> <li>1.4 Identifying cabling and power connections</li> <li>1.5 Critical thinking skills</li> <li>1.6 Problem- solving skills</li> <li>1.7 Communication skills</li> </ol>
2. Prepare Internet Of Things (IoT) system for installation	<ul> <li>2.1 Area is surveyed based on network plan</li> <li>2.2 Network Internet of Things (IoT) devices are laid out based on surveyed area</li> <li>2.3 <i>Installation</i> <i>requirements</i> are identified based on</li> </ul>	<ul> <li>2.1 Surveying techniques</li> <li>2.2 Environmental factors that influence network design</li> <li>2.3 Proper placement and functionality of Internet of</li> </ul>	<ul> <li>2.1 Conducting site surveys using appropriate tools and techniques</li> <li>2.2 Analyzing environmental factors (e.g., temperature, humidity, interference)</li> </ul>

the conducted	Things (IoT)	that impact
2.4 Hardware and	2.4 Power. cabling	performance
<ul> <li>the conducted survey</li> <li>2.4 Hardware and software <i>dependencies</i> are identified based on installation requirements</li> <li>2.5 Dependencies are gathered based on installation requirements</li> <li>2.6 Installation plan is prepared based on company policies and procedures and surveillance activity findings</li> </ul>	<ul> <li>2.4 Power, cabling, and environmental requirements</li> <li>2.5 Interdependen cies between hardware and software components</li> <li>2.6 Procedures in gathering and documenting necessary dependencies</li> <li>2.7 Risk Assessment and Mitigation</li> </ul>	<ul> <li>Inal impact network performance</li> <li>2.3 Identifying obstacles and factors that could affect network coverage and efficiency</li> <li>2.4 Placing Internet of Things (IoT) devices in optimal locations to maximize coverage and signal strength</li> <li>2.5 Assessing power requirements for each Internet of Things (IoT) device based on survey findings</li> <li>2.6 Identifying interdependenci es between hardware components</li> </ul>
		(e.g., Internet of Things (IoT) devices) and software components (e.g., operating systems, application software) 2 7 Configuring
		hardware for full functionality
		2.8 Assessing potential risks during the installation process (e.g., power failures, equipment

				malfunction).
3.	Set-up network Internet of Things (IoT) devices and software	<ul> <li>3.1 Tools, equipment and materials are checked for completeness based on installation plan</li> <li>3.2 Hardware components are assembled based on manufacturer's standards</li> <li>3.3 Tools, equipment and materials are positioned and</li> </ul>	<ul> <li>3.1 Installation plan</li> <li>3.2 Required tools, equipment, and material</li> <li>3.3 Hardware components</li> <li>3.4 Position tools, equipment, and materials</li> <li>3.5 Cabling and power supply installation</li> </ul>	3.1 Organizing tools and materials for the installation process 3.2 Assembling hardware components 3.3 Handling delicate or sensitive hardware with care 3.4 Positioning
	installed according to installation plan 3.4 Cabling and power supply connection are laid out in	standards (e.g., ANSI/TIA-568) 3.6 Software dependencies required	tools, equipment, and materials as specified in the installation plan	
		compliance with structured standards 3.5 Software dependencies are installed according to manufacturer's standards and installation plan 3.6 Functionality of hardware is checked and troubleshot based on standard operating procedures	3.7 Procedures for checking and troubleshooting hardware for proper functionality and identify faults.	<ul> <li>3.5 Laying out and connecting cables and power supplies</li> <li>3.6 installing software dependencies (e.g., drivers, operating systems, network management software)</li> <li>3.7 Identifying, diagnosing, and resolving hardware issues</li> </ul>

VARIABLE	RANGE	
1. Hardware	May include:	
Components	1.1 Modules (WiFi, GPS, LoRa, Bluetooth)	
	1.2 Microcontrollers and Chipsets	
	1.3 Sensor and Actuators	
	1.4 Power Supply	
	1.5 Edge Compatibility Devices	
2. Software Components	May include:	
	2.1 Device Firmware	
	2.2 Operating System (OS)	
	2.3 MQTT, CoAP, HTTP	
	2.4 AI/ML Analytics	
	2.5 Encryption	
	2.6 Authentication Decryption	
3. Installation	May include:	
requirements	3.1 Hardware	
	3.2 Software	
	3.3 Electrical	
	3.4Network	
4. Dependencies	May Include:	
	4.1 Hardware	
	Modules (WiFi, GPS, LoRa, Bluetooth)	
	Microcontrollers and Chipsets	
	Sensors and Actuators	
	Power Supply Units	
	Memory and Storage	
	4.2 Software	
	Operating System (OS)	
	Firmware	
	Middleware	
	• API	
	• DLL	
	Plugins	
	Applications	
	Device Drivers	
5. Tools, equipment and	May include:	
materials	5.1 Hardware	
	Sensors     Actuators	
	Actuators     Operativity Markets	
	Connectivity Modules	
	Power Supply	

	Prototyping Tools
5	5.2 Software & Development Tools
	<ul> <li>Development Environments</li> </ul>
	<ul> <li>Programming Languages</li> </ul>
	Communication Protocols
	Cloud Platforms
	<ul> <li>Database &amp; Data Management</li> </ul>
	Communication Tools & Protocols
5	5.3 Networking & Cloud Integration
5	5.4 Miscellaneous Materials
5	5.5 Testing & Debugging Tools
	5 55 5

competencies1.1Interpreted network plan1.1.1Identified hardware and software components base on network plan1.1.2Identified Tools, equipment and materials based on network plan1.1.3Identified Personal Protective Equipment based on job requirements1.2Prepared Interpret of Things (IoT) system for
<ul> <li>1.1.1 Identified hardware and software components base on network plan</li> <li>1.1.2 Identified Tools, equipment and materials based on network plan</li> <li>1.1.3 Identified Personal Protective Equipment based on job requirements</li> <li>1.2 Prepared Internet of Things (IoT) system for</li> </ul>
components base on network plan 1.1.2 Identified Tools, equipment and materials based on network plan 1.1.3 Identified Personal Protective Equipment based on job requirements
1.1.2 Identified Tools, equipment and materials based on network plan 1.1.3 Identified Personal Protective Equipment based on job requirements
based on network plan 1.1.3 Identified Personal Protective Equipment based on job requirements 1.2 Prepared Internet of Things (IoT) system for
1.1.3 Identified Personal Protective Equipment based on job requirements
based on job requirements
1.2 Prenared Internet of Things (IoT) system for
installation
1.2.1 Identified installation requirements based
on survey and network plan
1.2.2 Prepared install plan based on
and procedure
1.3 Set-up network Internet of Things (IoT) devices
and software
1.3.1 Checked tools, equipment and materials
for completeness based on installation
plan
1.3.2 Laid out cabling and power supply
connection in compliance with installation
standards
2. Resource Implications The following resources should be provided:
2.1 Simulated workplace
2.2 Tools, equipment, devices and materials
2.3 Hardware and software/firmware
2.4 Plans, specifications, guidelines and standards
3. Methods of
Assessment 3.1 Institutional Assessment
3.2 Written test
3.3 Demonstration and oral questioning
3.4 Interview
4. Context for 4.1 Competency may be assessed individually in the
Assessment actual workplace or in simulation environment in
TESDA accredited training institutions.

UNIT OF COMPETENCY	CONFIGURE INTERNET OF THINGS (IOT)
UNIT CODE	: AB-ELC1381100742302
UNIT DESCRIPTOR	This unit covers the knowledge, skills and attitudes required to set-up system configuration, test and calibrate Internet of Things (IoT) systems, and prepare Internet of Things (IoT) system for installation report.

ELEMENT	PERFORMANCE CRITERIA Italicized terms are elaborated in the Range of Variable	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Set-up system configuration	<ul> <li>1.1 <i>Hardware systems</i> <i>identity</i> are designated based on network plan</li> <li>1.2 Network communication systems are routed based on network plan</li> <li>1.3 Internet of Things (IoT) system applications are executed based on configuration requirements</li> <li>1.4 <i>Security measures</i> are applied based on communication protocol</li> </ul>	<ul> <li>1.1 Network plan and hardware system</li> <li>1.2 Routing protocols and network communication systems</li> <li>1.3 Internet of Things (IoT) system configuration and application execution</li> <li>1.4 Communication protocols and security measures</li> </ul>	<ul> <li>1.1 Interpreting network plan and identifying hardware system</li> <li>1.2 Configuring and verifying network routes</li> <li>1.3 Installing, configuring, and executing Internet of Things (IoT) applications</li> <li>1.4 Applying security measures (e.g., encryption, firewalls)</li> <li>1.5 Problem solving skills</li> <li>1.6 Critical thinking skills</li> <li>1.7 Communicati on skills</li> </ul>

2.	Test and calibrate Internet of Things (IoT) systems	<ul> <li>2.1 Internet of Things (IoT) systems are launched based on network plan</li> <li>2.2 <i>Corrective</i> <i>measures</i> are performed on system malfunctions based on system configuration</li> </ul>	<ul> <li>2.1 Network plan and its specific requirements</li> <li>2.2 System configuration and troubleshootin g procedures for Internet of Things (IoT) systems</li> </ul>	<ul> <li>2.1 Launching Internet of Things (IoT) systems</li> <li>2.2 Identifying and performing corrective actions on IoT system malfunctions</li> </ul>
		2.3 Penetration tests on security breaches are performed based on <i>penetration</i> <i>testing standards</i>	2.3 Penetration testing standards and security protocols	<ul> <li>2.3 Conducting penetration tests to identify security vulnerabilitie s in Internet of Things (IoT) systems</li> <li>2.4 Problem solving skills</li> <li>2.5 Critical thinking skills</li> <li>2.6 Communicati on skills</li> </ul>
3.	Prepare Internet of Things (IoT) system for installation report	<ul> <li>3.1 Relevant integration data, system performance, error lags and troubleshooting history are collected based on standard operating procedures</li> <li>3.2 <i>Reports</i> are compiled based on organizational standards</li> <li>3.3 Documentation reports are shared/submitted with relevant stakeholders/depart</li> </ul>	<ul> <li>3.1 Standard operating procedures (SOPs)</li> <li>3.2 Procedures in collecting and recording integration data, system performance metrics, error lags, and troubleshooting history</li> <li>3.3 Procedures in submitting and sharing reports</li> </ul>	<ul> <li>3.1 Collecting and documenting relevant integration data, system performance , error logs, and troubleshooti ng history</li> <li>3.2 Sharing and submitting documentati on reports</li> <li>3.3 Communicat ion skills</li> </ul>

ments based on company policy 3.4 Internet of Things (IoT) system settings are backed-up based on configuration requirements	<ul> <li>3.4 Internet of Things (IoT) system configuration requirements</li> <li>3.5 Back up procedures for Internet of Things (IoT) system settings</li> </ul>	3.4 Backing up Internet of Things (IoT) system settings 3.5 Problem solving skills 3.6 Critical thinking
	, ,	skills 3.7Communicat ion skills

VARIABLE	RANGE
1. Hardware systems identity	May include:
	1.1 IP Address
	1.2 MAC Address
	1.3 Channel
	1.4 IPv4 Address
	1.0 GOID 1.7 ZIGBEE Device Address
	1.8 Device Token
2. Security measures	May include:
	2.1 Set password
	2.2 Firewall
	2.3 Encryption
	2.4 Access control
	2.5 PIN Code
	2.6 Filtering
3. Corrective measures	May include:
	3.1 Set password
	3.2 Firewall
	3.3 Encryption
	3.4 Access control
	3.5 PIN Code
	3.6 Filtering
4. Penetration testing	May include:
standards	4.1OWASP
	4.2PTES
	4.3NIST
	4.4OSSTMM
	4.5PCI DSS
5. Reports	May include:
'	5.1 Checklist form
	5.2 Incident report
	5.3 Inventory report
	5.4 Troubleshooting history
	5.5User logs

1. Critical aspect of Assessment requires evidence that the candidate	
competencies 1.1 Set-up system configuration	
1.1.1 Designated hardware systems identity base	ed on
network plan	
1.1.2 Routed network communication systems ba	ased
on network plan	
1.1.3 Executed Internet of Things (IoT) systems	
applications based on configuration	
requirements	
1.1.4 Applied security measures based on	
communication protocol	
1.2 Tested and calibrated Internet of Things (IoT) syst	ems
1.2.1 Launched Internet of Things (IoT) systems	
based on network plan	
1.2.2 Performed corrective actions on systems	
malfunction based on system configuration	
1.2.3 Performed penetration tests on security	
breaches based on penetration testing	
standards	
1.3Prepared Internet of Things (IoT) system installation	on
report	
1.3.1 Collected integration data, system performa	ance,
error lags and troubleshooting history base	d on
standard operating procedures	
1.3.2 Shared/submitted documentation reports w	ith
relevant stakeholders/departments based o	'n
company policy	
1.3.3 Backed-up Internet of Things (IoT) system	
settings based on configuration requirement	ts
2 Posourco The following resources should be provided:	
Implications 2.1 Simulated workplace	
2.7 Tools equipment devices and materials	
2.2 Hordware and software/firmware	
2.5 Hardware and Software/Infinware	
2.4 Plans, specifications, guidelines and standards	
3. Methods of Competency in this unit must be assessed through:	
3.1 Institutional Assessment	
3.2Written test	
3.3 Demonstration and oral questioning	
3.4 Interview	
4. Context for 4.1 Competency may be assessed individually in the a	actual
Assessment workplace or in simulation environment in TESDA	

# UNIT OF COMPETENCY: MAINTAIN INTERNET OF THINGS (IOT) SYSTEMSUNIT CODE: AB-ELC1381100742303UNIT DESCRIPTORThis unit covers the knowledge, skills and attitudes<br/>required to inspect Internet of Things (IoT) systems,<br/>troubleshoot Internet of Things (IoT) system issues,<br/>update Internet of Things (IoT) systems software

troubleshoot Internet of Things (IoT) system issues, update Internet of Things (IoT) systems software, upgrade IoT systems, upgrade Internet of Things (IoT) systems, and document maintenance activities.

ELEMENT	PERFORMANCE CRITERIA Italicized terms are elaborated in the Range of Variable	REQUIRED KNOWLEDGE	REQUIRED SKILLS
<ol> <li>Inspect Internet of Things (IoT) systems</li> </ol>	<ul> <li>1.1 Maintenance plan is obtained based on company policies and procedures</li> <li>1.2 Internet of Things (IoT) systems health condition are diagnosed based on maintenance plan</li> <li>1.3 OSH policy and procedures are followed based on company policies and procedures</li> <li>1.4 <i>Findings</i> are recorded and reported following maintenance documentation standards</li> </ul>	<ol> <li>Maintenance plan</li> <li>Company policies and procedures</li> <li>Maintenance procedures and diagnostic tools to assess the health condition of Internet of Things (IoT) systems</li> <li>Occupational Safety and Health (OSH) guidelines</li> <li>Personal protective equipment (PPE)</li> <li>Maintenance documentatio n standards for recording and reporting findings</li> </ol>	<ul> <li>1.1 Interpreting maintenance plan</li> <li>1.2 Diagnosing the condition of Internet of Things (IoT) systems using appropriate tools and methods, based on the maintenance plan</li> <li>1.3 Using personal protective equipment (PPE)</li> <li>1.4 Documenting inspection findings</li> </ul>

	ELEMENT	PERFORMANCE CRITERIA Italicized terms are elaborated in the Range of Variable	REQUIRED KNOWLEDGE	REQUIRED SKILLS
2.	Troubleshoo t Internet of Things (IoT) system issues	<ul> <li>2.1 Faults and system failures are identified using <i>Troubleshooting</i> <i>techniques</i></li> <li>2.2 <i>Network issues</i> are resolved following default communication protocols</li> <li>2.3 <i>Corrective</i> <i>measures</i> are applied in compliance with manufacturer guidelines</li> <li>2.4 System functionality is tested based on default system</li> </ul>	<ul> <li>2.1 Troubleshootin g techniques and diagnostic tools to identify faults and failures in Internet of Things (IoT) systems.</li> <li>2.2 Default communication protocols (e.g., TCP/IP, MQTT)</li> </ul>	2.3 Applying systematic troubleshootin g techniques to identify the root causes of faults and system failures in Internet of Things (IoT) systems
3.	Update Internet of Things (IoT) systems software	<ul> <li>3.1 <i>Firmware</i> and software updates are checked based on compatibility requirements</li> <li>3.2 Backup procedures are performed following company policies and procedures and manufacturer's guidelines</li> <li>3.3 Updates are installed following manufacturer's guidelines and industry standards</li> <li>3.4 System software is tested for stability and compatibility based on</li> </ul>	<ul> <li>3.1 Software/firmw are versioning and compatibility</li> <li>3.2 Backup procedures</li> <li>3.3 Standard procedures for installing updates</li> <li>3.4 Test software stability and compatibility</li> <li>3.5 Document and report software updates and testing results</li> </ul>	<ul> <li>3.1 Assessing new updates for compatibility with existing systems</li> <li>3.2 Implementing backup procedures</li> <li>3.3 Establishing standard procedures for installing updates</li> <li>3.4 Testing software stability and compatibility</li> <li>3.5 Documenting and reporting software</li> </ul>

ELEMENT	PERFORMANCE CRITERIA Italicized terms are elaborated in the Range of Variable	REQUIRED KNOWLEDGE	REQUIRED SKILLS
	3.5 Logs and report of software updates are based on compliance with company policies and procedures		testing results
<ol> <li>Upgrade Internet of Things (IoT) Systems</li> </ol>	<ul> <li>4.1 Hardware and software upgrade requirements are assessed based on system performance and client needs</li> <li>4.2 Compatibility of new components with existing Internet of Things (IoT) systems is evaluated based on manufacturer's guidelines</li> <li>4.3 Old hardware and software are replaced following manufacturing guidelines protocols and company policies and procedures</li> <li>4.4 New components are installed are according to MG</li> <li>4.5 System configurations are adjusted based on Internet of Things (IoT) system requirements</li> <li>4.6 Testing and validation of</li> </ul>	<ul> <li>4.1 Internet of Things (IoT) system architecture and performance metrics</li> <li>4.2 Internet of Things (IoT) component specifications and integration guidelines</li> <li>4.3 Hardware and software components</li> <li>4.4 Installation protocols</li> <li>4.5 Testing methodologies and performance validation</li> </ul>	<ul> <li>4.1 Assessing client needs and evaluating system performance</li> <li>4.2 Checking compatibility</li> <li>4.3 Performing replacement of hardware/soft ware</li> <li>4.4 Installing and configurating of Internet of Things (IoT) components</li> <li>4.5 Configuring and adjusting system settings</li> <li>4.6 Testing and validating system upgrades</li> </ul>

ELEMENT	PERFORMANCE CRITERIA Italicized terms are elaborated in the Range of Variable	REQUIRED KNOWLEDGE	REQUIRED SKILLS
	upgraded system performance are conducted based on company policies and procedures		
5. Document maintenance activities	<ul> <li>5.1 Maintenance activities, repairs and upgrades are recorded following documentation protocols</li> <li>5.2 Reports are updated based on compliance and tracking requirements</li> <li>5.3 Documentation is stored and submitted with concerned personnel according to company policies and procedures</li> </ul>	<ul> <li>5.1 Compliance standards and regulatory requirements</li> <li>5.2 Systems tracking for maintenance activities</li> <li>5.3 Storage systems for maintenance documentation</li> </ul>	<ul> <li>5.1 Tracking systems for maintenance activities.</li> <li>5.2 Utilizing storage systems for maintenance documentation</li> <li>5.3 Communicatio n skills</li> </ul>
# RANGE OF VARIABLES

VARIABLE	RANGE
1. Findings	May include: 1.1 System Downtime or Latency 1.2 Hardware Failures 1.3 Software Bugs or Outdated Firmware 1.4 Connectivity Problems 1.5 Power Issues 1.6 Security Gaps 1.7 Non-Compliance to regulatory standards 1.8 Lack of Documentation 1.9 Misuse of IoT systems
2. Troubleshooting techniques	May include: 2.1 Resetting 2.2 Restoration 2.3 Debugging 2.4 Reinstalling 2.5 Reconfiguration 2.6 Rewiring 2.7 Replacement
3. Network issues	May include: 3.1 Connectivity Problems 3.2 Slow Performance 3.3 Intermittent Issues 3.4 Security Vulnerabilities 3.5 Specific Application
4. Corrective measures	May include: 4.1 Reconfiguration 4.2 Reinstallation 4.3 Fix
5. Firmware	May include: 5.1 Low-level firmware 5.2 High-level firmware 5.3 Subsystem firmware
6. Hardware and software upgrade requirements	<ul> <li>6.1 Hardware Variables</li> <li>Processing Power and Memory</li> <li>Power Efficiency</li> <li>Device Compatibility</li> <li>Scalability</li> <li>Security</li> </ul>

	<ul> <li>Environmental Durability</li> <li>Cost and ROI</li> <li>6.2 Software Variables</li> </ul>
	<ul> <li>Performance Improvements</li> <li>Security Upgrades</li> <li>Compatibility</li> <li>Scalability</li> <li>UI/UX Enhancements</li> <li>Maintenance and Updates</li> <li>Data Management</li> </ul>
7. Components	May include:
	7.1 Hardware
	<ul> <li>Raspberry Pi</li> <li>Arduino</li> <li>Expansion Board</li> <li>Sensors</li> <li>Internet of Things (IoT) Modules</li> </ul>
	7.2 Software
	<ul> <li>Internet of Things (IoT) Platforms</li> <li>Network systems</li> <li>Software tools</li> </ul>
8. Concerned personnel	May include:
	<ul> <li>8.1 Internet of Things (IoT) Specialist</li> <li>8.2 Internet of Things (IoT) Programmer</li> <li>8.3 Internet of Things (IoT) Record keeper</li> <li>8.4 Internet of Things (IoT) Manager</li> </ul>

# EVIDENCE GUIDE

1. Critical aspect of	Assessment	requires evidence that the candidate
competencies	1.1 Inspe	ected Internet of Things (IoT) systems
	1.1.1	Diagnosed Internet of Things (IoT) systems
		condition based on maintenance plan
	1.1.2	Recorded and reported findings following
		maintenance documentation standards
	1.1.3	Followed OSH policy and procedures based on
		company policies and procedures
	1.2Troub	leshot Internet of Things (IoT) system issues
	1.2.1	Identified faults and system failures using
		troubleshooting techniques
	1.2.2	Resolved network issues following default
		communication protocols
	1.2.3	Applied corrective measures in compliance with
		manufacturer guidelines
	1.2.4	Tested system functionality based on default
		system configuration
	1.2.5	Checked updates of software and firmware
		based on compatibility requirements
	1.2.6	Prepared Internet of Things (IoT) system
		installation report
	1.3 Upda	ted Internet of Things (IoT) systems software
	1.3.1	Performed backup procedures following
		company policies and procedures and
		manufacturer's guidelines
	1.3.2	Installed updates following manufacturer's
		guidelines and industry standards
	1.3.3	Tested system software stability and
		compatibility based manufacturer's guidelines
	1.3.4	Recorded and reported software updates in
		compliance with company policies and
	procedures	
	1.4 Upgraded Internet of Things (IoT) systems	
	1.4.1	Assessed hardware and software upgrade
		requirements based on
		system performance and client needs
	1.4.2	Replaced old hardware and software following
		manufacturer's guidelines and company policies
		and procedures
	1.4.3	Adjusted systems configurations based on
		Internet of Things (IOT) system requirements
	1.4.4	Conducted testing and validation of upgraded
	4.55	system performance
	1.5Docu	mented maintenance activities

	<ul> <li>1.5.1 Recorded maintenance activities, repairs and upgrades following documentation protocols</li> <li>1.5.2 Updated reports are based on compliance and tracking requirements</li> <li>1.5.3 Stored documentation and submitted with concerned personnel according to Company policies and procedures</li> </ul>	
2. Resource	The following resources should be provided:	
Implications	2.1 Simulated workplace	
	2.2 Tools, equipment, devices and materials	
	2.3 Hardware and software/firmware	
	2.4 Plans, specifications, guidelines and standards	
<ol> <li>Methods of Assessment</li> </ol>	Competency in this unit must be assessed through: 3.1 Institutional Assessment	
	3.2 Written test	
	3.3 Demonstration and oral questioning	
	3.4 Interview	
4. Context for	4.1 Competency may be assessed individually in the actual	
Assessment	workplace or in simulation environment in TESDA	
	accredited training institutions.	

# **GLOSSARY OF TERMS**

1. Access Control	A security technique that regulates who or what can view or
	use resources within a network or system.
2. Application	A set of protocols and tools that allows different software
Programming	components to communicate with each other.
Interface (API)	
3. Arduino	A microcontroller board used in Internet of Things (IoT)
	applications for controlling sensors and actuators.
4. Authentication	I he process of verifying the identity of a device, user, or
5 Backup	The process of creating a copy of data configurations or
	settings to restore them in case of data loss or system
	failure.
6. Bandwidth	The maximum rate of data transfer across a network,
	affecting Internet of Things (IoT) device communication.
7. Bluetooth	A short-range wireless technology standard used for
8 Cabling	The structured arrangement of network cables used to
	connect Internet of Things (IoT) devices, routers, and other
	network components.
9. Channel	A specific frequency or communication path used by Internet
-	of Things (IoT) devices to transmit and receive data.
10. Checklist Form	A structured document used to verify whether specific tasks,
	conditions, or requirements have been met during system
11. Chipset	A set of electronic components in an integrated circuit that
	manages data flow between the processor, memory, and
	peripherals.
12. Communication	A set of rules that define how data is transmitted between
Protocols	devices in a network (e.g., MQTT, HTTP, CoAP).
13. Compatibility	The specifications a system must meet to support new
Requirements	hardware or software updates.
14. Configuration	The technical specifications and settings needed to properly
Requirements	set up an Internet of Things (IoT) system for optimal
15 Connectivity Issues	Problems related to network access, slow performance, or
	intermittent connections in Internet of Things (IoT) systems.
16. Corrective Measures	Actions taken to fix or restore Internet of Things (IoT)
	system functions, such as reconfiguration, reinstallation, or
	debugging.
17. Decryption	The process of converting encrypted data back into its
18 Debugging	The process of identifying and removing errors from
	software, hardware, or network configurations.
19. Device Firmware	A type of software that provides low-level control of a
	device's hardware and ensures its proper functionality.

20. Device Token	A unique identifier assigned to an Internet of Things (IoT) device for authentication and communication within a network.
21. Diagnostic Tools	Software or hardware used to analyze and troubleshoot Internet of Things (IoT) system performance and issues.
22. Edge Compatibility	Hardware components that enable processing at the edge of
Devices	a network, reducing latency and dependency on cloud- based computing.
23. Encryption	The process of converting data into a secure format to prevent unauthorized access.
24. Error Logs	Records that track system errors, failures, and performance issues for troubleshooting and analysis.
25. Expansion Board	A hardware component that enhances the capabilities of Internet of Things (IoT) microcontrollers like Raspberry Pi or Arduino.
26. Firewall	A security mechanism that monitors and controls network traffic to prevent unauthorized access to or from a network.
27. Firmware	A specialized software embedded into a hardware device to control its functions.
28.GUID (Globally	A unique reference number used to identify devices,
Unique Identifier)	applications, or components in a system.
29. Hardware	The physical parts of an Internet of Things (IoT) system,
Components	supplies.
30. Hardware Upgrade	The process of replacing or adding physical components (e.g., sensors, processors) to enhance Internet of Things (IoT) system performance.
31.Health Condition (IoT Systems)	The status of an Internet of Things (IoT) system's performance, reliability, and security, often assessed using diagnostic tools.
32. Incident Report	A formal record documenting any issues, malfunctions, or security breaches within an Internet of Things (IoT) system.
33. Installation Plan	A documented strategy outlining the steps and requirements for setting up Internet of Things (IoT) devices and networks.
34. Integration	The process of connecting Internet of Things (IoT) hardware and software components to ensure seamless functionality.
35. Internet of Things (IoT)	A network of interconnected devices that communicate and share data over the internet.
36. Inventory Report	A document listing all hardware, software, and network components associated with an Internet of Things (IoT) system.
37.IP Address (Internet Protocol Address)	A numerical label assigned to each device in a network for identification and communication.
38. IPv4 (Internet Protocol Version 4)	The fourth version of the Internet Protocol, using a 32-bit address system (e.g., 192.168.1.1).
39. IPv6 (Internet Protocol Version 6)	The latest version of the Internet Protocol, using a 128-bit address system to accommodate more devices and improve security.

40. Internet of Things (IoT) System Configuration	The process of setting up Internet of Things (IoT) devices, network communication, and security settings to ensure seamless functionality.
41. LoRa (Long Range)	A wireless communication technology designed for long- range, low-power Internet of Things (IoT) applications.
42. Maintenance Plan	A structured schedule outlining the procedures for inspecting, troubleshooting, and updating Internet of Things (IoT) systems.
43.MAC Address (Media Access Control Address)	A unique identifier assigned to a network interface for communication within a network segment.
44. Manufacturer's Guidelines (MG)	Official instructions from the device manufacturer detailing installation, updates, and maintenance procedures.
45. Microcontroller	A small computing device that controls the functions of an Internet of Things (IoT) system by processing inputs and managing outputs.
46. Middleware	A software layer that acts as a bridge between the operating system and applications, facilitating communication and data management.
47.MQTT (Message Queuing Telemetry Transport)	A lightweight messaging protocol designed for Internet of Things (IoT) devices to communicate efficiently over the internet.
48. Network Configuration	The setup of devices, communication protocols, and security settings that determine how Internet of Things (IoT) systems operate.
49. Network Issues	Problems that disrupt the communication between Internet of Things (IoT) devices, including connectivity failures and slow response times.
50. Network Plan	A blueprint that defines the structure, components, and connectivity of a network setup.
51.NIST (National Institute of Standards and Technology)	A set of cybersecurity and testing standards used for evaluating system security, including Internet of Things (IoT) networks.
52. Occupational Safety and Health (OSH)	Guidelines ensuring the safety of personnel working with Internet of Things (IoT) systems, including PPE usage.
53. Operating System (OS)	Describes the goods being handled by a piece of equipment.
54.OWASP (Open Web Application Security Project)	A widely recognized standard for identifying and addressing security vulnerabilities in web and Internet of Things (IoT) applications.
55.OSSTMM (Open- Source Security Testing Methodology Manual)	A framework for performing security testing and risk assessment on networks and systems.

56. PCI DSS (Payment Card Industry Data Security Standard)	A security standard for protecting sensitive financial data, often applied to Internet of Things (IoT) systems handling transactions.
57. Penetration Testing	A security assessment process that simulates cyberattacks to identify vulnerabilities in an Internet of Things (IoT) system.
58. Personal Protective Equipment (PPE)	Safety gear (e.g., gloves, eye protection) worn when maintaining or troubleshooting Internet of Things (IoT) devices.
59. Performance Metrics	Measurements used to evaluate the efficiency and effectiveness of an Internet of Things (IoT) system (e.g., response time, uptime).
60. Plugins	Additional software components that extend the functionality of an application or system.
61. Power Supply Unit (PSU)	A hardware component that provides electrical power to IoT devices.
62.PTES (Penetration Testing Execution Standard)	A structured approach for performing penetration tests to assess system security.
63. Raspberry Pi	A small, affordable computer commonly used in IoT applications for data processing and automation.
64. Reconfiguration	The ability to control or monitor IoT devices from a distant location over the internet or a private network.
65. Restoration	The process of bringing an IoT system back to a previous functional state after a failure.
66. Risk Assessment	The process of identifying potential hazards and determining their impact on the IoT installation process.
67. Routing Protocols	Algorithms that determine the best path for data transmission between IoT devices and networks (e.g., OSPF, BGP, RPL).
68.Router	A networking device that forwards data packets between computer networks and IoT devices.
69. Sensors and Actuators	Hardware components in IoT devices that detect environmental changes (sensors) and perform actions (actuators) based on received signals.
70. Security Measures	Techniques and protocols used to protect an IoT system from unauthorized access, data breaches, and cyber threats.
71. Security Vulnerabilities	Weaknesses in an IoT system that could be exploited by cyber threats.
72. Software Components	The programs, applications, and protocols that enable IoT devices to function and communicate.
73. Software Update	The process of installing new versions of software or firmware to fix bugs, enhance security, and improve functionality.
74. Storage Systems	Platforms or devices used to securely store IoT system maintenance documentation and logs.
75. Structured Cabling	A standardized approach to designing and installing network cabling systems to support multiple hardware devices.

76. Surveying Techniques	Methods used to assess the physical and environmental factors affecting IoT device placement.
77. System Malfunction	A failure or error in an IoT system that causes it to operate incorrectly or inefficiently.
78. System Configuration	The setup and adjustment of an IoT system's hardware and software settings for optimal performance.
79. Testing Methodologies	Standardized procedures for assessing IoT system performance, security, and stability.
80. Troubleshooting	The process of identifying, diagnosing, and resolving issues within IoT hardware and software.
81. Troubleshooting History	A recorded log of past issues, solutions, and configurations applied to an IoT system for future reference.
82. Upgrade (Hardware/Software)	The process of improving an IoT system by adding new features, enhancing performance, or replacing outdated components.
83. User Logs	A record of user activities within an IoT system, used for monitoring security, performance, and access control.
84. Wi-Fi	A wireless networking technology that allows IoT devices to connect to the internet without physical cables.
85. Zigbee Device Address	A unique identifier assigned to Zigbee-enabled IoT devices for low-power, short-range wireless communication.

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### THE TECHNICAL EXPERT PANEL (TEP)

ENGR. RHESSAN JAN R. MAMORANSING Hytec Power Inc. #2 T. Cruz St., Cruzville, Zabarte Rd., Brgy Kaligayahan, Novaliches, Quezon Clty	MARY GRACE ROSALIA N. GULAN Mary Grace International Education Inc. 2705N Joya Lofts and Towers, Rockwell Center, Makati
<b>RONIE RONOLO</b> Integrated Computer Systems Limketkai Building, Ortigas Avenue, Greenhills, San Juan City	ENGR. PATRICIA MAE ABANTE Hytec Power Inc. #2 T. Cruz St., Cruzville, Zabarte Rd., Brgy Kaligayahan, Novaliches, Quezon Clty
ARRISH C. ALTAVANO National ICT Confederation of the Philippines/ Southern Luzon Technological College San Loranzo St. Brgy. Kapitolyo, Pasig City	<b>DR. DANILO V. AYAP</b> Lyceum of Alabang Km 30 National Road, Tunasan, Muntinlupa City
MARY JOSSA T. MIRANDA Philippine Center for Creative Imaging, Inc. 14 Samaria St. Multinational Village, Moonwalk, Parañaque City	MARK DAVID D. MIRANDA Pixel Digital Imaging Studio & Service Bureau, Inc. 14 Samaria St. Multinational Village, Moonwalk, Parañaque City
FRANCIS T. POLO College of Saint Amatiel 37, Brgy lugam, lugam, city of malolos, bulacan	LARRY M. SISON JR. Emmanuel John Institute of Science and Technology / Computer Center LACS 34 Araneta Ave Cor Gov Pascual Potrero Malabon City
VICTOR JAMES B. ORDOÑEZ Southern Institute of Maritime Studies (SIMS) 011 Purok I, Lumangbayan Plaridel, Bulacan	<b>LEONACE B. COREAL</b> Mary Grace International Education Inc. 1413 Newton St. San Isidro, Makati Clty
NCR ABDD TVET FOCALS	
NELSON T. EFREN TESDA-PasMak TESDA Building 15, TESDA Complex East Service Road, South Luzon Expressway, Fort Bonifacio Taguig City	EDEN F. TUGADE TESDA-National Capital Region Building 15, TESDA Complex East Service Road, South Luzon Expressway, Fort Bonifacio, Taguig City

KRISTEL MARINE C. LABRADOR	
TESDA-PasMak	
TESDA Building 15, TESDA Complex	
East Service Road, South Luzon	
Expressway, Fort Bonifacio Taguig City	
THE SECRETARIAT	
ROCEL M. ALCASODA	
TESDA-PasMak	
TESDA Building 15, TESDA Complex	
East Sarvice Read South Luzon	
East Service Road, South Luzon	