

TRAINING REGULATIONS



MECHATRONICS SERVICING NC II

ELECTRICAL & ELECTRONICS SECTOR

TECHNICAL EDUCATION AND SKILLS DEVELOPMENT AUTHORITY
East Service Road, South Superhighway, Taguig City, Metro Manila

*Technical Education and Skills Development Act of 1994
(Republic Act No. 7796)*

Section 22, “Establishment and Administration of the National Trade Skills Standards” of the RA 7796 known as the TESDA Act mandates TESDA to establish national occupational skill standards. The Authority shall develop and implement a certification and accreditation program in which private industry group and trade associations are accredited to conduct approved trade tests, and the local government units to promote such trade testing activities in their respective areas in accordance with the guidelines to be set by the Authority.

The Training Regulations (TR) serve as basis for the:

- 1 Competency assessment and certification;
- 2 Registration and delivery of training programs; and
- 3 Development of curriculum and assessment instruments.

Each TR has four sections:

- | | |
|-----------|--|
| Section 1 | Definition of Qualification - refers to the group of competencies that describes the different functions of the qualification. |
| Section 2 | Competency Standards - gives the specifications of competencies required for effective work performance. |
| Section 3 | Training Arrangements - contains information and requirements in designing training program for certain Qualification. It includes curriculum design, training delivery; trainee entry requirements; tools and requirements; tools and equipment; training facilities and trainer's qualification. |
| Section 4 | Assessment and Certification Arrangements - describes the policies governing assessment and certification procedure |

TABLE OF CONTENTS

ELECTRICAL & ELECTRONICS SECTOR MECHATRONICS SERVICING NATIONAL CERTIFICATE LEVEL II

	Page No.
SECTION 1	
MECHATRONICS SERVICING NC II QUALIFICATIONS	1
SECTION 2	
COMPETENCY STANDARDS	2 - 49
• Basic Competencies	2 - 15
• Common Competencies	16 - 40
• Core Competencies	41 - 49
SECTION 3	
TRAINING ARRANGEMENTS	50 - 77
3.1 Curriculum Design	50 - 69
3.2 Training Delivery	70 - 71
3.3 Trainee Entry Requirements	71
3.4 List of Tools, Equipment and Materials	72
3.5 Training Facilities	73
3.6 Trainers Qualification	73
3.7 Institutional Assessment	73
SECTION 4	
ASSESSMENT AND CERTIFICATION ARRANGEMENTS	74 - 75
DEFINITION OF TERMS	76 - 79
COMPETENCY MAP	80
ACKNOWLEDGEMENT	81 - 82

TRAINING REGULATIONS FOR MECHATRONICS SERVICING NC II

Section 1 MECHATRONICS SERVICING NC II QUALIFICATIONS

The Mechatronics Servicing NC II Qualification consists of competencies that must be possessed to enable a person to install, configure and test mechatronics and automation devices/system.

This Qualification is packaged from the competency map of the Electrical & Electronics Industry sector as shown in Annex A.

The units of competency comprising this qualification include the following:

Code	BASIC COMPETENCIES
5 00 311 1 05	Participate in workplace communication
5 00 311 1 06	Work in team environment
5 00 311 1 07	Practice career professionalism
5 00 311 1 08	Practice occupational health and safety procedures
Code	COMMON COMPETENCIES
ELC311205	Use Hand Tools
ELC311201	Perform Mensuration and Calculation
ELC311202	Prepare and Interpret Technical Drawing
ELC311204	Apply Quality Standards
ELC311203	Perform Computer Operations
ELC311206	Terminate and Connect Electrical Wiring and Electronic Circuits
ELC311209	Test Electronic Components
Code	CORE COMPETENCIES
ELC311301	Install Mechatronics and Automation Devices
ELC311302	Configure and Test Mechatronics and Automation System

A person who has achieved this Qualification is competent to be:

- Mechatronics and Automation Technician
- Mechatronics and Automation Installer

SECTION 2: COMPETENCY STANDARDS

This section gives the details of the contents of the basic, common, and core units of competency required for Mechatronics Servicing NC II.

BASIC COMPETENCIES

UNIT OF COMPETENCY : PARTICIPATE IN WORKPLACE COMMUNICATION

UNIT CODE : 500311105

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

ELEMENT	PERFORMANCE CRITERIA <i>Italicized</i> 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 <i>appropriate sources</i> 1.2 Effective questioning , active listening and speaking skills are used to gather and convey information 1.3 Appropriate <i>medium</i> is used to transfer information and ideas 1.4 Appropriate non- verbal communication is used 1.5 Appropriate lines of communication with supervisors and colleagues are identified and followed 1.6 Defined workplace procedures for the location and <i>storage</i> of information are used 1.7 Personal interaction is carried out clearly and concisely	<ul style="list-style-type: none"> • Effective communication • Different modes of communication • Written communication • Organizational policies • Sources of information • Types of question • Medium of communication • Flow of communication • Storage system • Telephone courtesy 	<ul style="list-style-type: none"> • Follow simple spoken language • Performing routine workplace duties following simple written notices • Ability to relate to people of social range in the workplace • Gather and provide information in response to workplace requirements • Listening skills • Questioning skills • Workplace language skills
2. Participate in workplace meetings and discussions	2.1 Team meetings are attended on time 2.2 Own opinions are clearly expressed and those of others are listened to without interruption 2.3 Meeting inputs are consistent with the meeting purpose and established <i>protocols</i> 2.4 <i>Workplace interactions</i> are conducted in a courteous manner	<ul style="list-style-type: none"> • Communication procedures and systems • Meeting protocols • Nature of workplace meetings • Barriers of communication • Workplace interactions • Non verbal communication 	<ul style="list-style-type: none"> • Ability to relate to people of social range in the workplace • Interpersonal communication skill • Observing meeting protocols

ELEMENT	PERFORMANCE CRITERIA <i>Italicized</i> terms are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
	2.5 Questions about simple routine workplace procedures and matters concerning working conditions of employment are asked and responded to 2.6 Meetings outcomes are interpreted and implemented		
3. Complete relevant work related documents	3.1 Range of forms relating to conditions of employment are completed accurately and legibly 3.2 Workplace data is recorded on standard workplace forms and documents 3.3 Basic mathematical processes are used for routine calculations 3.4 Errors in recording information on forms/ documents are identified and properly acted upon 3.5 Reporting requirements to supervisor are completed according to organizational guidelines	<ul style="list-style-type: none"> • Technology relevant to the enterprise and the individual's work • Types of workplace documents and forms • Basic mathematical concepts • Kinds of workplace report 	<ul style="list-style-type: none"> • Apply basic mathematical processes of addition, subtraction, division and multiplication • Data recording • Report writing

RANGE OF VARIABLES

VARIABLE	RANGE
1. Appropriate sources	1.1. Team members 1.2. Suppliers 1.3. Trade personnel 1.4. Local government 1.5. Industry bodies
2. Medium	2.1. Memorandum 2.2. Circular 2.3. Notice 2.4. Information discussion 2.5. Follow-up or verbal instructions 2.6. Face to face communication
3. Storage	3.1. Manual filing system 3.2. Computer-based filing system
4. Forms	4.1. Personnel forms, telephone message forms, safety reports
5. Workplace interactions	5.1. Face to face 5.2. Telephone 5.3. Electronic and two way radio 5.4. Written including electronic, memos, instruction and forms, non-verbal including gestures, signals, signs and diagrams
6. Protocols	6.1. Observing meeting 6.2. Compliance with meeting decisions 6.3. Obeying meeting instructions

EVIDENCE GUIDE

1. Critical aspects of Competency	Assessment requires evidence that the candidate: 1.1. Prepared written communication following standard format of the organization 1.2. Accessed information using communication equipment 1.3. Made use of relevant terms as an aid to transfer information effectively 1.4. Conveyed information effectively adopting the formal or informal communication
2. Resource Implications	2.1. Fax machine 2.2. Telephone 2.3. Writing materials 2.4. Internet
3. Methods of Assessment	3.1. Direct Observation 3.2. Oral interview and written test
4. Context for Assessment	4.1. Competency may be assessed individually in the actual workplace or through accredited institution

UNIT OF COMPETENCY: WORK IN TEAM ENVIRONMENT**UNIT CODE : 500311106****UNIT DESCRIPTOR :** This unit covers the skills, knowledge and attitudes to identify role and responsibility as a member of a team.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized</i> terms are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Describe team role and scope	1.1. The <i>role and objective of the team</i> is identified from available <i>sources of information</i> 1.2. Team parameters, reporting relationships and responsibilities are identified from team discussions and appropriate external sources	<ul style="list-style-type: none"> • Team roles • Definition of Team • Difference between team and group • Different source of information • Objectives and goals of team 	<ul style="list-style-type: none"> • Describing the team role and scope
2. Identify own role and responsibility within team	2.1. Individual role and responsibilities within the team environment are identified 2.2. Roles and responsibility of other team members are identified and recognized 2.3. Reporting relationships within team and external to team are identified	<ul style="list-style-type: none"> • Team structure • Roles and responsibility of team members • Teams in work environment • Fundamental rights at work including gender sensitivity 	<ul style="list-style-type: none"> • Communicate appropriately, consistent with the culture of the workplace • Identifying individual role and responsibility • Identifying external relationship
3. Work as a team member	3.1. Effective and appropriate forms of communications used and interactions undertaken with team members who contribute to known team activities and objectives 3.2. Effective and appropriate contributions made to complement team activities and objectives, based on individual skills and competencies and <i>workplace context</i> 3.3. Observed protocols in reporting using standard operating procedures 3.4. Contribute to the development of team work plans based on an understanding of team's role and objectives and individual competencies of the members	<ul style="list-style-type: none"> • Communication process • Group planning and decision making • Team goals and objectives • Understanding individual competencies relative to teamwork • Types of individuals • Role of leaders 	<ul style="list-style-type: none"> • Interacting effectively with others • Setting team goals and expectations

RANGE OF VARIABLES

VARIABLE	RANGE
1. Role and objective 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 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	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

EVIDENCE GUIDE

1. Critical aspects of Competency	<p>Assessment requires evidence that the candidate:</p> <ol style="list-style-type: none"> 1.1. Operated 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 1.6. Reported outcomes
2. Resource Implications	<p>The following resources MUST be provided:</p> <ol style="list-style-type: none"> 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 Assessment	<p>Competency may be assessed through:</p> <ol style="list-style-type: none"> 3.1. Observation of the individual member in relation to the work activities of the group 3.2. Observation of simulation and or role play involving the participation of individual member to the attainment of organizational goal 3.3. Case studies and scenarios as a basis for discussion of issues and strategies in teamwork
4. Context for Assessment	<ol style="list-style-type: none"> 4.1. Competency may be assessed in workplace or in a simulated workplace setting 4.2. Assessment shall be observed while task are being undertaken whether individually or in group

UNIT OF COMPETENCY: PRACTICE CAREER PROFESSIONALISM

UNIT CODE : 500311107

UNIT DESCRIPTOR : This unit covers the knowledge, skills and attitudes in promoting career growth and advancement.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized</i> terms are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Integrate personal objectives with organizational goals	1.1. Personal growth and work plans are pursued towards improving the qualifications set for the profession 1.2. Intra- and interpersonal relationships are maintained in the course of managing oneself based on performance evaluation 1.3. Commitment to the organization and its goal is demonstrated in the performance of duties	<ul style="list-style-type: none"> • Work values and ethics (Code of Conduct, Code of Ethics, etc.) • Understanding personal objectives • Understanding organizational goals • Difference between intra and interpersonal relationship • Performance evaluation 	<ul style="list-style-type: none"> • Demonstrate Intra and Interpersonal skills at work • Demonstrate personal commitment in work
2. Set and meet work priorities	2.1. Competing demands are prioritized to achieve personal, team and organizational goals and objectives. 2.2. Resources are utilized efficiently and effectively to manage work priorities and commitments 2.3. Practices along economic use and maintenance of equipment and facilities are followed as per established procedures	<ul style="list-style-type: none"> • Company policies • Company operations, procedures and standards • Time management • Basic strategic planning concepts • Resource utilization and management 	<ul style="list-style-type: none"> • Managing goals and time • Practice economic use of resources and facilities • Setting work priorities • Practice time management
3. Maintain professional growth and development	3.1. Trainings and career opportunities are identified and availed of based on job requirements 3.2. Recognitions are sought/received and demonstrated as proof of career advancement 3.3. Licenses and/or certifications relevant to job and career are obtained and renewed	<ul style="list-style-type: none"> • Career development opportunities • Company recognition and incentives • Information on relevant licenses and or certifications 	<ul style="list-style-type: none"> • Determining personal career development needs • Identifying career opportunities

RANGE OF VARIABLES

VARIABLE	RANGE
1. Evaluation	1.1 Performance Appraisal 1.2 Psychological Profile 1.3 Aptitude Tests
2. Resources	2.1 Human 2.2 Financial 2.3 Technology 2.3.1 Hardware 2.3.2 Software
3. Trainings and career opportunities	3.1 Participation in training programs 3.1.1 Technical 3.1.2 Supervisory 3.1.3 Managerial 3.1.4 Continuing Education 3.2 Serving as Resource Persons in conferences and workshops
4. Recognitions	4.1 Recommendations 4.2 Citations 4.3 Certificate of Appreciations 4.4 Commendations 4.5 Awards 4.6 Tangible and Intangible Rewards
5. Licenses and/or certifications	5.1 National Certificates 5.2 Certificate of Competency 5.3 Support Level Licenses 5.4 Professional Licenses

EVIDENCE GUIDE

1. Critical aspects of Competency	Assessment requires evidence that the candidate: 1.1 Attained job targets within key result areas (KRAs) 1.2 Maintained intra - and interpersonal relationship in the course of managing oneself based on performance evaluation 1.3 Completed trainings and career opportunities which are based on the requirements of the industries 1.4 Acquired and maintained licenses and/or certifications according to the requirement of the qualification
2. Resource Implications	The following resources MUST be provided: 2.1 Workplace or assessment location 2.2 Case studies/scenarios
3. Methods of Assessment	Competency may be assessed through: 3.1 Portfolio Assessment 3.2 Interview 3.3 Simulation/Role-plays 3.4 Observation 3.5 Third Party Reports 3.6 Exams and Tests
4. Context for Assessment	4.1 Competency may be assessed in the work place or in a simulated work place setting

UNIT OF COMPETENCY : PRACTICE OCCUPATIONAL HEALTH AND SAFETY PROCEDURES**UNIT CODE : 500311108****UNIT DESCRIPTOR : This unit covers the outcomes required to comply with regulatory and organizational requirements for occupational health and safety.**

ELEMENT	PERFORMANCE CRITERIA <i>Italicized</i> terms are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Identify hazards and risks	1.1 Safety regulations and workplace safety and hazard control practices and procedures are clarified and explained based on organization procedures 1.2 Hazards/risks in the workplace and their corresponding indicators are identified to minimize or eliminate risk to co-workers, workplace and environment in accordance with organization procedures 1.3 Contingency measures during workplace accidents, fire and other emergencies are recognized and established in accordance with organization procedures	<ul style="list-style-type: none"> • OHS procedures and practices and regulations • Hazards/risks identification and control • OHS indicators • Organizational contingency practices 	<ul style="list-style-type: none"> • Hazards/risks identification and control skills • Practice of safety and health procedures and personal hygiene
2. Evaluate hazards and risks	2.1 Terms of maximum tolerable limits which when exceeded will result in harm or damage are identified based on threshold limit values (TLV) 2.2 Effects of the hazards are determined 2.3 OHS issues and/or concerns and identified safety hazards are reported to designated personnel in accordance with workplace requirements and relevant workplace OHS legislation	<ul style="list-style-type: none"> • Threshold Limit Value (TLV) • Effects of safety hazards 	<ul style="list-style-type: none"> • Communication skills • Reporting safety hazards
3. Control hazards and risks	3.1 Occupational Health and Safety (OHS) procedures for controlling hazards/risks in workplace are consistently followed 3.2 Procedures for dealing with workplace accidents, fire and emergencies are followed in accordance with organization OHS policies	<ul style="list-style-type: none"> • Personal hygiene practices • Organization safety and health protocol • Company emergency procedure practices 	<ul style="list-style-type: none"> • Practice of personal hygiene • Respond to emergency

ELEMENT	PERFORMANCE CRITERIA <i>Italicized</i> terms are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
	3.3 <i>Personal protective equipment (PPE)</i> is correctly used in accordance with organization OHS procedures and practices 3.4 Appropriate assistance is provided in the event of a workplace emergency in accordance with established organization protocol		
4. Maintain OHS awareness	4.1 <i>Emergency-related drills and trainings</i> are participated in as per established organization guidelines and procedures 4.2 <i>OHS personal records</i> are completed and updated in accordance with workplace requirements	<ul style="list-style-type: none"> • Workplace OHS personal records • Information on emergency-related drills 	<ul style="list-style-type: none"> • Practice emergency-related drill skills in the workplace

RANGE OF VARIABLES

VARIABLE	RANGE
1. Safety regulations	May include but are not limited to: 1.1 Clean Air Act 1.2 Building code 1.3 National Electrical and Fire Safety Codes 1.4 Waste management statutes and rules 1.5 Philippine Occupational Safety and Health Standards 1.6 DOLE regulations on safety legal requirements 1.7 ECC regulations
2. Hazards/Risks	May include but are not limited to: 2.1 Physical hazards – impact, illumination, pressure, noise, vibration, temperature, radiation 2.2 Biological hazards- bacteria, viruses, plants, parasites, mites, molds, fungi, insects 2.3 Chemical hazards – dusts, fibers, mists, fumes, smoke, gasses, vapors 2.4 Ergonomics 2.4.1 Psychological factors – over exertion/ excessive force, awkward/static positions, fatigue, direct pressure, varying metabolic cycles 2.4.2 Physiological factors – monotony, personal relationship, work out cycle
3. Contingency measures	May include but are not limited to: 3.1 Evacuation 3.2 Isolation 3.3 Decontamination 3.4 (Calling designed) emergency personnel
4. PPE	May include but are not limited to: 4.1 Mask 4.2 Gloves 4.3 Goggles 4.4 Hair Net/cap/bonnet 4.5 Face mask/shield 4.6 Ear muffs 4.7 Apron/Gown/coverall/jump suit 4.8 Anti-static suits

VARIABLE	RANGE
5. Emergency-related drills and training	5.1 Fire drill 5.2 Earthquake drill 5.3 Basic life support/CPR 5.4 First aid 5.5 Spillage control 5.6 Decontamination of chemical and toxic 5.7 Disaster preparedness/management
6. OHS personal records	6.1 Medical/Health records 6.2 Incident reports 6.3 Accident reports 6.4 OHS-related training completed

EVIDENCE GUIDE

1. Critical aspects of Competency	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> 1.1 Explained clearly established workplace safety and hazard control practices and procedures 1.2 Identified hazards/risks in the workplace and its corresponding indicators in accordance with company procedures 1.3 Recognized contingency measures during workplace accidents, fire and other emergencies 1.4 Identified terms of maximum tolerable limits based on threshold limit value (TLV). 1.5 Followed Occupational Health and Safety (OHS) procedures for controlling hazards/risks in workplace 1.6 Used Personal Protective Equipment (PPE) in accordance with company OHS procedures and practices 1.7 Completed and updated OHS personal records in accordance with workplace requirements
2. Resource Implications	<p>The following resources must be provided:</p> <ul style="list-style-type: none"> 2.1 Workplace or assessment location 2.2 OHS personal records 2.3 PPE 2.4 Health records
3. Methods of Assessment	<p>Competency may be assessed through:</p> <ul style="list-style-type: none"> 3.1 Portfolio Assessment 3.2 Interview 3.3 Case Study/Situation
4. Context for Assessment	<ul style="list-style-type: none"> 4.1 Competency may be assessed in the work place or in a simulated work place setting

COMMON COMPETENCIES

UNIT TITLE : **USE HAND TOOLS**
UNIT CODE : **ELC311205**
UNIT DESCRIPTOR : This unit covers the knowledge, skills and attitudes on the safe use, handling and maintenance of tools.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized Bold</i> terms are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Plan and prepare for tasks to be undertaken	1.1. Tasks to be undertaken are properly identified 1.2. Appropriate hand tools are identified and selected according to the task requirements	<ul style="list-style-type: none"> • Planning and preparing task/ activity • Electronics hand tools and their uses • Function, operation and common faults in electronics hand tools 	<ul style="list-style-type: none"> • Preparing required tasks • Communication skills • Using hand tools properly
2. Prepare hand tools	2.1. Appropriate hand tools are checked for proper operation and safety 2.2. Unsafe or faulty tools are identified and marked for repair according to standard company procedure	<ul style="list-style-type: none"> • Checking and safety requirements in handling tools • Standard procedures in checking, identification and marking of safe or unsafe/ faulty tools 	<ul style="list-style-type: none"> • Identifying and checking hand tools • Marking of safe or unsafe/ faulty hand tools
3. Use appropriate hand tools and test equipment	3.1. Tools are used according to tasks undertaken 3.2. All safety procedures in using tools are observed at all times and appropriate personal protective equipment (PPE) are used 3.3. Malfunctions, unplanned or unusual events are reported to the supervisor	<ul style="list-style-type: none"> • Safety requirements in using electronics hand tools and test equipment • Electronics hand tools for adjusting, dismantling, assembling, finishing, and cutting. • Processes, Operations, Systems <ul style="list-style-type: none"> ○ Proper usage and care of hand tools ○ Types and uses of test equipment • Common faults in the use of hand tool 	<ul style="list-style-type: none"> • Reading skills required to interpret work instruction and numerical skills • Using PPE properly • Problem solving in emergency situation
4. Maintain hand tools	4.1. Tools are not dropped to avoid damage 4.2. Routine maintenance of tools undertaken according to standard operational procedures, principles and techniques 4.3. Tools are stored safely in appropriate locations in accordance with manufacturer's specifications or standard operating procedures	<ul style="list-style-type: none"> • Safety requirements in maintenance of hand tools • Processes, Operations, Systems <ul style="list-style-type: none"> ○ Maintenance of tools ○ Storage of hand tools 	<ul style="list-style-type: none"> • Checking and cleaning hand tools • Storing hand tools properly

RANGE OF VARIABLES

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

EVIDENCE GUIDE

1. Critical aspect of competency	Assessment requires evidence that the candidate: <ul style="list-style-type: none"> 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. Method of assessment	Competency in this unit must be assessed through: <ul style="list-style-type: none"> 2.1. Observation 2.2. Oral questioning
3. Resource Implication	Tools may include the following but not limited to: <ul style="list-style-type: none"> 3.1. screw drivers 3.2. pliers 3.3. punches 3.4. wrenches, files
4. Context of Assessment	4.1. Assessment may be conducted in the workplace or in a simulated work environment

UNIT TITLE : **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 <i>Italicized Bold</i> terms are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Select measuring instruments	1.1. Object or component to be measured is identified 1.2. Correct specifications are obtained from relevant source 1.3. Measuring tools are selected in line with job requirements	<ul style="list-style-type: none"> • Category of measuring instruments • Types and uses of measuring instruments • Shapes and Dimensions • Formulas for volume, areas, perimeters of plane and geometric figures 	<ul style="list-style-type: none"> • Identifying and selecting measuring instruments • Visualizing objects and shapes
2. Carry out measurements and calculation	2.1. Appropriate measuring instrument is selected to achieve required outcome 2.2. Accurate measurements are obtained for job 2.3. Calculation needed to complete work tasks are performed using the four basic process of addition (+), subtraction (-), multiplication (x), and division (/) 2.4. Calculation involving fractions, percentages and mixed numbers are used to complete workplace tasks. 2.5. Numerical computation is self-checked and corrected for accuracy 2.6. Instruments are read to the limit of accuracy of the tool.	<ul style="list-style-type: none"> • Calculation & measurement • Four fundamental operation • Linear measurement • Dimensions • Unit conversion • Ratio and proportion 	<ul style="list-style-type: none"> • Performing calculation by addition, subtraction, multiplication and division; • Interpreting formulas for volume, areas, perimeters of plane and geometric figures • Handling of measuring instruments
3. Maintain measuring instruments	3.1. Measuring instruments are not dropped to avoid damage 3.2. Measuring instruments are cleaned before and after using. 3.3. Proper storage of instruments undertaken according to manufacturer's specifications and standard operating procedures.	<ul style="list-style-type: none"> • Types of measuring instruments and their uses • Safe handling procedures in using measuring instruments • Four fundamental operation of mathematics • Formula for volume, area, perimeter and other geometric figures 	<ul style="list-style-type: none"> • Handling and maintaining measuring instruments

RANGE OF VARIABLES

VARIABLE	RANGE
1. Measuring instruments	1.1. Straight edge 1.2. Torque gauge 1.3. Try square 1.4. Protractor 1.5. Combination gauge 1.6. Steel rule
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

EVIDENCE GUIDE

1. Critical aspect of competency	Assessment requires evidence 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. Method of assessment	Competency in this unit must be assessed through: 2.1. Observation 2.2. Oral questioning
3. Resource implication	3.1. Place of assessment 3.2. Measuring instruments 3.3. Straight edge 3.4. Torque gauge 3.5. Try square 3.6. Protractor 3.7. Combination gauge 3.8. Steel rule
4. Context of Assessment	4.1. Assessment may be conducted in the workplace or in a simulated environment

UNIT TITLE : PREPARE AND INTERPRET TECHNICAL DRAWING

UNIT CODE : ELC311202

UNIT DESCRIPTOR : This unit covers the knowledge, skills and attitudes and values needed to prepare/interpret diagrams, engineering abbreviation and drawings, symbols, dimension.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized Bold</i> terms are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Identify different kinds of technical drawings	1.1. Correct technical drawing is selected according to job requirements. 1.2. Technical drawings are segregated in accordance with the types and kinds of drawings	<ul style="list-style-type: none"> • Types of technical drawings • Applications for technical drawing • Methods of technical drawings • Symbols • Mark up/Notation of Drawings 	<ul style="list-style-type: none"> • Reading skills required to interpret work instruction • Interpreting electrical/ electronic signs and symbols
2. Interpret technical drawing	2.1. Components, assemblies or objects are recognized as required. 2.2. Dimensions of the key features of the objects depicted in the drawing are correctly identified. 2.3. Symbols used in the drawing are identified and interpreted correctly. 2.4. Drawing is checked and validated against job requirements or equipment in accordance with standard operating procedures.	<ul style="list-style-type: none"> • Trade Mathematics <ul style="list-style-type: none"> ○ Linear measurement ○ Dimension ○ Unit conversion • Blueprint Reading and Plan Specification <ul style="list-style-type: none"> ○ Architectural, electrical, electronics, mechanical plan, symbols and abbreviations ○ Drawing standard symbols • Trade Theory <ul style="list-style-type: none"> ○ Basic technical drawing ○ Types technical plans ○ Various types of drawings ○ Notes and specifications 	<ul style="list-style-type: none"> • Interpreting drawing/ orthographic drawing • Interpreting technical plans • Matching specification details with existing resources • Safety handling of drawing instruments
3. Prepare/ make changes to electrical/ electronic schematics and drawings	3.1. Electrical/electronic schematic is drawn and correctly identified. 3.2. Correct drawing is identified, equipment are selected and used in accordance with job requirements.	<ul style="list-style-type: none"> • Drawing conventions • Dimensioning Conventions • Mathematics <ul style="list-style-type: none"> ○ Four fundamental operations ○ Percentage ○ Fraction ○ Algebra ○ Geometry 	<ul style="list-style-type: none"> • Reading skills required to interpret work instruction • Communication skills • Preparing/ Making electrical/ electronic signs and symbols • Computing formulas

ELEMENT	PERFORMANCE CRITERIA <i>Italicized Bold</i> terms are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
4. Store technical drawings and equipment/instruments	4.1. Care and maintenance of drawings are undertaken according to company procedures. 4.2. Technical drawings are recorded and inventory is prepared in accordance with company procedures. 4.3. Proper storage of instruments is undertaken according to company procedures.	<ul style="list-style-type: none"> • Effective ways to catalogue and store technical drawings • Manual methods of handling, storing and maintaining paper drawings • Storing drawing in digital forms <ul style="list-style-type: none"> ○ Scanner ○ CAD 	<ul style="list-style-type: none"> • Handling and storing of drawings • Scanning and storing drawings in digital form • Matching specification details with existing resources • Handling of drawing instruments

RANGE OF VARIABLES

VARIABLE	RANGE
1. Technical drawings	Technical drawings include the following but not limited to: <ul style="list-style-type: none"> 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	Dimensions may include but not limited to: <ul style="list-style-type: none"> 2.1. Length 2.2. Width 2.3. Height 2.4. Diameter 2.5. Angles
3. Symbols	May include but not limited to: <ul style="list-style-type: none"> 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 style="list-style-type: none"> 4.1. Components/dividers 4.2. Drawing boards 4.3. Rulers 4.4. T-square 4.5. Calculator

EVIDENCE GUIDE

1. Critical aspect of competencies	<p>Assessment requires evidence that the candidate:</p> <ol style="list-style-type: none"> 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. Method of assessment	<p>Competency in this unit must be assessed through:</p> <ol style="list-style-type: none"> 2.1. Practical tasks involving interpretation of a range of technical drawings 2.2. Oral questioning
3. Resource implication	<ol style="list-style-type: none"> 3.1. Drawings 3.2. Diagrams 3.3. Charts 3.4. Plans
4. Context of Assessment	<ol style="list-style-type: none"> 4.1 Assessment may be conducted in the workplace or in a simulated environment

UNIT TITLE : **APPLY QUALITY STANDARDS**

UNIT CODE : **ELC311204**

UNIT DESCRIPTOR : This unit covers the knowledge, skills, (and) 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 <i>Italicized Bold</i> terms are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Assess quality of received materials or components	1.1. Work instructions are obtained and work is carried out in accordance with standard operating procedures 1.2. Received materials or component parts are checked against workplace standards and specifications 1.3. Faulty material or components related to work are identified and isolated 1.4. Faults and any identified causes are recorded and/or reported to the supervisor concerned in accordance with workplace procedures 1.5. Faulty materials or components are replaced in accordance with workplace procedures	<ul style="list-style-type: none"> • Relevant production processes, materials and products • Characteristics of materials, software and hardware used in production processes • Quality checking procedures • Quality Workplace procedures • Identification of faulty materials related to work 	<ul style="list-style-type: none"> • Reading skills required to interpret work instruction • Critical thinking • Interpreting work instructions
2. Assess own work	2.1. Documentation relative to quality within the company is identified and used 2.2. Completed work is checked against workplace standards relevant to the task undertaken 2.3. Faulty pieces are identified and isolated 2.4. Information on the quality and other indicators of production performance is recorded in accordance with workplace procedures 2.5. In cases of deviations from specified quality standards , causes are documented and reported in accordance with the workplace' standards operating procedures	<ul style="list-style-type: none"> • Safety and environmental aspects of production processes • Fault identification and reporting • Workplace procedure in documenting completed work • Workplace Quality Indicators 	<ul style="list-style-type: none"> • Carry out work in accordance with OHS policies and procedures

ELEMENT	PERFORMANCE CRITERIA <i>Italicized Bold</i> terms are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
3. Engage in quality improvement	3.1. Process improvement procedures are participated in relation to workplace assignment 3.2. Work is carried out in accordance with process improvement procedures 3.3. Performance of operation or quality of product or service to ensure customer satisfaction is monitored	<ul style="list-style-type: none"> • Quality improvement processes • Company customers defined 	<ul style="list-style-type: none"> • Solution providing and decision-making • Practice company process improvement procedure

RANGE OF VARIABLES

VARIABLE	RANGE
1. Materials/components	1.1. Materials may include but not limited to: 1.1.1. wires 1.1.2. cables, soldering lead 1.1.3. electrical tape 1.2. Components may include but not limited to: 1.2.1. ICs 1.2.2. Diodes
2. Faults	Faults may include but not limited to: 2.1. Components/materials not according to specification 2.2. Components/materials contain manufacturing defects 2.3. Components/materials do not conform with government regulation i.e., PEC, environmental code 2.4. Components/materials have safety defect
3. Documentation	3.1. Organization work procedures 3.2. Manufacturer's instruction manual 3.3. Customer requirements 3.4. Forms
4. Quality standards	4.1. Quality standards may relate but not limited to the following: 4.1.1. materials 4.1.2. component parts 4.1.3. final product 4.1.4. production processes
5. Customer	5.1. Co-worker 5.2. Supplier 5.3. Client 5.4. Organization receiving the product or service

EVIDENCE GUIDE

1. Critical aspect of competency	<p>Assessment must show that the candidate:</p> <ol style="list-style-type: none"> 1.1. Carried out work in accordance with the company's standard operating procedures 1.2. Performed task according to specifications 1.3. Reported defects detected in accordance with standard operating procedures 1.4. Carried out work in accordance with the process improvement procedures
2. Method of assessment	<ol style="list-style-type: none"> 2.1. The assessor may select two (2) of the following assessment methods to objectively assess the candidate: <ol style="list-style-type: none"> 2.1.1. Observation 2.1.2. Questioning 2.1.3. Practical demonstration
3. Resource implication	<ol style="list-style-type: none"> 3.1. Materials and component parts and equipment to be used in a real or simulated electronic production situation
4. Context of Assessment	<ol style="list-style-type: none"> 4.1. Assessment may be conducted in the workplace or in a simulated environment.

UNIT TITLE : **PERFORM COMPUTER OPERATIONS**
UNIT CODE : **ELC311203**
UNIT DESCRIPTOR : This unit covers the knowledge, skills, (and) 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 <i>Italicized</i> terms are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Plan and prepare for task to be undertaken	1.1. Requirements of task are determined 1.2. Appropriate hardware and software are selected according to task assigned and required outcome 1.3. Task is planned to ensure OH&S guidelines and procedures are followed	<ul style="list-style-type: none"> • Main types of computers and basic features of different operating systems • Main parts of a computer • Information on hardware and software • Data security guidelines 	<ul style="list-style-type: none"> • Reading and comprehension skills required to interpret work instruction and to interpret basic user manuals. • Communication skills to identify lines of communication, request advice, follow instructions and receive feedback. • Interpreting user manuals and security guidelines
2. Input data into computer	2.1. Data are entered into the computer using appropriate program/application in accordance with company procedures 2.2. Accuracy of information is checked and information is saved in accordance with standard operating procedures 2.3. Inputted data are stored in storage media according to requirements 2.4. Work is performed within ergonomic guidelines	<ul style="list-style-type: none"> • Basic ergonomics of keyboard and computer user • Storage devices and basic categories of memory • Relevant types of software 	<ul style="list-style-type: none"> • Technology skills to use equipment safely including keyboard skills. • Entering data
3. Access information using computer	3.1. Correct program/application is selected based on job requirements 3.2. Program/application containing the information required is accessed according to company procedures 3.3. Desktop icons are correctly selected, opened and closed for navigation	<ul style="list-style-type: none"> • General security, privacy legislation and copyright • Productivity Application • Business Application 	<ul style="list-style-type: none"> • Accessing information • Searching and browsing files and data

ELEMENT	PERFORMANCE CRITERIA <i>Italicized</i> terms are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
	<p>purposes</p> <p>3.4. Keyboard techniques are carried out in line with OH&S requirements for safe use of keyboards</p>		
4. Produce/output data using computer system	<p>4.1. Entered data are processed using appropriate software commands</p> <p>4.2. Data printed out as required using computer hardware/peripheral devices in accordance with standard operating procedures</p> <p>4.3. Files, data are transferred between compatible systems using computer software, hardware/peripheral devices in accordance with standard operating procedures</p>	<ul style="list-style-type: none"> • Computer application in printing, scanning and sending facsimile • Types and function of computer peripheral devices 	<ul style="list-style-type: none"> • Computer data processing • Printing of data • Transferring files and data
5. Maintain computer equipment and systems	<p>5.1. Systems for cleaning, minor <i>maintenance</i> and replacement of consumables are implemented</p> <p>5.2. Procedures for ensuring security of data, including regular back-ups and virus checks are implemented in accordance with standard operating procedures</p> <p>5.3. Basic file maintenance procedures are implemented in line with the standard operating procedures</p>	<ul style="list-style-type: none"> • Basic internet operation <ul style="list-style-type: none"> ○ Web address ○ Types and functions of search engines • Different web browser security features and maintenance 	<ul style="list-style-type: none"> • Locating information using browser • Internet browsing

RANGE OF VARIABLES

VARIABLE	RANGE
1. Hardware and peripheral devices	1.1. Personal computers 1.2. Networked systems 1.3. Communication equipment 1.4. Printers 1.5. Scanners 1.6. Keyboard 1.7. Mouse
2. Software	Software includes the following but not limited to: 2.1. Word processing packages 2.2. Data base packages 2.3. Internet 2.4. Spreadsheets
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
5. Ergonomic guidelines	5.1. Types of equipment used 5.2. Appropriate furniture 5.3. Seating posture 5.4. Lifting posture 5.5. Visual display unit screen brightness
6. Desktop icons	Icons include the following but not limited to: 6.1. directories/folders 6.2. files 6.3. network devices 6.4. recycle bin
7. Maintenance	7.1. Creating more space in the hard disk 7.2. Reviewing programs 7.3. Deleting unwanted files 7.4. Backing up files 7.5. Checking hard drive for errors 7.6. Using up to date anti-virus programs 7.7. Cleaning dust from internal and external surfaces

EVIDENCE GUIDE

1. Critical aspect of competency	<p>Assessment requires evidence that the candidate:</p> <ol style="list-style-type: none"> 1.1. Selected and used hardware components correctly and according to the task requirement 1.2. Identified and explain the functions of both hardware and software used, their general features and capabilities 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. Maintained computer system
2. Method of assessment	<ol style="list-style-type: none"> 2.1. The assessor may select two of the following assessment methods to objectively assess the candidate: <ol style="list-style-type: none"> 2.1.1. Observation 2.1.2. Questioning 2.1.3. Practical demonstration
3. Resource implication	<ol style="list-style-type: none"> 3.1. Computer hardware with peripherals 3.2. Appropriate software
4. Context of Assessment	<ol style="list-style-type: none"> 4.1. Assessment may be conducted in the workplace or in a simulated work environment

UNIT TITLE : **TERMINATE AND CONNECT ELECTRICAL WIRING AND ELECTRONICS CIRCUIT**
UNIT CODE : **ELC311206**
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 <i>Italicized</i> terms are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Plan and prepare for termination/ connection of electrical wiring/electronic s circuits	1.1. Materials are checked according to specifications and tasks 1.2. Appropriate tools and equipment are selected according to tasks requirements 1.3. Task is planned to ensure OH & S guidelines and procedures are followed 1.4. Electrical wiring/electronic circuits are correctly prepared for connecting/termination in accordance with instructions and work site procedures	<ul style="list-style-type: none"> • Use of tools • Use of test instruments/ equipment • Electrical theory • Principals of AC and DC • OH & S guidelines and procedures • Basic electrical and electronic devices 	<ul style="list-style-type: none"> • Reading skills required to interpret work instruction • Checking materials for conformance to specifications • Checking existing and new installation site for correct location and specification
2. Terminate/ connect electrical wiring/ electronic circuits	2.1. Safety procedures in using tools are observed at all times and appropriate personal protective equipment are used 2.2. Work is undertaken safely in accordance with the workplace and standard procedures 2.3. Appropriate range of methods in termination/connection 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. Confirmed termination/connection is undertaken successfully in accordance with job specification	<ul style="list-style-type: none"> • Wiring techniques • OH & S principles • Use of lead-free soldering technology • Surface mount soldering techniques • Specifications and methods for terminating different materials 	<ul style="list-style-type: none"> • Communication skills • Marking, tagging and labeling requirements for cables, wires, conductors and connections • Soldering techniques • Adjusting and fixing wiring supports

ELEMENT	PERFORMANCE CRITERIA <i>Italicized</i> terms are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
3. Test termination/ connections of electrical wiring/ electronics circuits	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 3.2. Wiring and circuits are checked using specified testing procedures 3.3. Unplanned events or conditions are responded to in accordance with established procedures	<ul style="list-style-type: none"> • AC and DC power supplies • Uses of diagnostic equipment • Tests for wiring and connections • Wiring support techniques and alternatives 	<ul style="list-style-type: none"> • Printed circuit board repair and techniques • Electronic assembly functional and quality testing • Testing of wiring and connections for conformance to specification

RANGE OF VARIABLES

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

EVIDENCE GUIDE

1. Critical aspect of competency	<p>Assessment requires evidence that the candidate:</p> <ol style="list-style-type: none"> 1.1. Undertook work safely and according to workplace and standard procedures 1.2. used appropriate termination/ connection methods 1.3. followed correct sequence in termination / connection process 1.4. conducted testing of terminated connected electrical wiring/electronic circuits using appropriate procedures and standards
2. Method of assessment	<ol style="list-style-type: none"> 2.1. The assessor may select two (2) of the following assessment methods to objectively assess the candidate: <ol style="list-style-type: none"> 2.1.1. Observation 2.1.2. Oral Questioning 2.1.3. Practical demonstration
3. Resource implication	<ol style="list-style-type: none"> 3.1. Tools for measuring, cutting, drilling, assembling/disassembling, connecting. Tool set includes the following but not limited to: <ol style="list-style-type: none"> 3.1.1. screw drivers 3.1.2. pliers 3.1.3. cutters
4. Context of Assessment	<ol style="list-style-type: none"> 4.1. Assessment may be conducted in the workplace or in a simulated work environment

UNIT OF COMPETENCY: **TEST ELECTRONIC COMPONENTS**UNIT CODE : **ELC311209**

DESCRIPTON : 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 <i>Italicized</i> terms are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Determine criteria for testing electronics components	1.1 Work instructions are obtained and clarified based on job order or client requirements 1.2 Responsible person is consulted for effective and proper work coordination 1.3 Data sheets/Application notes are obtained and interpreted based on manufacturer's specifications 1.4 Testing criteria are defined to ensure that components meet technical and quality requirements 1.5 Document and communicate testing criteria to relevant personnel	<ul style="list-style-type: none"> • Mensuration/ Mathematics <ul style="list-style-type: none"> ○ Conversion of Units ○ Applied Mathematics • Safety <ul style="list-style-type: none"> ○ Work Safety requirements and economy of materials with durability • Systems and Processes <ul style="list-style-type: none"> ○ Principles of electrical / electronic circuits ○ Identifying sources of electricity ○ Identifying conductors and insulators ○ Supplying different voltage using variable power supply ○ Measuring resistance using VOM ○ Testing resistors ○ Measuring current and voltage using VOM • Testing Criteria <ul style="list-style-type: none"> ○ Controls ○ Effectiveness ○ Efficiency ○ Bug detection ○ Functionality, including flow ○ Interoperability ○ Performance ○ Reliability ○ Operating parameters 	<ul style="list-style-type: none"> • Work efficiently & systematically • Communication skills • Skills in testing electronic components • Work safety practices and time management • Reading skills

ELEMENT	PERFORMANCE CRITERIA <i>Italicized</i> terms are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
2. Plan an approach for component testing	2.1 Various testing methods are identified based on types of electronic components 2.2 Characteristics and appropriateness of testing methods to be used during development and on completion is determined 2.3 Testing methods are considered/selected in relation to appropriate testing strategy 2.4 Plan for testing components is developed at specified points during development and on completion 2.5 Required test & measuring instruments and tools are prepared and checked in accordance with established procedures 2.6 Records system is established to document testing results, including problems and faults	<ul style="list-style-type: none"> • Safety <ul style="list-style-type: none"> ○ Work Safety requirements and economy of materials with durability ○ Knowledge in 5S application and observation of required timeframe • Materials, tools and equipment uses and specifications <ul style="list-style-type: none"> ○ Proper care and use of tools • Types of electronic components <ul style="list-style-type: none"> ○ Passive components ○ Active components ○ Dynamic components ○ Hybrid components • Testing methods <ul style="list-style-type: none"> ○ Automated ○ Debugging ○ Inspection ○ Platform testing ○ Prototyping • Systems and Processes <ul style="list-style-type: none"> ○ Describing resistance and identify resistors ○ Describing alternating current circuits ○ Describing capacitance and identifying capacitors ○ Describing inductance and identifying inductors ○ Describing the characteristic of transformers ○ Describing and identifying semiconductor diode ○ Describing and identifying bipolar transistor ○ Describing and analyzing digital gate 	<ul style="list-style-type: none"> • Skills in testing electronic components • Work safety practices and time management • Planning skills • Problem solving skills • Reading skills • Checking test & measuring instruments and tools • Documentation skills
3. Test components	3.1 Testing methods are applied to ensure that products meet creative, production and technical requirements 3.2 Problems and faults	<ul style="list-style-type: none"> • Safety <ul style="list-style-type: none"> ○ Work Safety requirements and economy of materials with durability • Materials, tools and equipment uses and 	<ul style="list-style-type: none"> • Skills in testing electronic components • Troubleshooting skills • Problem solving skills

ELEMENT	PERFORMANCE CRITERIA <i>Italicized</i> terms are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
	<p>detected by testing are recorded and remedial steps taken in records system is documented</p> <p>3.3 Problems and faults detected during testing are resolved in accordance with agreed project or industry practice</p> <p>3.4 Evaluate final products against the previously determined criteria</p> <p>3.5 Testing process is documented and summarized evaluation report is submitted to relevant personnel</p>	<p>specifications</p> <ul style="list-style-type: none"> ○ Proper care and use of tools ● Systems and Processes <ul style="list-style-type: none"> ○ Principles of electrical/ electronic circuits ○ Supplying different voltage using variable power supply ○ Measuring resistance using VOM ○ Testing resistors ○ Measuring current and voltage using VOM ○ Observing waveform using oscilloscope ○ Generating waveform in various frequency using function generator ○ Measuring frequency using oscilloscope ○ Measuring capacitance using VOM ○ Testing capacitors ○ Testing inductors ○ Testing semiconductor diode ○ Testing bipolar transistor ○ Testing logic gates 	<ul style="list-style-type: none"> ● Documentation skills ● Work efficiently & systematically ● Product analysis and evaluation skills ● Communication skills ● Reading skills
4. Evaluate the testing process	<p>4.1 Testing methods that were successful and those that led to difficulties are identified based on industry standards</p> <p>4.2 Testing process and records system are evaluated based on standard procedures</p> <p>4.3 Test results/findings are documented for subsequent components testing.</p>	<ul style="list-style-type: none"> ● Evaluation of testing process and records system ● Systems and Processes <ul style="list-style-type: none"> ○ Analyzing simple circuit using ohms and power law ○ Analyzing series/ parallel circuits using ohms and power law ○ Analyzing series/ parallel capacitances ○ Analyzing series parallel inductors ○ Analyzing rectifier circuits ○ Analyzing amplifier circuit ○ Analyzing multi-vibrator circuit ○ Analyzing logic networks ○ Analyzing sequence circuits 	<ul style="list-style-type: none"> ● Work efficiently & systematically ● Skills in testing electronic components ● Product analysis and evaluation skills ● Documentation skills ● Communication skills ● Reading skills

RANGE OF VARIABLES

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	4.1. Passive components 4.2. Active components 4.3. Dynamic components 4.4. Hybrid components
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

VARIABLE	RANGE
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

EVIDENCE GUIDE

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 Method of assessment	Competency may be assessed through two or more of the following methods: 2.1 Direct observation of application to tasks and questions related to required knowledge 2.2 Demonstration with oral questioning 2.3 Third party report 2.4 Written test 2.5 Portfolio
3 Resource implications	The following resources must be provided: 3.1 Tools and equipment (see range of variables) 3.2 Working area/bench 3.3 Electronic components 3.4 Testing instruments and equipment 3.5 Assessment rating sheet 3.6 Reporting forms
4 Context of assessment	4.1 Assessment maybe conducted in the workplace or in a simulated workplace setting

CORE COMPETENCIES

UNIT TITLE : **INSTALL MECHATRONICS AND AUTOMATION DEVICES**

UNIT CODE : **ELC311301**

UNIT DESCRIPTOR : This unit covers the knowledge, skills and attitudes necessary to install mechatronics and automation devices. It includes planning, preparing and installing mechatronics and automation devices. This also includes testing of installed mechatronics and automation devices.

This unit supersedes the unit of competency with unit code ELC724308 (Install mechatronics devices).

ELEMENT	PERFORMANCE CRITERIA <i>Italicized</i> terms are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Plan and prepare mechatronics and automation devices for installation	1.1. Work instructions are read and interpreted to determine job requirements. 1.2. Tools and testing devices needed to carry out the installation work are selected in accordance with established procedures and checked for correct operation and safety. 1.3. Materials and devices necessary to complete the work are obtained in accordance with job requirements. 1.4. Components and devices are pre-tested in accordance to product specifications	<ul style="list-style-type: none"> • Function, specification and configuration of Input and output of mechatronics and automation devices • Drawing and wiring circuit interpretation • Electrical and electronics symbol applicable for mechatronics and automation • Set-up and testing methodologies and procedures • International standards i.e IEC, JIC, JIS, DIN, UL, NEMA, ANSI, others. • Different types of testing instruments such as DMM, VOM etc. • Safe handling of tools and devices • Type of wires, cables and connectors • Use of tools • Use of test equipment/ instruments • Basic PLC Input/ Output devices wiring and termination • visual inspection for wear and tear • Continuity test • Function test 	<ul style="list-style-type: none"> • Reading skills required to interpret work instructions • Checking defective tools and equipment. • Communication skills needed to interpret and define work procedures • Understand drawing and wiring circuit diagram • Can understand and follow instructional manuals • Visual inspection skills • Perform proper use of testing instruments

ELEMENT	PERFORMANCE CRITERIA <i>Italicized</i> terms are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
2. Install mechatronics and automation devices	<p>2.1 Appropriate personal protective equipment is worn in line with standard operating procedures.</p> <p>2.2 OH & S policies and procedures for installation are followed in line with the job requirements.</p> <p>2.3 Devices are installed in accordance with manufacturer's instructions, requirements, and without damage to the surrounding place or environment</p> <p>2.4 Unplanned events or conditions are responded to in accordance with established procedures</p>	<ul style="list-style-type: none"> • Usage of PPEs • Safety procedures on installation of mechatronics and automation devices • OSHES policies and procedures • Manufacturer's Installation standards for mechatronics and automation devices <ul style="list-style-type: none"> ○ Handling of devices ○ Wiring and termination requirements ○ Safety • Basic electricity & electronics • Identification of work and health hazards • Use of installation tools 	<ul style="list-style-type: none"> • Reading skills required to interpret work instructions • Communication skills needed to interpret and define work procedures • Understand drawing and wiring circuit diagram • Can understand and follow instructional manuals • Ability to properly install, wire and terminate mechatronics devices
3. Test installed mechatronics and automation devices	<p>3.1 Devices are tested in accordance with manufacturer's instruction</p> <p>3.2 Final inspections are undertaken to ensure that the installed devices conform to manufacturer's instruction.</p> <p>3.3 Work site is cleaned and cleared of all debris and left safe in accordance with the company requirements</p> <p>3.4 Documentation (as-built) on installation and testing of equipment is prepared in accordance with the company requirements.</p>	<ul style="list-style-type: none"> • Safety procedures on testing of devices • Function test of installed devices • Physical inspection of devices set-up. • Occupational health and safety/ 5S • Applicable technical report on device installation 	<ul style="list-style-type: none"> • Able to check functionality of mechatronics and automation devices • Checking defective mechatronics and automation devices. • Able to do continuity test • Able to identify fault indicators • Able to prepare accomplishment report • Able to identify hazards on workplace

RANGE OF VARIABLES

VARIABLE	RANGE
1. Tools	Tools may include: 1.1. Pliers; assorted 1.2. Screwdrivers; assorted 1.3. Wrenches; assorted 1.4. Wire Stripper; assorted 1.5. Wire Crimper; Assorted
2. Test equipment/instruments	Includes: 2.1. Multi-tester 2.1.1 Analog 2.1.2 Digital
3. Materials	Materials may include: 3.1. Wires 3.2. Terminal lugs 3.3. Terminal blocks 3.4. Terminal wire marker 3.5. Tubing 3.6. Tube fittings 3.7. Electrical/Rubber Tape 3.8. Teflon Tape
4. Pre-testing of components and devices	Pre-testing may include: 4.1. visual inspection for wear and tear 4.2. Continuity test
5. Personal protective equipment (PPE)	PPEs may include: 5.1. Safety hat 5.2. Safety shoes 5.3. Ear muffs 5.4. Goggles 5.5. Safety belt/Harness 5.6. Gloves 5.7. Face Mask
6. OH & S policies and procedures	OH & S policies and procedures may include: 6.1. OH & S guidelines 6.2. Philippine environmental standards 6.3. OSHE standards

VARIABLE	RANGE
7. Mechatronics and automation devices	Mechatronics and automation devices may Include: <ul style="list-style-type: none"> 7.1. Transducers 7.2. Pneumatic / Hydraulic Actuators 7.3. Buzzers 7.4. Indicating Lamps 7.5. Magnetic contactors 7.6. Photo-sensors 7.7. Proximity sensors 7.8. Directional solenoid valves 7.9. Switches <ul style="list-style-type: none"> 7.9.1 Limit switches 7.9.2 Push button 7.9.3 Toggle/Selector switches 7.9.4 Etc.

EVIDENCE GUIDE

1. Critical aspect of competency	<p>Assessment requires evidence that the candidate:</p> <ol style="list-style-type: none"> 1.1. Read and interpreted work instructions to determine job requirements 1.2. Installed mechatronics and automation devices according to manufacturer's instruction 1.3. Pre-tested components and devices in accordance to product specifications 1.4. Installed and tested mechatronics and automation devices according to manufacturer's instruction 1.5. Tested installed mechatronics and automation devices. 1.6. Prepared documentation (as-built) on installation and testing of in accordance with the company requirements.
2. Method of assessment	<ol style="list-style-type: none"> 2.1. The assessor may select two of the following assessment methods to objectively assess the candidate: <ol style="list-style-type: none"> 2.1.1. Direct Observation with oral questioning 2.1.2. Demonstration with oral questioning 2.1.3. Written Exam
3. Resource Implication	<p>Includes but not limited to:</p> <ol style="list-style-type: none"> 3.1. Tools 3.2. Test equipment/instruments 3.3. Mechatronics devices 3.4. Materials 3.5. PPE 3.6. Technical manuals
4. Context of Assessment	<ol style="list-style-type: none"> 4.1. Assessment may be conducted in the workplace or in a simulated environment

UNIT TITLE : **CONFIGURE AND TEST MECHATRONICS AND AUTOMATION SYSTEM**

UNIT CODE : **ELC311302**

UNIT DESCRIPTOR : This unit covers the knowledge, skills and attitudes needed to configure and test mechatronics and automation system. This includes planning and preparing for configuration and testing, checking and configuring mechatronics and automation system. This also includes inspecting and testing the configured system.

This unit supersedes the unit of competency with unit code ELC724309 (Configure and adjusts mechatronics devices).

ELEMENT	PERFORMANCE CRITERIA <i>Italicized Bold</i> items are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Plan and prepare for configuration and testing of mechatronics and automation system	1.1. Configuration and testing are planned and prepared in line with job requirements. 1.2. OHS policies and procedures are followed in line with job requirements. 1.3. Mechatronics and automation devices for configuration & testing are checked against specifications and requirements. 1.4. Materials necessary to complete the work are obtained in accordance with established procedures and checked against job requirements. 1.5. Tools, equipment and testing devices needed for configuration & testing are obtained and checked for correct operation and safety 1.6. Mechatronics and automation system to be configured and tested are identified from the Job/ Service Order or instructions	<ul style="list-style-type: none"> • Safety procedures on configuration and testing of system • Application of OHS • Interpret instructional manuals, protocols and methodologies • Selection of appropriate materials for system application • Safe keeping of tools and equipment • Preventive maintenance of tools and equipment • Different system functionality and operation 	<ul style="list-style-type: none"> • Reading and communication skills required to interpret work instructions • Checking defective tools and equipment. • Understand drawing and wiring circuit diagram • Can understand and follow instructional manuals • Able to analyze system • Calculation and mensuration skills • Able to identify hazards on workplace
2. Check and configure mechatronics and automation system	2.1. Appropriate personal protective equipment is used and OHS policies and procedures are followed 2.2. Normal function of mechatronics and	<ul style="list-style-type: none"> • Safety procedures on configuration and testing of mechatronics and automation system • Logic / Sequential 	<ul style="list-style-type: none"> • Reading and skills required to interpret work instructions • Communication skills needed to interpret and define

ELEMENT	PERFORMANCE CRITERIA <i>Italicized Bold</i> items are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
	<p>automation system are checked in accordance with manufacturer's instructions.</p> <p>2.3. Fault or problem in the system is diagnosed in line with the standard operating procedures.</p> <p>2.4. Mechatronics and automation system are configured in line with the standard operating procedures.</p> <p>2.5. Unplanned events or conditions are responded to in accordance with established procedures</p>	<p>Circuits</p> <ul style="list-style-type: none"> • International Standards for block/circuit diagram applicable to the system • Procedures and methodologies on mechatronics and automation system configuration • Identification of safety and hazards on mechatronics and automation system 	<p>work procedures</p> <ul style="list-style-type: none"> • Understand drawing and wiring circuit diagram • Can understand and follow instructional manuals • Able to analyze system • Able to utilize test instruments • Able to do continuity test • Able to identify fault indicators • Able to prepare accomplishment report • Able to identify hazards on workplace • Problem solving in emergency situation
<p>3. Inspect and test the configured mechatronics and automation system</p>	<p>3.1. Final inspections are undertaken to ensure that the adjustment & testing done on the system conforms with design requirement</p> <p>3.2. Configured mechatronics and automation system are tested to ensure safe operation.</p> <p>3.3. When necessary, problems are referred to appropriate personnel.</p> <p>3.4. Documentation (as-built) is prepared/completed in accordance with the company requirements</p>	<ul style="list-style-type: none"> • Final inspections procedures • Final wiring, and termination procedures • Final testing procedures • Technical reports i.e daily accomplishment, service, progress etc. 	<ul style="list-style-type: none"> • Communication skills needed to interpret and define work procedures • Can understand and follow instructional manuals and test protocols • Able to analyze system • Able to utilize test instruments • Able to do continuity test • Able to identify fault indicators • Able to prepare accomplishment report • Able to identify hazards on workplace

RANGE OF VARIABLES

VARIABLE	RANGE	
1. OH & S policies and procedures	OH & S policies and procedures may include: 1.1. OH & S guidelines 1.2. Philippine environmental standards 1.3. OSHE standards	
2. Mechatronics and automation devices	May include the following but not limited to: 2.1.1 Transducers 2.1.2 Pneumatic / Hydraulic Actuators 2.1.3 Buzzers 2.1.4 Indicating Lamps 2.1.5 Magnetic contactors 2.1.6 Photo-sensors 2.1.7 Proximity sensors 2.1.8 Directional solenoid valves 2.1.9 Switches 2.1.9.1 Limit switches 2.1.9.2 Push Button 2.1.9.3 Toggle/ Selector Switches, etc.	
3. Materials	Materials may include: 3.1. Wires 3.2. Terminal lugs 3.3. Terminal blocks 3.4. Terminal wire marker	3.5. Tubing 3.6. Tube fittings 3.7. Teflon tape 3.8. Electrical Tape 3.9. Rubber Tape
4. Tools	Tools may include: 4.1 Pliers; assorted 4.2 Screwdrivers; assorted 4.3 Wrenches; assorted 4.4 Wire stripper; 4.5 Wire Crimper;	
5 Test equipment/ instruments	Include the following but not limited to: 5.1 Multi-tester 5.1.1 Analog 5.1.2 Digital	
6 Personal protective equipment (PPE)	PPEs may include: 6.1 Safety hat 6.2 Safety shoes 6.3 Ear muffs 6.4 Goggles	6.5 Safety belt/Harness 6.6 Gloves 6.7 Face/Nose Mask 6.8 Safety Mask
7 Appropriate Personnel	Appropriate personnel may include: 7.1 Immediate Superior 7.2 Senior Technician 7.3 Maintenance Personnel	

EVIDENCE GUIDE

1. Critical aspects of competency	<p>Assessment requires evidence that the candidate:</p> <ol style="list-style-type: none"> 1.1. Selected, checked, and used tools equipment and testing devices needed for configuration and testing for correct operation and safety 1.2. Checked mechatronics and automation devices for configuration and testing to conform to the specifications and requirements 1.3. Identified and tested mechatronics system to be configured 1.4. Configured identified mechatronics and automation system 1.5. Diagnosed faults or problems on the devices 1.6. Inspected and tested the configured mechatronics and automation system 1.7. Prepared/completed documentation in accordance with the company requirements
2. Method of assessment	<ol style="list-style-type: none"> 2.1. The assessor may select two of the following assessment methods to objectively assess the candidate: <ol style="list-style-type: none"> 2.1.1. Direct Observation with oral questioning 2.1.2. Demonstration with oral questioning 2.1.3. Written Examination
3. Resource Implication	<p>Includes but not limited to</p> <ol style="list-style-type: none"> 3.1. Tools 3.2. Test equipment/instruments 3.3. Field devices 3.4. Materials 3.5. PPE 3.6. Technical manuals
4. Context of Assessment	<ol style="list-style-type: none"> 4.1. Assessment may be conducted in the workplace or in a simulated work environment

SECTION 3 TRAINING ARRANGEMENTS

This set of standards provides Technical and Vocational Education and Training (TVET) providers with information and other important requirements to consider when designing training programs for Mechatronics Servicing NC II.

This includes information on curriculum design; training delivery; trainee entry requirements; tools and equipment; training facilities; and trainer's qualification and institutional assessment.

3.1 CURRICULUM DESIGN

TESDA shall provide the training on the development of competency-based curricula to enable training providers develop their own curricula with the components mentioned below.

Delivery of knowledge requirements for the basic, common and core units of competency specifically in the areas of mathematics, science/technology, communication/language and other academic subjects shall be contextualized. To this end, TVET providers shall develop a Contextual Learning Matrix (CLM) to accompany their curricula.

Course Title: Mechatronics Servicing

NC Level: NC II

Nominal Training Duration: 18 hrs – Basic Competencies
60 hrs – Common Competencies
80 hrs – Core Competencies

158 hrs

Course Description:

This course is designed to develop & enhance the knowledge, skills, & attitudes of a mechatronics and automation technician, in accordance with industry standards. It covers the basic & common competencies in addition to the core competencies such as installing, configuring & testing mechatronics and automation devices/system.

To obtain this, all units prescribed for this qualification must be achieved:

BASIC COMPETENCIES

(18 hours)

Unit of Competency	Learning Outcomes	Learning Contents	Practical Activities	Methodologies	Assessment Methods	Nominal Duration
1. Participate in workplace communication	1.1 Obtain and convey workplace information	<ul style="list-style-type: none"> • Effective communication • Different modes of communication • Written communication • Organizational policies • Communication procedures and systems • Technology relevant to enterprise and individual's work responsibilities • Sources of information • Types of question • Medium of communication • Flow of communication • Storage system • Telephone courtesy 	<ul style="list-style-type: none"> • Follow simple spoken language • Perform routine workplace duties following simple written notices • Participate in workplace meetings and discussions • Complete work related documents • Ability to relate to people of social range in the workplace • Gather and provide information in response to workplace requirements 	<ul style="list-style-type: none"> • Group discussion • Role Play • Demonstration 	<ul style="list-style-type: none"> • Oral Interview • Written test • Demonstration 	4 hours
	1.2 Complete relevant work related documents	<ul style="list-style-type: none"> • Communication procedures and systems • Meeting protocols • Nature of workplace meetings • Barriers of communication • Workplace interactions • Non verbal communication 	<ul style="list-style-type: none"> • Follow simple spoken language • Perform routine workplace duties • Participate in workplace meetings and discussions • Complete work related documents • Estimate, calculate and record routine workplace measures • Basic mathematical processes of addition, subtraction, division and multiplication 	<ul style="list-style-type: none"> • Role Play • Demonstration 	<ul style="list-style-type: none"> • Observation • Oral Interview • Written test 	

Unit of Competency	Learning Outcomes	Learning Contents	Practical Activities	Methodologies	Assessment Methods	Nominal Duration
			<ul style="list-style-type: none"> • Relate to people of social range in the workplace • Gather and provide information in response to workplace requirements 			
	1.3 Participate in workplace meeting and discussion	<ul style="list-style-type: none"> • Technology relevant to enterprise and individual's work responsibilities • Types of workplace documents and forms • Basic mathematical concepts • Kinds of workplace report 	<ul style="list-style-type: none"> • Follow simple spoken language • Ability to relate to people of social range in the workplace • Gather and provide information in response to workplace requirements 	<ul style="list-style-type: none"> • Interaction • Demonstration 	<ul style="list-style-type: none"> • Observation • Oral Interview • Written test 	
2. Work in a team environment	2.1 Describe and identify team role and responsibility in a team.	<ul style="list-style-type: none"> • Definition of Team • Difference between team and group • Different sources of information • Objectives and goals of team 	<ul style="list-style-type: none"> • Describing the team role and scope 	<ul style="list-style-type: none"> • Discussion 	<ul style="list-style-type: none"> • Demonstration • Observation 	4 hours
	2.2 Describe work as a team member	<ul style="list-style-type: none"> • Team goals and objectives • Fundamental rights at work including gender sensitivity • Understanding individual competencies relative to teamwork • Types of individuals • Role of leaders 	<ul style="list-style-type: none"> • Identifying individual role and responsibility • Identifying external relationship • Interacting effectively with others • Setting team goals and expectations 	<ul style="list-style-type: none"> • Interaction 	<ul style="list-style-type: none"> • Interviews/questioning • Demonstration 	

Unit of Competency	Learning Outcomes	Learning Contents	Practical Activities	Methodologies	Assessment Methods	Nominal Duration
3. Practice career professionalism	3.1 Integrate personal objectives with organizational goals	<ul style="list-style-type: none"> • Work values and ethics (Code of Conduct, Code of Ethics, etc.) • Understanding personal objectives • Understanding organizational goals • Difference between intra and interpersonal relationship • Performance evaluation 	<ul style="list-style-type: none"> • Demonstrate Intra and Interpersonal skills at work • Demonstrate personal commitment in work 	<ul style="list-style-type: none"> • Discussion 	<ul style="list-style-type: none"> • Demonstration 	6 hours
	3.2 Set and meet work priorities	<ul style="list-style-type: none"> • Company policies • Company operations, procedures and standards • Time management • Basic strategic planning concepts • Resource utilization and management 	<ul style="list-style-type: none"> • Managing goals and time • Practice economic use of resources and facilities • Setting work priorities • Practice time management 	<ul style="list-style-type: none"> • Interaction • Role Play 	<ul style="list-style-type: none"> • Observation • Demonstration 	
	3.3 Maintain professional growth and development	<ul style="list-style-type: none"> • Career development opportunities • Company recognition and incentives • Information on relevant licenses and or certifications 	<ul style="list-style-type: none"> • Determining personal career development needs • Identifying career opportunities 	<ul style="list-style-type: none"> • Interaction • Role Play 	<ul style="list-style-type: none"> • Interviews/questioning 	
4. Practice occupational health and safety	4.1 Identify hazard and risks	<ul style="list-style-type: none"> • OHS procedures, practices and regulations • Hazards/risks identification and control • OHS indicators • Organizational contingency practices 	<ul style="list-style-type: none"> • Hazards/risks identification and control skills 	<ul style="list-style-type: none"> • Discussion • Plant tour • Symposium 	<ul style="list-style-type: none"> • Observation • Interview 	4 hours

Unit of Competency	Learning Outcomes	Learning Contents	Practical Activities	Methodologies	Assessment Methods	Nominal Duration
	4.2 Evaluate hazard and risks	<ul style="list-style-type: none"> • Threshold Limit Value – TLV • Effects of safety hazards 	<ul style="list-style-type: none"> • Communication skills • Reporting safety hazards 	<ul style="list-style-type: none"> • Discussion • Plant tour 	<ul style="list-style-type: none"> • Observation • Interview 	
	4.3 Control hazards and risks	<ul style="list-style-type: none"> • Personal hygiene practices • Organization safety and health protocol • Company emergency procedure practices 	<ul style="list-style-type: none"> • Respond to emergency 	<ul style="list-style-type: none"> • Discussion • Demonstration 	<ul style="list-style-type: none"> • Portfolio assessment • Interview 	
	4.4 Maintain occupational health and safety awareness	<ul style="list-style-type: none"> • Workplace OHS personal records • Information on emergency-related drills 	<ul style="list-style-type: none"> • Practice emergency-related drill skills in the workplace 	<ul style="list-style-type: none"> • Discussion • Role-play • Simulation 	<ul style="list-style-type: none"> • Portfolio assessment • Interview 	

COMMON COMPETENCIES

(60 hours)

Unit of Competency	Learning Outcomes	Learning Contents	Practical Activities	Methodologies	Assessment Methods	Nominal Duration
1. Use Hand Tools	1.1 Plan and prepare for tasks to be undertaken	<ul style="list-style-type: none"> • Identification of different types of hand tools • Electronics hand tools and their uses • Function, operation and common faults in electronics hand tools 	<ul style="list-style-type: none"> • Planning and preparing task/activity 	<ul style="list-style-type: none"> ▪ Lecture / Demonstration ▪ Distance education ▪ Film Showing 	<ul style="list-style-type: none"> ▪ Written/Oral examination ▪ Practical demonstration 	2 hours
	1.2 Prepare hand tools	<ul style="list-style-type: none"> • Proper use of hand tools • Checking and safety requirements in handling tools • Standard procedures in checking, identification and marking of safe or unsafe/ faulty tools 	<ul style="list-style-type: none"> • Identifying and checking hand tools • Marking of safe or unsafe/ faulty hand tools 	<ul style="list-style-type: none"> ▪ Lecture / Demonstration ▪ Distance education ▪ Film Showing 	<ul style="list-style-type: none"> ▪ Written/Oral examination ▪ Practical demonstration 	2 hours
	1.3 Use appropriate hand tools and test equipment.	<ul style="list-style-type: none"> • Safety requirements in using electronics hand tools and test equipment • Electronics hand tools for adjusting, dismantling, assembling, finishing, and cutting • Processes, Operations, Systems • Proper usage and care of hand tools • Types and uses of test equipment • Common faults in the use of hand tools 	<ul style="list-style-type: none"> • Applying safety handling of hand tools and test equipment • Using appropriate hand tools and test equipment for the job requirement 	<ul style="list-style-type: none"> ▪ Lecture / Demonstration ▪ Distance education ▪ Film Showing 	<ul style="list-style-type: none"> ▪ Written/Oral examination ▪ Practical demonstration 	2 hours

Unit of Competency	Learning Outcomes	Learning Contents	Practical Activities	Methodologies	Assessment Methods	Nominal Duration
	1.4 Maintain hand tools	<ul style="list-style-type: none"> ○ Safety requirements in maintenance of hand tools ○ Processes, Operations, Systems ▪ Maintenance of tools ▪ Storage of hand tools ○ Procedures in maintaining hand tools 	<ul style="list-style-type: none"> ○ Applying 5S principles in maintenance of hand tools 	<ul style="list-style-type: none"> ▪ Lecture / Demonstration ▪ Distance education ▪ Film Showing 	<ul style="list-style-type: none"> ▪ Written/Oral examination ▪ Practical demonstration 	2 hours
2. Perform Mensurations and Calculation	2.1 Select measuring instruments;	<ul style="list-style-type: none"> • Types of measuring tools and its uses 	<ul style="list-style-type: none"> • Selecting measuring instruments 	<ul style="list-style-type: none"> ▪ Self- paced/modular ▪ Demonstration ▪ Small group discussion 	<ul style="list-style-type: none"> ▪ Written/Oral examination ▪ Practical demonstration 	2 hours
	2.2 Carry-out measurements and calculations	<ul style="list-style-type: none"> • Measurements • Linear measurement • Geometrical measurement • Trade Mathematics • Unit conversion • Ratio and proportion • Area 	<ul style="list-style-type: none"> • Interpreting formulas for volume, areas, perimeters of plane and geometric figures • Performing measurement • Computing measurement formulas 	<ul style="list-style-type: none"> ▪ Self- paced/modular ▪ Demonstration ▪ Small group discussion 	<ul style="list-style-type: none"> ▪ Written/Oral examination ▪ Practical demonstration 	4 hours
	2.3 Maintain measuring instruments	<ul style="list-style-type: none"> ○ Safe handling procedures in using measuring instruments ○ Procedures on maintenance of measuring instruments 	<ul style="list-style-type: none"> ○ Handling and maintaining measuring instruments 	<ul style="list-style-type: none"> ▪ Self- paced/modular ▪ Demonstration ▪ Small group discussion 	<ul style="list-style-type: none"> ▪ Written/Oral examination ▪ Practical demonstration 	2 hours

Unit of Competency	Learning Outcomes	Learning Contents	Practical Activities	Methodologies	Assessment Methods	Nominal Duration
3. Prepare and Interpret Technical Drawing	3.1 Identify different kinds of technical drawings	<ul style="list-style-type: none"> • Types of technical drawings • Technical drawing applications • Mark up/Notation of Drawings 	<ul style="list-style-type: none"> • Identifying type of drawing • Evaluating mark-up/notation of drawings • Interpreting signs and symbols 	<ul style="list-style-type: none"> ▪ Lecture ▪ demonstration ▪ Film Viewing ▪ Individualized Learning 	<ul style="list-style-type: none"> ▪ Written /oral ▪ examinations ▪ Direct observation ▪ Project method ▪ interview 	2 hours
	3.2 Interpret technical drawing	<ul style="list-style-type: none"> • Blueprint Reading and Plan Specification • Electronics symbols and abbreviations • Trade Theory • Types of electronics/semiconductors product plans • Notes and specifications 	<ul style="list-style-type: none"> • Interpreting technical drawing and plans for electronics • Matching specification details with existing resources 	<ul style="list-style-type: none"> ▪ Lecture ▪ demonstration ▪ Film Viewing ▪ Individualized Learning ▪ Direct Student Laboratory Experience 	<ul style="list-style-type: none"> ▪ Written /oral ▪ examinations ▪ Direct observation ▪ Project method ▪ Interview 	2 hours
	3.3 Prepare/ make changes to electrical/ electronic schematics and drawings	<ul style="list-style-type: none"> ○ Freehand sketching techniques ○ Pictorial drawing ○ Drawing conventions ○ Dimensioning conventions ○ Mathematics <ul style="list-style-type: none"> ▪ Four fundamental operations ▪ Percentage ▪ Fraction ▪ Algebra ▪ Geometry 	<ul style="list-style-type: none"> ○ Sketching drawings and plans ○ Sketching pictures ○ Computing formulas ○ Using drawing instruments 	<ul style="list-style-type: none"> ▪ Lecture ▪ demonstration ▪ Film Viewing ▪ Individualized Learning ▪ Direct Student Laboratory Experience 	<ul style="list-style-type: none"> ▪ Written /oral ▪ examinations ▪ Direct observation ▪ Project method ▪ Interview 	2 hours
	3.4 Store technical drawings and equipment/ instruments	<ul style="list-style-type: none"> ○ Effective ways to catalogue and store technical drawings 	<ul style="list-style-type: none"> ○ Handling and storing of drawings ○ scanning and storing drawings in digital form 	<ul style="list-style-type: none"> ▪ Lecture ▪ demonstration ▪ Film Viewing 	<ul style="list-style-type: none"> ▪ Written /oral ▪ examinations ▪ Direct observation ▪ Project method 	2 hours

Unit of Competency	Learning Outcomes	Learning Contents	Practical Activities	Methodologies	Assessment Methods	Nominal Duration
		<ul style="list-style-type: none"> ○ Manual methods of handling, storing and maintaining paper drawings ○ Storing drawing in digital forms ○ Scanner ○ CAD 	<ul style="list-style-type: none"> ○ Handling and storing drawing instruments 	<ul style="list-style-type: none"> ▪ Individualized Learning ▪ Direct Student Laboratory Experience 	<ul style="list-style-type: none"> ▪ Interview 	
4. Apply Quality Standards	4.1 Assess quality of received materials	<ul style="list-style-type: none"> ○ Relevant production processes, materials and products ○ Characteristics of materials, software and hardware used in production processes ○ Quality checking procedures ○ Quality Workplace procedures ○ Identification of faulty materials 	<ul style="list-style-type: none"> ○ Checking quality of materials or component parts as per manufacturer's standards ○ Interpreting specifications or symbols 	<ul style="list-style-type: none"> ▪ Field trip ▪ Symposium ▪ Video clips ▪ Simulation/ Role playing ▪ On the job training 	<ul style="list-style-type: none"> ▪ Written test ▪ Demonstration & questioning ▪ Observation & questioning 	3 hours
	4.2 Assess own work	<ul style="list-style-type: none"> ● Safety and environmental aspects of production processes ● Fault identification and reporting ● Workplace procedure in documenting completed work ● Workplace Quality Indicators 	<ul style="list-style-type: none"> ● Observing safety and environmental aspects of production processes ● Preparing technical reports ● Performing procedures in the workplace 	<ul style="list-style-type: none"> ▪ Field trip ▪ Symposium ▪ Film showing ▪ Simulation ▪ On the job training 	<ul style="list-style-type: none"> ▪ Demonstration & questioning ▪ Observation & questioning ▪ Third party report 	3 hours

Unit of Competency	Learning Outcomes	Learning Contents	Practical Activities	Methodologies	Assessment Methods	Nominal Duration
	4.3 Engage in quality improvement	<ul style="list-style-type: none"> ○ Quality improvement processes ○ IEC/ISO standards ○ Environmental and safety standards 	<ul style="list-style-type: none"> ○ Implementing continuous improvement 	<ul style="list-style-type: none"> ▪ Field trip ▪ Symposium ▪ Film showing ▪ Simulation ▪ On the job training 	<ul style="list-style-type: none"> ▪ Demonstration & questioning ▪ Observation & questioning ▪ Third party report 	2 hours
5. Perform Computer Operations	1.1 Plan and prepare for task to be undertaken	<ul style="list-style-type: none"> ○ Main types of computers and basic features of different operating systems ○ Main parts of a computer ○ Information on hardware and software ○ Data security guidelines ○ Different Computer specifications 	<ul style="list-style-type: none"> ○ Planning and preparing computer operation activity 	<ul style="list-style-type: none"> ▪ Modular ▪ Film showing ▪ Computer based training (e-learning) ▪ Project method ▪ On the job training 	<ul style="list-style-type: none"> ▪ Demonstration & questioning ▪ Observation & questioning ▪ Third party report ▪ Assessment of output product ▪ Portfolio ▪ Computer- based assessment 	2 hours
	1.2 Input data into computer	<ul style="list-style-type: none"> ○ keyboard and computer user ○ Storage devices and basic categories of memory ○ Relevant types of software 	<ul style="list-style-type: none"> ○ Encoding of data ○ Saving encoded data 	<ul style="list-style-type: none"> ▪ Modular ▪ Film showing ▪ Computer based training (e-learning) ▪ Project method ▪ On the job training 	<ul style="list-style-type: none"> ▪ Demonstration & questioning ▪ Observation & questioning ▪ Third party report ▪ Assessment of output product ▪ Portfolio ▪ Computer- based assessment 	1 hour
	1.3 Access information using computer	<ul style="list-style-type: none"> ○ General security, privacy legislation and copyright ○ Productivity Application • Microsoft office applications 	<ul style="list-style-type: none"> ○ Accessing computer data/files ○ Performing data encoding ○ Creating presentation materials 	<ul style="list-style-type: none"> ▪ Modular ▪ Film showing ▪ Computer based training (e-learning) ▪ Project method 	<ul style="list-style-type: none"> ▪ Demonstration & questioning ▪ Observation & questioning ▪ Third party report ▪ Assessment of 	2 hours

Unit of Competency	Learning Outcomes	Learning Contents	Practical Activities	Methodologies	Assessment Methods	Nominal Duration
		<ul style="list-style-type: none"> ○ Business Application ● Introduction to Basic Programming software 	<ul style="list-style-type: none"> ○ Drafting office communication and documents 	<ul style="list-style-type: none"> ▪ On the job training 	<ul style="list-style-type: none"> output product ▪ Portfolio ▪ Computer- based assessment 	
	1.4 Produce/output data using computer system	<ul style="list-style-type: none"> ○ Computer application in printing, scanning and sending facsimile ○ Types and function of computer peripheral devices 	<ul style="list-style-type: none"> ○ Printing and scanning of office documents ● and materials ○ Sending of office/business documents ○ Saving of documents in storage devices ○ CD/DVD ○ USB drives ○ Hard disk drives 	<ul style="list-style-type: none"> ▪ Modular ▪ Film showing ▪ Computer based training (e-learning) ▪ Project method ▪ On the job training 	<ul style="list-style-type: none"> ▪ Demonstration & questioning ▪ Observation & questioning ▪ Third party report ▪ Assessment of output product ▪ Portfolio ▪ Computer- based assessment 	1 hour
	1.5 Maintain computer equipment and systems	<ul style="list-style-type: none"> ○ Computer equipment/system basic maintenance procedures ○ Different types of computer viruses ○ Basic file maintenance procedures 	<ul style="list-style-type: none"> ○ Performing cleaning of PC parts/hardware components ○ Scanning/Debugging of computer software and applications ○ Performing cleaning and defragmentation of computer files ○ Performing backup of computer files 	<ul style="list-style-type: none"> ▪ Modular ▪ Film showing ▪ Computer based training (e-learning) ▪ Project method ▪ On the job training 	<ul style="list-style-type: none"> ▪ Demonstration & questioning ▪ Observation & questioning ▪ Third party report ▪ Assessment of output product ▪ Portfolio ▪ Computer- based assessment 	2 hours
6. Terminate and Connect Electrical wiring and Electronic Circuit	6.1 Plan and prepare for termination/ connection of electrical wiring/ electronics circuits	<ul style="list-style-type: none"> ● Use of hand tools and test instruments / equipment ● Basic Electrical theory and application ● OH & S guidelines and procedures 	<ul style="list-style-type: none"> ● Preparing hand tools and test equipment for termination ● Preparing electrical/electronic materials for termination 	<ul style="list-style-type: none"> ▪ Film Viewing ▪ Individualized Learning ▪ Direct Student Laboratory Experience ▪ On the Job Training 	<ul style="list-style-type: none"> ▪ Demonstration and Questioning ▪ Assessment of Output Product 	1 hour

Unit of Competency	Learning Outcomes	Learning Contents	Practical Activities	Methodologies	Assessment Methods	Nominal Duration
		<ul style="list-style-type: none"> Basic electrical and electronic devices 		<ul style="list-style-type: none"> Project Method 		
	6.2 Terminate/connect electrical wirings/electronic circuits	<ul style="list-style-type: none"> Electrical wirings <ul style="list-style-type: none"> Wiring techniques OH & S principles Specifications and methods for terminating different materials Electronics circuits <ul style="list-style-type: none"> Soldering techniques and procedures OH & S principles Surface mount soldering techniques Use of lead-free soldering technology 	<ul style="list-style-type: none"> Performing different types of splices Perform soldering techniques and procedures 	<ul style="list-style-type: none"> Film Viewing Individualized Learning Direct Student Laboratory Experience On the Job Training Project Method 	<ul style="list-style-type: none"> Demonstration and Questioning Assessment of Output Product 	4 hours
	6.3 Test termination/connections of electrical wiring/electronics circuits	<ul style="list-style-type: none"> Use of diagnostic equipment Continuity testing and grounding <ul style="list-style-type: none"> Electrical Electronics Functionality test <ul style="list-style-type: none"> Electrical Electronics 	<ul style="list-style-type: none"> Performing continuity test Performing functionality test 	<ul style="list-style-type: none"> Film Viewing Individualized Learning Direct Student Laboratory Experience On the Job Training Project Method 	<ul style="list-style-type: none"> Demonstration and Questioning Assessment of Output Product 	3 hours
7. Test electronic components	7.1 Determine criteria for testing electronics components	<ul style="list-style-type: none"> Work Safety requirements and economy of materials with durability Testing Criteria <ul style="list-style-type: none"> controls effectiveness efficiency bug detection 	<ul style="list-style-type: none"> Determining testing criteria for electronics components 	<ul style="list-style-type: none"> Film Viewing Individualized Learning Direct Student Laboratory Experience On the Job Training 	<ul style="list-style-type: none"> Demonstration and Questioning Assessment of Output Product 	2 hours

Unit of Competency	Learning Outcomes	Learning Contents	Practical Activities	Methodologies	Assessment Methods	Nominal Duration
		<ul style="list-style-type: none"> ▪ functionality, including flow ▪ interoperability ▪ performance ▪ reliability ▪ operating parameters 		<ul style="list-style-type: none"> ▪ Project Method 		
	7.2 Plan an approach for component testing	<ul style="list-style-type: none"> • Knowledge in 5S application and observation of required timeframe • Work Safety requirements and economy of materials with durability • Various testing methods • Types of electronic components 	<ul style="list-style-type: none"> • Proper use of VOM/DMM • Observing OH&S principles • Identifying electronics components • Identifying testing methods 	<ul style="list-style-type: none"> ▪ Film Viewing ▪ Individualized Learning ▪ Direct Student Laboratory Experience ▪ On the Job Training ▪ Project Method 	<ul style="list-style-type: none"> ▪ Demonstration and Questioning ▪ Assessment of Output Product 	2 hours
	7.3 Test components	<ul style="list-style-type: none"> ○ Materials, tools and equipment uses and specifications <ul style="list-style-type: none"> ▪ Proper care and use of tools ○ Types of electronic components <ul style="list-style-type: none"> ▪ Passive components ▪ Active components ▪ Dynamic components ▪ Hybrid components ○ Testing methods <ul style="list-style-type: none"> ▪ automated ▪ debugging ▪ inspection ▪ platform testing ▪ prototyping 	<ul style="list-style-type: none"> ○ Determining testing procedures for electronics components ○ Identifying electronics component parts ○ Applying proper use of testing instruments 	<ul style="list-style-type: none"> ▪ Film Viewing ▪ Individualized Learning ▪ Direct Student Laboratory Experience ▪ On the Job Training ▪ Project Method 	<ul style="list-style-type: none"> ▪ Demonstration and Questioning ▪ Assessment of Output Product 	6 hours

Unit of Competency	Learning Outcomes	Learning Contents	Practical Activities	Methodologies	Assessment Methods	Nominal Duration
		<ul style="list-style-type: none"> ○ Measuring capacitance and resistance using VOM/ DMM 				
	7.4 Evaluate the testing process	<ul style="list-style-type: none"> ○ Evaluation of testing process and records system ○ Systems and Processes <ul style="list-style-type: none"> ▪ Analyzing simple circuit using ohms and power law ▪ Analyzing series/parallel circuits using ohms and power law ▪ Analyzing series/parallel capacitances ▪ analyzing series parallel inductors ▪ analyzing rectifier circuits ▪ analyzing amplifier circuit ▪ analyzing multi-vibrator circuit ▪ analyzing logic networks ▪ analyzing sequence circuits 	<ul style="list-style-type: none"> ○ Performing data evaluation and records ○ Evaluating functionality and operation of electronic system 	<ul style="list-style-type: none"> ▪ Film Viewing ▪ Individualized Learning ▪ Direct Student Laboratory Experience ▪ On the Job Training ▪ Project Method 	<ul style="list-style-type: none"> ▪ Demonstration and Questioning ▪ Assessment of Output Product 	2 hours

CORE COMPETENCIES

80 hrs

Unit of Competency	Learning Outcomes	Learning Contents	Practical Activities	Methodologies	Assessment Methods	Nominal Duration
1. Install Mechatronics and Automation Devices	1.1 Plan and prepare mechatronics and automation devices for installation	<ul style="list-style-type: none"> • Function, specification and configuration of Input and output of mechatronics and automation devices • Drawing and wiring circuit interpretation • Electrical and electronics symbol applicable for mechatronics and automation • Type of wires, cables and connectors • Use of basic hand tools • Use of test equipment/ instruments for mechatronics and automation 	<ul style="list-style-type: none"> • Identifying appropriate mechatronics devices and test equipment • Interpreting pneumatics, electro-pneumatics, hydraulics, electro-hydraulics and electrical signs and symbols • Interpreting pneumatics, electro-pneumatics, hydraulics, electro-hydraulics and electrical diagrams • Following work instruction and manuals • Conducting visual inspections on diagrams • Using and maintaining test equipment 	<ul style="list-style-type: none"> • Lecture • Discussion • Demonstration • Viewing multimedia • Structured learning exercises 	<ul style="list-style-type: none"> • Written exam • Practical exam 	8 hours

Unit of Competency	Learning Outcomes	Learning Contents	Practical Activities	Methodologies	Assessment Methods	Nominal Duration
	1.2 Install mechatronics and automation devices.	<ul style="list-style-type: none"> • Set-up and testing methodologies and procedures for mechatronics and automation devices • Manufacturer's Installation standards for mechatronics and automation devices • Handling of devices • Safety procedures on installation of mechatronics and automation devices • Basic PLC Input/ Output devices wiring and termination • Use of PPEs • Use on installation tools • OSHES policies and procedures on handling of electrical and electronics equipment • Identification of work and health hazards 	<ul style="list-style-type: none"> • Wirings and installation of mechatronics devices • Sensors • Relays • Timers • Counters • Motors • Motor control devices • Electro-pneumatic devices • Electro-hydraulic devices • PLC input/output • Following work instruction and manuals • Testing of individual mechatronics and automation devices • Implementing safety precautions 	<ul style="list-style-type: none"> • Lecture • Discussion • Demonstration • Viewing multimedia • Hands-on 	<ul style="list-style-type: none"> • Written exam • Practical exam 	48 hours

Unit of Competency	Learning Outcomes	Learning Contents	Practical Activities	Methodologies	Assessment Methods	Nominal Duration
	1.3 Test installed mechatronics and automation devices.	<ul style="list-style-type: none"> • Safety procedures on testing of devices • Testing procedures of installed devices • Physical inspection of devices set-up • Different types of testing instruments • Applicable technical report on device installation 	<ul style="list-style-type: none"> • Actual testing of installed devices • Configuring input and output mechatronics devices especially sensor technology • Using multi-tester to test the functionality and continuity of devices • Identifying fault and hazards in installed devices • Filling out forms relevant to task performed 	<ul style="list-style-type: none"> • Lecture • Discussion • Demonstration • Viewing multimedia • Hands-on 	<ul style="list-style-type: none"> • Written exam • Practical exam 	4 hours

Unit of Competency	Learning Outcomes	Learning Contents	Practical Activities	Methodologies	Assessment Methods	Nominal Duration
2. Configure and Test Mechatronics and Automation System	2.1 Plan and prepare for configuration and testing of mechatronics and automation system.	<ul style="list-style-type: none"> • Safety procedures on configuration and testing of system • Selection of appropriate materials for system application • Drawing and wiring circuit interpretation <ul style="list-style-type: none"> • Electrical and electronics symbol applicable for mechatronics and automation • Functionality and operation of different system of mechatronics and automation devices • Function test of installed devices • Interpret instructional manuals, protocols and methodologies • Preventive maintenance of tools and equipment 	<ul style="list-style-type: none"> • Following sequence and flow of mechatronics system through flow chart or other technique • Acquiring the needed input and output devices on each station of the system • Interpreting and analyzing drawings and wiring diagrams for electronics and electrical circuits • Following work instruction and manuals • Selecting, Using and Maintaining tools and equipment • Performing calculation and mensuration • Practicing safety in the workplace 	<ul style="list-style-type: none"> • Lecture • Discussion • Demonstration • Viewing multimedia 	<ul style="list-style-type: none"> • Written exam • Practical exam 	4 hours

Unit of Competency	Learning Outcomes	Learning Contents	Practical Activities	Methodologies	Assessment Methods	Nominal Duration
	2.2 Check and configure mechatronics and automation system.	<ul style="list-style-type: none"> • Safety procedures on configuring and testing of mechatronics and automation system • Logic and sequential circuit • International standards for block/circuit diagram applicable to the system • Functionality of mechatronics and automation system • System conventional operation • Safety and hazards in mechatronics and automation system • Procedures and methodologies on checking and configuring mechatronics and automation system 	<ul style="list-style-type: none"> • Performing the sequence and flow of mechatronics system through ladder diagram or other techniques • Using and maintaining tools and equipment • Checking and Analyzing the needed input and output devices on each station of the system • Interfacing of different station one after the other on a single mechatronics system • Checking, identifying fault and solving problems in mechatronics and automation system operation • Differentiating the application of each devices on a station and system 	<ul style="list-style-type: none"> • Lecture • Discussion • Demonstration • Viewing multimedia • Structured learning exercises 	<ul style="list-style-type: none"> • Written exam • Practical exam 	8 hours

Unit of Competency	Learning Outcomes	Learning Contents	Practical Activities	Methodologies	Assessment Methods	Nominal Duration
	2.3 Inspect and test the configured mechatronics and automation system	<ul style="list-style-type: none"> • Procedures on final wiring and termination of configured mechatronics and automation system • Procedures on final inspections of configured mechatronics and automation system • Procedures on final testing and operation of configured mechatronics and automation system • Preparation of technical reports 	<ul style="list-style-type: none"> • Following work instructions, manuals and test protocols • Analyzing faults and hazards and perform problem solving in mechatronics and automation system • Defining the desired outcome on each station in a mechatronics system • Using and maintaining tools and test equipment • Distinguishing the final output or outcome of the final stage or station of the system • Preparing technical reports 	<ul style="list-style-type: none"> • Lecture • Discussion • Demonstration • Viewing multimedia • Structured learning exercises 	<ul style="list-style-type: none"> • Written exam • Practical exam 	8 hours

3.2 TRAINING DELIVERY

1. The delivery of training shall adhere to the design of the curriculum. Delivery shall be guided by the principles of competency-based TVET.
 - a. Course design is based on competency standards set by the industry or recognized industry sector; **(Learning system is driven by competencies written to industry standards)**
 - b. Training delivery is learner-centered and should accommodate individualized and self-paced learning strategies;
 - c. Training can be done on an actual workplace setting, simulation of a workplace and/or through adoption of modern technology.
 - d. Assessment is based in the collection of evidence of the performance of work to the industry required standards;
 - e. Assessment of competency takes the trainee's knowledge and attitude into account but requires evidence of actual performance of the competency as the primary source of evidence.
 - f. Training program allows for recognition of prior learning (RPL) or current competencies;
 - g. Training completion is based on satisfactory performance of all specified competencies.

2. The competency-based TVET system recognizes various types of delivery modes, both on-and off-the-job as long as the learning is driven by the competency standards specified by the industry. The following training modalities and their variations/components may be adopted singly or in combination with other modalities when designing and delivering training programs:

2.1. Institution- Based:

- Dual Training System (DTS)/Dualized Training Program (DTP) which contain both in-school and in-industry training or fieldwork components. Details can be referred to the Implementing Rules and Regulations of the DTS Law and the TESDA Guidelines on the DTP;
- Distance learning is a formal education process in which majority of the instruction occurs when the students and instructor are not in the same place. Distance learning may employ correspondence study, audio, video, computer technologies or other modern technology that can be used to facilitate learning and formal and non-formal training. Specific guidelines on this mode shall be issued by the TESDA Secretariat.

- The traditional classroom-based or in-center instruction may be enhanced through use of learner-centered methods as well as laboratory or field-work components.

2.2 Enterprise-Based:

- **Formal Apprenticeship** – Training within employment involving a contract between an apprentice and an enterprise on an approved apprenticeable occupation.
- **Enterprise-based Training-** where training is implemented within the company in accordance with the requirements of the specific company. Specific guidelines on this mode shall be issued by the TESDA Secretariat.

3.3 TRAINEE ENTRY REQUIREMENTS

The trainees who wish to enter the course should possess the following requirements:

- Must have completed at least 10 yrs. basic education or an alternative learning systems (ALS) certificate of achievement with grade 10 equivalent holder
- Can communicate orally & in writing
- Can perform basic mathematical computations

This list does not include specific institutional requirements such as written entrance exam, and other that may be required of the trainees by the school or training center delivering TVET program.

3.4 LIST OF TOOLS, EQUIPMENT AND MATERIALS

Recommended list of tools, equipment and materials for the training of 25 trainees for Mechatronics Servicing NC II:

TOOLS		EQUIPMENT		MATERIAL	
Qty.	Description	Qty.	Description	Qty.	Description
10 pcs	Long-nosed pliers	10 pcs	Multimeters (Analog/ Digital)	1 spool	Solder lead
10 pcs	Diagonal cutters	1 pc.	Air compressor	1 spool	Shielded cable
10 pcs	Standard screwdrivers	3 pcs	Transmitters or Transducers	1 lot	Terminal lugs
10 pcs	Phillips screwdrivers	5 pcs	Regulated DC power supplies	1 lot	Terminal strips/blocks
10 pcs	Electrical pliers	10 pcs	Cylinder Actuator	25 pcs	Cotton gloves
10 pcs	Soldering iron	10 pcs	Buzzers	1 lot	Plastic tubing
10 pcs	Adjustable wrench	25 pcs	Industrial panel switches	1 lot	Quick-connect fittings
5 pcs	Wire stripper	10 pcs	Indicating lamps	10 rolls	Electrical tape
5 pcs	Crimping tool	10 pcs	Directional solenoid valves	1 lot	Wire markers
5 sets	Allen wrench	5 pcs	Pressure gage	1 lot	Cable ties
5 sets	Precision screwdrivers	5 pcs	Filter-Regulator-Lubricator set		
		5 pcs	Limit switches		
		10 pcs	Photoelectric switches		
		10 pcs	Proximity switches		
		25 pcs	Relays		
		10 pcs	Magnetic contactors		
		10 pcs	Timers		
		10 pcs	Counters		
		2 pcs	Desktop/Laptop PC		
		5 pcs.	Safety helmet		
		5 pcs.	Safety harness		
		5 pcs.	Safety glasses/goggles		
		5 pcs.	Ear plugs/ear muffs		
		5 pcs.	Gas mask		
		5 pcs.	Face shield		
		2 pcs.	20 I/O's PLC		

3.5 TRAINING FACILITIES

Based on class size of 25 students/trainees the space requirements for the teaching/learning and circulation areas are as follows:

TEACHING/LEARNING AREAS	SIZE IN METERS	AREA IN SQ. METERS	QTY	TOTAL AREA IN SQ. METERS
Lecture Area	5 x 8	40	1	40
Laboratory Area	5 x 8	40	1	40
Learning Resource Area	4 x 5	20	1	20
Tool Room / Storage Area	4 x 5	20	1	20
Wash ,Toilet & Locker Room	1 x 2	2	1	2
Total				122
Facilities /Equipment/Circulation**				36
Total Area				158

**** Area requirement is equivalent to 30% of the total teaching/learning areas**

3.6 TRAINERS QUALIFICATIONS

Mechatronics Servicing NC II

- Holder of National TVET Trainer's Certificate (NTTC) Level 1 in Mechatronics Servicing NCII or higher;
- Must have at least 2 years relevant industry experience.

3.7 INSTITUTIONAL ASSESSMENT

Institutional assessment is undertaken by trainees to determine their achievement of units of competency. A certificate of achievement is issued for each unit of competency.

The result of the institutional assessment may be considered as evidence for the assessment for national certification.

SECTION 4: ASSESSMENT AND CERTIFICATION ARRANGEMENTS

Competency Assessment is the process of collecting evidence and making judgments whether competency has been achieved. The purpose of assessment is to confirm that an individual can perform to the standards expected at the workplace as expressed in relevant competency standards.

The assessment process is based on evidence or information gathered to prove achievement of competencies. The process may be applied to an employable unit(s) of competency in partial fulfillment of the requirements of the national qualification.

4.1 NATIONAL ASSESSMENT AND CERTIFICATION ARRANGEMENTS

- 4.1.1. To attain the National Qualification of the qualification, the candidate must demonstrate in all the units listed in Section 1. Successful candidates shall be awarded a **National Certificate II** signed by the TESDA Director General.
- 4.1.2. The qualification of **Mechatronics Servicing NC II** may be attained through accumulation of Certificates of Competency (COCs) in all the following units of competencies:
 - 4.1.2.1. Install Mechatronics and Automation Devices
 - 4.1.2.2. Configure and Test Mechatronics and Automation System

Successful candidates shall be awarded a **Certificate of Competency (COC)** in each of the core units.
- 4.1.3. Accumulation and submission of all COCs acquired for the relevant units of competency comprising a qualification, an individual shall be issued the corresponding National Certificate (NC).
- 4.1.4. Assessment shall focus on the core units of competency. The basic and common units shall be integrated or assessed concurrently with the core units.
- 4.1.5. The following are qualified to apply for assessment and certification:
 - 4.1.5.1. Graduate of formal and non-formal including enterprise-based training programs.
 - 4.1.5.2. Experienced workers (wage employed or self employed)
- 4.1.6. The existing NCs or COCs in Mechatronics Servicing NC II shall be in effect until the said NCs or COCs have expired. The NCs or COCs may be renewed provided that the holders present evidence that they are currently or have been employed in mechatronics and/or industrial automation job for the past three (3) years.

- 4.1.7. The conduct of assessment and issuance of certificates shall follow the procedures manual and implementing guidelines developed for the purpose.

4.2 COMPETENCY ASSESSMENT REQUISITE

- 4.2.1 Self-Assessment Guide. The self-assessment guide (SAG) is accomplished by the candidate prior to actual competency assessment. SAG is a pre-assessment tool to help the candidate and the assessor determine what evidence is available, where gaps exist, including readiness for assessment.

This document can:

- a. Identify the candidate's skills and knowledge
 - b. Highlight gaps in candidate's skills and knowledge
 - c. Provide critical guidance to the assessor and candidate on the evidence that need to be presented
 - d. Assist the candidate to identify key areas in which practice is needed or additional information or skills that should be gained prior `
- 4.2.2 Accredited Assessment Center. Only Assessment Center accredited by TESDA is authorized to conduct competency assessment. Assessment centers undergo a quality assured procedure for accreditation before they are authorized by TESDA to manage the assessment for National Certification.
- 4.2.3 Accredited Competency Assessor. Only accredited competency assessor is authorized to conduct assessment of competence. Competency assessors undergo a quality assured system of accreditation procedure before they are authorized by TESDA to assess the competencies of candidates for National Certification.

GLOSSARY OF TERMS

GENERAL

- 1) **Certification** - is the process of verifying and validating the competencies of a person through assessment
- 2) **Certificate of Competency (COC)** – is a certification issued to individuals who pass the assessment for a single unit or cluster of units of competency
- 3) **Common Competencies** - are the skills and knowledge needed by all people working in a particular industry
- 4) **Competency** - is the possession and application of knowledge, skills and attitudes to perform work activities to the standard expected in the workplace
- 5) **Competency Assessment** - is the process of collecting evidence and making judgments on whether competency has been achieved
- 6) **Competency Standard (CS)** - is the industry-determined specification of competencies required for effective work performance
- 7) **Context of Assessment** - refers to the place where assessment is to be conducted or carried out
- 8) **Core Competencies** - are the specific skills and knowledge needed in a particular area of work - industry sector/occupation/job role
- 9) **Critical aspects of competency** - refers to the evidence that is essential for successful performance of the unit of competency
- 10) **Elective Competencies** - are the additional skills and knowledge required by the individual or enterprise for work
- 11) **Elements** - are the building blocks of a unit of competency. They describe in outcome terms the functions that a person performs in the workplace.
- 12) **Evidence Guide** - is a component of the unit of competency that defines or identifies the evidences required to determine the competence of the individual. It provides information on critical aspects of competency, underpinning knowledge, underpinning skills, resource implications, assessment method and context of assessment
- 13) **Level** - refers to the category of skills and knowledge required to do a job
- 14) **Method of Assessment** - refers to the ways of collecting evidence and when, evidence should be collected

- 15) **National Certificate (NC)** – is a certification issued to individuals who achieve all the required units of competency for a national qualification defined under the Training Regulations. NCs are aligned to specific levels within the PTQF
- 16) **Performance Criteria** - are evaluative statements that specify what is to be assessed and the required level of performance
- 17) **Qualification** - is a cluster of units of competencies that meets job roles and is significant in the workplace. It is also a certification awarded to a person on successful completion of a course in recognition of having demonstrated competencies in an industry sector
- 18) **Range of Variables** - describes the circumstances or context in which the work is to be performed
- 19) **Recognition of Prior Learning (RPL)** – is the acknowledgement of an individual's skills, knowledge and attitudes gained from life and work experiences outside registered training programs
- 19) **Resource Implication** - refer to the resources needed for the successful performance of the work activity described in the unit of competency. It includes work environment and conditions, materials, tools and equipment
- 20) **Basic Competencies** - are the skills and knowledge that everyone needs for work
- 21) **Training Regulations (TR)** – refers to the document promulgated and issued by TESDA consisting of competency standards, national qualifications and training guidelines for specific sectors/occupations. The TR serves as basis for establishment of qualification and certification under the PTQF. It also serves as guide for development of competency-based curricula and instructional materials including registration of TVET programs offered by TVET providers
- 22) **Underpinning Knowledge** - refers to the competency that involves in applying knowledge to perform work activities. It includes specific knowledge that is essential to the performance of the competency
- 23) **Underpinning Skills** - refers to the list of the skills needed to achieve the elements and performance criteria in the unit of competency. It includes generic and industry specific skills
- 24) **Unit of Competency** – is a component of the competency standards stating a specific key function or role in a particular job or occupation; it is the smallest component of achievement that can be assessed and certified under the PTQF

SECTOR SPECIFIC

- 25) **Actuator:** In a closed-loop control system, that part of the final control element that translates the control signal into action by the control device.
- 26) **Assembler:** A program that translates assembly language instructions into machine language instructions.
- 27) **Assembly Language:** A machine oriented language in which mnemonics are used to represent each machine language instruction. Each CPU has its own specific assembly language.
- 28) **Automation:** (1) The conversion to and implementation of procedures, processes, or equipment by automated means. (2) Industrial open- or closed-loop control systems in which the manual operation of controls is replaced by servo operation.
- 29) **CAD:** Computer-Aided Design is the use of high-resolution graphics in a wide range of design activities, allowing quick evaluation and modification of intent. It is commonly used to design architectural, mechanical and electrical engineering drawings.
- 30) **Calibration:** The process of adjusting an instrument or compiling a deviation chart so that its reading can be correlated to the actual value being measured.
- 31) **CAM:** Computer-Aided Manufacturing is the use of computer technology to generate data to control part or all of a manufacturing process.
- 32) **Conveyor:** A horizontal, inclined or vertical device for moving or transporting bulk materials, packages, or objects in a path predetermined by the design of the device and having points of loading and discharge fixed, or selective.
- 33) **Ergonomics** --"The systematic application of knowledge about the psychological, physical, and social attributes of human beings in the design and use of all things which affect a person's working conditions: equipment and machinery, the work environment and layout, the job itself, training and the organization of work."
(Human systems Inc).
- 34) **HMI:** Human Machine Interface (HMI) is a software application (typically a Graphical User Interface or GUI) that present information to the operator about the state of a process, and to accept and implement the operators control instructions. It may also interpret the plant information and guide the interaction of the operator with the system. Also known as Man Machine Interface (MMI).
- 35) **PID control:** Proportional plus Integral plus Derivative control is used in processes where the controlled variable is affected by long downtimes.
- 36) **PLC (Programmable Logic Controller) :** A class of industrially hardened devices that provides hardware interface for input sensors and output actuators. PLCs can be programmed using relay ladder logic to control the outputs based on input conditions and / or algorithms contained in the memory of the PLC.

- 37) **Robotics:** The study of the design and use of robots, particularly for their use in manufacturing and related processes.
- 38) **Sensor:** A transducer whose input is a physical phenomenon and whose output is a quantitative measure of the phenomenon.
- 39) **Sequence control:** The control of a series of machine movements, with the completion of one movement initiating the next. The extent of movements is typically not specified by numerical input data.
- 40) **Servomechanism:** An automatic device for controlling large amounts of power by means of small amounts of power.
- 41) **Servomotor:** A power-driven mechanism that supplements a primary control operated by a comparatively feeble force (as in a servomechanism).
- 42) **Simulation:** (1) A device, system, or computer program that represents certain features of the behavior of a physical or abstract system. Vendors of planning and scheduling, forecasting and demand management, and other types of decision-support systems make growing use of simulation to compare the consequences of alternative courses of action.
- 43) **Software:** The entire set of programs, procedures, and related documentation associated with a computer.
- 44) **Systems integration:** The ability of computers, instrumentation, and equipment to share data or applications with other components in the same or other functional areas.
- 45) **Transducer:** A device that converts signals from one physical form to another.

ANNEX A - COMPETENCY MAP (*Electrical & Electronics sector*)

BASIC COMPETENCIES

Receive and Respond to Workplace Communication	Work with Others	Demonstrate work values	Practice basic housekeeping procedures	Participate in Workplace Communication
Work in a Team Environment	Practice career professionalism	Practice occupational health and safety procedures	Lead Workplace Communication	Lead Small Team
Develop and practice negotiation skills	Solve Problems Related to Work Activities	Use mathematical concepts and techniques	Use relevant technologies	Utilize Specialist Communication Skills
Develop Team and Individuals	Apply Problem Solving Techniques in the Workplace	Collect, analyze and organize information	Plan and Organize Work	Promote environmental protection

COMMON COMPETENCIES

Use Hand Tools	Perform Mensuration and Calculation	Prepare and Interpret Technical Drawing	Apply Quality Standards	Perform Computer Operations
Terminate and Connect Electrical Wiring and Electronic Circuits	Test Electronic Components			

CORE COMPETENCIES

Install Instrumentation and Control Devices	Calibrate Instrumentation and Control Devices	Configure Instrumentation and Control Devices	Loop Check Instrumentation and Control Devices	Maintain and Repair Instrumentation & Control Devices
Start-up Instrumentation and Control Systems	Diagnose and Troubleshoot Instrumentation and Control Systems	Install Mechatronics and Automation Devices	Configure & Test Mechatronics and Automation System	Maintain and Repair PLC-based Mechatronics and Automation System
Develop Mechatronics and Automation Control Circuits & PLC Software Application Programs	Develop PLC and HMI software application program	Diagnose and Troubleshoot Mechatronics and Automation System	Commission PLC- and HMI-based Mechatronics and Automation System	Develop Motion Control and System Configuration
Service and Repair Audio Systems and Products	Service and Repair Video Systems and Products	Service and Repair Business Machines	Assemble and Disassemble Consumer Electronic Products	Maintain and Repair Electronically Controlled Domestic Appliances
Maintain and Repair Audio-Video Products and Systems	Maintain and Repair Cellular Phones	Commission Consumer Electronic Products and Systems	Develop Servicing Systems for Consumer Electronic Products	Train service technician
Manage Servicing Systems for Consumer Electronics Products and Systems	Train service technician supervisors			

ACKNOWLEDGEMENTS

The Technical Education and Skills Development Authority (TESDA) wishes to extend gratitude and appreciation to the many representatives of business, industry, academe and government agencies and labor groups who donated their time and expertise to the development and validation of these Training Regulations.

- **THE TECHNICAL EXPERT COMMITTEE (FOR CY 2006)**

- **MR. ERNIE O. DIMALANTA**

- Technical Expert
PICS Foundation, Inc.
PhilAsia School of Instrumentation
and Automation

- **ENGR. CHUCK L.G. EBALO**

- Technical Expert
PhilAsia School of Instrumentation
and Automation

- **MS. MA. ZENaida S. VILLALVA**

- Technical Expert
Rizal Technological University
PICS Foundation, Inc.

- **ENGR. RAINNEL R. MACLANG**

- Technical Expert
Instrumentation & Control Specialist, Inc.

- **PHILIPPINE INSTRUMENTATION AND CONTROL SOCIETY FOUNDATION, INC.**

- **THE TESDA BOARD - STANDARDS SETTING AND SYSTEMS DEVELOPMENT COMMITTEE**

- **THE MANAGEMENT AND STAFF OF TESDA SECRETARIAT**

- Qualifications and Standards Office (QSO)

ACKNOWLEDGEMENTS

The Technical Education and Skills Development Authority (TESDA) wishes to extend gratitude and appreciation to the many representatives of business, industry, academe and government agencies and labor groups who donated their time and expertise to the review, updating and validation of this Training Regulations.

- **THE TECHNICAL EXPERT COMMITTEE (FOR CY 2014)**

- | | |
|---------------------------|--|
| 1. GAMALIEL F. ITAO, PEE | MRSP/ICC/MTC |
| 2. JOEL B. BAJADOR, PECE | JB Professional Consulting /
IECEP/MRSP |
| 3. PHILIP MARVIN D. JOVEN | ICC/MTC/MRSP |
| 4. THOMMY A. PURISIMA | MTC/ICC |

- **THE VALIDATION EXPERT COMMITTEE**

- | | |
|----------------------------|---|
| 1. AUGUSTO C. SOLIMAN, PME | Hytec Power, Inc. |
| 2. EDWIN J. CALILUNG, PhD | DLSU/MRSP |
| 3. RODRIGOT. PECOLERA, PEE | IIEE / RT Pecolera Construction Corp. |
| 4. ARIEL P. DURAN, REE | SPECS/ Polyphase One Construction, Inc. |
| 5. SANDINO E. SERVIÑO | MTC |

- **MECHATRONICS AND ROBOTICS SOCIETY OF THE PHILIPPINES**

- **THE TESDA BOARD - STANDARDS SETTING AND SYSTEMS DEVELOPMENT COMMITTEE**

- **THE MANAGEMENT AND STAFF OF TESDA SECRETARIAT**

- Qualifications and Standards Office (QSO)

1. ZOILO C. GALANG	- CSDD-QSO-TESDA
2. JULFORD C. ABASOLO	- CSDD-QSO-TESDA
3. SAMUEL E. CALADO, JR.	- CSDD-QSO-TESDA
4. VENZEL Y. CONCOLES	- CSDD-QSO-TESDA
- National Institute for Technical Education and Skills Development (NITESD)

1. AGNES P. PANEM	- CTADD/NITESD
2. FAMY I. PEPITO	- CTADD/NITESD
3. RAMON SANTIAGO	- CTADD/NITESD