# TRAINING REGULATIONS



## ELECTRONICS BACK-END OPERATIONS NC II

### ELECTRICAL & ELECTRONICS SECTOR

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 skills 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** – describes the qualification and defines the competencies that comprise the qualification.

Section 2  The **Competency Standards** format was revised to include the Required Knowledge and Required Skills per element. These fields explicitly state the required knowledge and skills for competent performance of a unit of competency in an informed and effective manner. These also emphasize the application of knowledge and skills to situations where understanding is converted into a workplace outcome.

Section 3  **Training Arrangements** - contain information and requirements which serve as bases for training providers in designing and delivering competency-based curriculum for the qualification. The revisions to section 3 entail identifying the Learning Activities leading to achievement of the identified Learning Outcome per unit of competency.

Section 4  **Assessment and Certification Arrangements** - describe the policies governing assessment and certification procedures for the qualification.

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# TRAINING REGULATIONS FOR
# ELECTRONICS BACK-END OPERATIONS NC II

## Section 1    ELECTRONICS BACK-END OPERATIONS NC II QUALIFICATIONS

The Electronics Back-end Operations NC II qualification consists of competencies that must be possessed to enable a person  to work in an electronics company engaged in production of electronics back-end products. This qualification involves such competencies to set up back-end operations workplace, analyze, carry-out and monitor back-end operations and check quality compliance of back-end operations for electronics production line.

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

The units of competency comprising this qualification include the following:

| Code | **BASIC COMPETENCIES** |
|------|------------------------|
| 500311105 | Participate in workplace communication |
| 500311106 | Work in team environment |
| 500311107 | Practice career professionalism |
| 500311108 | Practice occupational health and safety procedures |

| Code | **COMMON COMPETENCIES** |
|------|-------------------------|
| ELC311205 | Use Hand Tools |
| ELC311204 | Apply Quality Standards |
| ELC311203 | Perform Computer Operations |

| Code | **CORE COMPETENCIES** |
|------|-----------------------|
| ELC313301 | Set up back-end operations workplace for electronics production line |
| ELC313302 | Analyze, carry-out and monitor back-end operations for electronics production line |
| ELC313303 | Check quality compliance of back-end operations for electronics production line |

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

- Electronics Back-end Operator

**SECTION 2:        COMPETENCY STANDARDS**

These guidelines are set to provide the Technical Vocational Education and Training (TVET) providers with information and other important requirements to consider when designing training programs for Electronics Back-end Operations 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 *Italicized* terms are elaborated in the Range of Variables | REQUIRED KNOWLEDGE | REQUIRED SKILLS |
|---|---|---|---|
| 1. Obtain and convey workplace information | 1.1. Specific and  relevant information is accessed from ***appropriate sources***<br>1.2. Effective questioning, active listening and speaking skills are used to gather and convey information<br>1.3. Appropriate ***medium*** is used to transfer information and ideas<br>1.4. Appropriate non- verbal communication is used<br>1.5. Appropriate lines of communication with supervisors and colleagues are identified and followed<br>1.6. Defined workplace procedures for the location and ***storage*** of information are used<br>1.7. Personal interaction is carried out clearly and concisely | • Effective communication<br>• Different modes of communication<br>• Written communication<br>• Organizational policies<br>• Sources of information<br>• Types of question<br>• Medium of communication<br>• Flow of communication<br>• Storage system<br>• Telephone courtesy | • Follow simple spoken language<br>• Performing routine workplace duties following simple written notices<br>• Ability to relate to people of social range in the workplace<br>• Gather and provide information in response to workplace requirements<br>• Listening skills<br>• Questioning skills<br>• Workplace language skills |

| ELEMENT | PERFORMANCE CRITERIA *Italicized* terms are elaborated in the Range of Variables | REQUIRED KNOWLEDGE | REQUIRED SKILLS |
|---|---|---|---|
| 2. Participate in workplace meetings and discussions | 2.1 Team meetings are attended on time<br>2.2 Own opinions are clearly expressed and those of others are listened to without interruption<br>2.3 Meeting inputs are consistent with the meeting purpose and established **protocols**<br>2.4 **Workplace interactions** are conducted in a courteous manner<br>2.5 Questions about simple routine workplace procedures and matters concerning working conditions of employment are asked and responded to according to organizational guidelines<br>2.6 Meetings outcomes are interpreted and implemented | • Communication procedures and systems<br>• Meeting protocols<br>• Nature of workplace meetings<br>• Barriers of communication<br>• Workplace interactions<br>• Nonverbal communication | • Ability to relate to people of social range in the workplace<br>• Interpersonal communication skill<br>• Observing meeting protocols |
| 3. Complete relevant work related documents | 3.1 Range of **forms** relating to conditions of employment are completed accurately and legibly<br>3.2 Workplace data is recorded on standard workplace forms and documents<br>3.3 Basic mathematical processes are used for routine calculations<br>3.4 Errors in recording information on forms/ documents are identified and properly acted upon<br>3.5 Reporting requirements to supervisor are completed according to organizational guidelines | • Technology relevant to the enterprise and the individual's work<br>• Types of workplace documents and forms<br>• Basic mathematical concepts<br>• Kinds of workplace report | • Apply basic mathematical processes of addition, subtraction, division and multiplication<br>• Data recording<br>• Report writing |

**RANGE OF VARIABLES**

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

**EVIDENCE GUIDE**

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|---|---|
| 1. Critical aspects of Competency | Assessment requires evidence that the candidate:<br>1.1. Prepared written communication following standard format of the organization<br>1.2. Accessed information using communication equipment<br>1.3. Made use of relevant terms as an aid to transfer information effectively<br>1.4. Conveyed information effectively adopting the formal or informal communication |
| 2. Resource Implications | 2.1. Fax machine<br>2.2. Telephone<br>2.3. Writing materials<br>2.4. Internet |
| 3. Methods of Assessment | 3.1. Direct Observation<br>3.2. Oral interview and written test |
| 4. Context for Assessment | 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 Italicized terms are elaborated in the Range of Variables | REQUIRED KNOWLEDGE | REQUIRED SKILLS |
|---|---|---|---|
| 1. Describe team role and scope | 1.1 The **role and objective of the team** is identified from available **sources of information** 1.2 Team parameters, reporting relationships and responsibilities are identified from team discussions and appropriate external sources | • Team roles • Definition of Team • Difference between team and • group • Different sources of information • Objectives and goals of team | • 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 | • Team structure • Roles and responsibility of team members • Teams in work environment • Fundamental rights at work including gender sensitivity | • Communicating 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 workplace context 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 | • Communication process • Group planning and decision making • Team goals and objectives • Understanding individual competencies relative to teamwork • Types of individuals • Role of leaders | • 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<br>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<br>2.2. Job procedures<br>2.3. Machine/equipment manufacturer's specifications and instructions<br>2.4. Organizational or external personnel<br>2.5. Client/supplier instructions<br>2.6. Quality standards<br>2.7. OHS and environmental standards |
| 3. Workplace context | 3.1. Work procedures and practices<br>3.2. Conditions of work environments<br>3.3. Legislation and industrial agreements<br>3.4. Standard work practice including the storage, safe handling and disposal of chemicals<br>3.5. Safety, environmental, housekeeping and quality guidelines |

**EVIDENCE GUIDE**

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|---|---|
| 1. Critical aspects of Competency | Assessment requires evidence that the candidate:<br><br>1.1. Operated in a team to complete workplace activity<br>1.2. Worked effectively with others<br>1.3. Conveyed information in written or oral form<br>1.4. Selected and used appropriate workplace language<br>1.5. Followed designated work plan for the job<br>1.6. Reported outcomes |
| 2. Resource Implications | The following resources **MUST** be provided:<br><br>2.1. Access to relevant workplace or appropriately simulated environment where assessment can take place<br>2.2. Materials relevant to the proposed activity or tasks |
| 3. Methods of Assessment | Competency may be assessed through:<br><br>3.1. Observation of the individual member in relation to the work activities of the group<br>3.2. Observation of simulation and or role play involving the participation of individual member to the attainment of organizational goal<br>3.3. Case studies and scenarios as a basis for discussion of issues and strategies in teamwork |
| 4. Context for Assessment | 4.1. Competency may be assessed in workplace or in a simulated workplace setting<br>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 Italicized 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<br>1.2. Intra- and interpersonal relationships are maintained in the course of managing oneself based on performance **evaluation**<br>1.3. Commitment to the organization and its goal is demonstrated in the performance of duties | • Work values and ethics (Code of Conduct, Code of Ethics, etc.)<br>• Understanding personal objectives<br>• Understanding organizational goals<br>• Difference between intra and interpersonal relationship<br>• Performance evaluation | • Demonstrate Intra and Interpersonal skills at work<br>• 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.<br>2.2 **Resources** are utilized efficiently and effectively to manage work priorities and commitments<br>2.3 Practices along economic use and maintenance of equipment and facilities are followed  as per established procedures | • Company policies<br>• Company operations, procedures and standards<br>• Time management<br>• Basic strategic planning concepts<br>• Resource utilization and management | • Managing goals and time<br>• Practice economic use of resources and facilities<br>• Setting work priorities<br>• Practice time management |
| 3. Maintain professional growth and development | 4.1 **Trainings and career opportunities** are identified and availed of based on job requirements<br>4.2 **Recognitions** are sought/received and demonstrated as proof of career advancement<br>4.3 **Licenses and/or certifications** relevant to job and career are obtained and renewed | • Career development opportunities<br>• Company recognition and incentives<br>• Information on relevant licenses and or certifications | • Determining personal career development needs<br>• Identifying career opportunities |

**RANGE OF VARIABLES**

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

**EVIDENCE GUIDE**

| | |
|---|---|
| 1. Critical aspects of Competency | Assessment requires evidence that the candidate:<br>1.1 Attained job targets within key result areas (KRAs)<br>1.2 Maintained intra - and interpersonal relationship in the course of managing oneself based on performance evaluation<br>1.3 Completed trainings and career opportunities which are based on the requirements of the industries<br>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:<br>2.1 Workplace or assessment location<br>2.2 Case studies/scenarios |
| 3. Methods of Assessment | Competency may be assessed through:<br>3.1 Portfolio Assessment<br>3.2 Interview<br>3.3 Simulation/Role-plays<br>3.4 Observation<br>3.5 Third Party Reports<br>3.6 Exams and Tests |
| 4. Context for Assessment | 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<br>*Italicized* 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<br>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<br>1.3 **Contingency measures** during workplace accidents, fire and other emergencies are recognized and established in accordance with organization procedures | • OHS procedures and practices and regulations<br>• Hazards/risks identification and control<br>• OHS indicators<br>• Organizational contingency practices | • Hazards/risks identification and control skills<br>• 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)<br>2.2 Effects of the hazards are determined<br>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 | • Threshold Limit Value -TLV<br>• Effects of safety hazards | • Communication skills<br>• 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<br>3.2 Procedures for dealing with workplace accidents, fire and emergencies are followed in accordance with organization OHS policies | • Personal hygiene practices<br>• Organization safety and health protocol<br>• Company emergency procedure practices | • Practice of personal hygiene<br>• Respond to emergency |

| ELEMENT | PERFORMANCE CRITERIA *Italicized* terms are elaborated in the Range of Variables | REQUIRED KNOWLEDGE | REQUIRED SKILLS |
|---|---|---|---|
| | 3.3 ***Personal protective equipment (PPE)*** is correctly used in accordance with organization OHS procedures and practices<br>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 ***Emergency-related drills and trainings*** are participated in as per established organization guidelines and procedures<br>4.2 ***OHS personal records*** are completed and updated in accordance with workplace requirements | • Workplace OHS personal records<br>• Information on emergency-related drills | • Practice emergency-related drill skills in the workplace |

**RANGE OF VARIABLES**

| VARIABLE | RANGE |
|---|---|
| 1. Safety regulations | May include but are not limited to:<br>1.1 Clean Air Act<br>1.2 Building code<br>1.3 National Electrical and Fire Safety Codes<br>1.4 Waste management statutes and rules<br>1.5 Philippine Occupational Safety and Health Standards<br>1.6 DOLE regulations on safety legal requirements<br>1.7 ECC regulations |
| 2. Hazards/Risks | May include but are not limited to:<br>2.1 Physical hazards – impact, illumination, pressure, noise, vibration, temperature, radiation<br>2.2 Biological hazards- bacteria, viruses, plants, parasites, mites, molds, fungi, insects<br>2.3 Chemical hazards – dusts, fibers, mists, fumes, smoke, gasses, vapors<br>2.4 Ergonomics<br>    2.4.1 Psychological factors – over exertion/ excessive force, awkward/static positions, fatigue, direct pressure, varying metabolic cycles<br>    2.4.2 Physiological factors – monotony, personal relationship, work out cycle |
| 3. Contingency measures | May include but are not limited to:<br>3.1 Evacuation<br>3.2 Isolation<br>3.3 Decontamination<br>3.4 (Calling designed) emergency personnel |
| 4. PPE | May include but are not limited to:<br>4.1 Mask<br>4.2 Gloves<br>4.3 Goggles<br>4.4 Hair Net/cap/bonnet<br>4.5 Face mask/shield<br>4.6 Ear muffs<br>4.7 Apron/Gown/coverall/jump suit<br>4.8 Anti-static suits |
| 5. Emergency-related drills and training | 5.1 Fire drill<br>5.2 Earthquake drill<br>5.3 Basic life support/CPR<br>5.4 First aid<br>5.5 Spillage control<br>5.6 Decontamination of chemical and toxic<br>5.7 Disaster preparedness/management |
| 6. OHS personal records | 6.1 Medical/Health records<br>6.2 Incident reports<br>6.3 Accident reports<br>6.4 OHS-related training completed |

**EVIDENCE GUIDE**

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|---|---|
| 1. Critical aspects of Competency | Assessment requires evidence that the candidate:<br>1.1 Explained clearly established workplace safety and hazard control practices and procedures<br>1.2 Identified hazards/risks in the workplace and its corresponding indicators in accordance with company procedures<br>1.3 Recognized contingency measures during workplace accidents, fire and other emergencies<br>1.4 Identified terms of maximum tolerable limits based on threshold limit value- TLV.<br>1.5 Followed Occupational Health and Safety (OHS) procedures for controlling hazards/risks in workplace<br>1.6 Used Personal Protective Equipment (PPE) in accordance with company OHS procedures and practices<br>1.7 Completed and updated OHS personal records in accordance with workplace requirements |
| 2. Resource Implications | The following resources must be provided:<br>2.1 Workplace or assessment location<br>2.2 OHS personal records<br>2.3 PPE<br>2.4 Health records |
| 3. Methods of Assessment | Competency may be assessed through:<br>3.1 Portfolio Assessment<br>3.2 Interview<br>3.3 Case Study/Situation |
| 4. Context for Assessment | 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 *Italicized* 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<br>1.2. Appropriate **hand tools** are identified and selected according to the task requirements | • Planning and preparing task/activity<br>• Electronics hand tools and their uses<br>• Function, operation and common faults in electronics hand tools | • Preparing required tasks<br>• Communication skills<br>• Using hand tools properly |
| 2. Prepare hand tools | 2.1. Appropriate hand tools are checked for proper operation and safety<br>2.2. Unsafe or faulty tools are identified and marked for repair according to standard company procedure | • Checking and safety requirements in handling tools<br>• Standard procedures in checking, identification and marking of safe or unsafe/ faulty tools | • Identifying and checking hand tools<br>• 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<br>3.2 All safety procedures in using tools are observed at all times and appropriate **personal protective equipment** (PPE) are used<br>3.3 Malfunctions, unplanned or unusual events are reported to the supervisor | • Safety requirements in using electronics hand tools and test equipment<br>• Electronics hand tools for adjusting, dismantling, assembling, finishing, and cutting.<br>• Processes, Operations, Systems<br>  o Proper usage and care of hand tools<br>  o Types and uses of test equipment<br>• Common faults in the use of hand tools | • Reading skills required to interpret work instruction and numerical skills<br>• Using PPE properly<br>• Problem solving in emergency situation |

| ELEMENT | PERFORMANCE CRITERIA<br>*Italicized* terms are elaborated in the Range of Variables | REQUIRED KNOWLEDGE | REQUIRED SKILLS |
|---------|-----------|-----------|-----------|
| 4. Maintain hand tools | 4.1 Tools are not dropped to avoid damage<br>4.2 Routine **maintenance** of tools undertaken according to standard operational procedures, principles and techniques<br>4.3 Tools are stored safely in appropriate locations in accordance with manufacturer's specifications or standard operating procedures | • Safety requirements in maintenance of hand tools<br>• Processes, Operations, Systems<br> o Maintenance of tools<br> o Storage of hand tools | • Checking and cleaning hand tools<br>• Storing hand tools properly |

**RANGE OF VARIABLES**

| VARIABLE | RANGE |
|---|---|
| 1. Hand tools | 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<br>2.2. Protective eyewear<br>2.3. Apron/overall |
| 3. Maintenance | 3.1. Cleaning<br>3.2. Lubricating<br>3.3. Tightening<br>3.4. Simple tool repairs<br>3.5. Hand sharpening<br>3.6. Adjustment using correct procedures |

**EVIDENCE GUIDE**

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|---|---|
| 1. Critical aspect of competency | Assessment requires evidence that the candidate:<br><br>1.1. Demonstrated safe working practices at all times<br>1.2. Communicated information about processes, events or tasks being undertaken to ensure a safe and efficient working environment<br>1.3. Planned tasks in all situations and reviewed task requirements as appropriate<br>1.4. Performed all tasks to specification<br>1.5. Maintained and stored tools in appropriate location |
| 2. Method of assessment | Competency in this unit must be assessed through:<br>2.1. Observation<br>2.2. Oral questioning |
| 3. Resource Implication | Tools may include the following but not limited to:<br>3.1 screw drivers<br>3.2 pliers<br>3.3 punches<br>3.4 wrenches, files |
| 4. Context of Assessment | Assessment may be conducted in the workplace or in a simulated work 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<br>*Italicized Bold* 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<br>1.2. Received ***materials or component parts*** are checked against workplace standards and specifications<br>1.3. Faulty material or components related to work are identified and isolated<br>1.4. ***Faults*** and any identified causes are recorded and/or reported to the supervisor concerned in accordance with workplace procedures<br>1.5. Faulty materials or components are replaced in accordance with workplace procedures | • Relevant production processes, materials and products<br>• Characteristics of materials, software and hardware used in production processes<br>• Quality checking procedures<br>• Quality Workplace procedures<br>• Identification of faulty materials related to work | • Reading skills required to interpret work instruction<br>• Critical thinking<br>• Interpreting work instructions |
| 2. Assess own work | 2.1. ***Documentation*** relative to quality within the company is identified and used<br>2.2. Completed work is checked against workplace standards relevant to the task undertaken<br>2.3. Faulty pieces  are identified and isolated<br>2.4. Information on the quality and other indicators of production performance is recorded in accordance with workplace procedures<br>2.5. In cases of deviations from specified ***quality standards***, causes are documented and   reported in accordance with the workplace' standards operating procedures | • Safety and environmental aspects of production processes<br>• Fault identification and reporting<br>• Workplace procedure in documenting completed work<br>• Workplace Quality Indicators | • Carry out work in accordance with OHS policies and procedures |

| ELEMENT | PERFORMANCE CRITERIA<br>*Italicized Bold* 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<br>3.2 Work is carried out in accordance with process improvement procedures<br>3.3 Performance of operation or quality of product or service to ensure *customer* satisfaction is monitored | • Quality improvement processes<br>• Company customers defined | • Solution providing and decision-making<br>• Practice company process improvement procedure |

**RANGE OF VARIABLES**

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

**EVIDENCE GUIDE**

| 1. Critical aspect of competency | Assessment must show that the candidate:<br><br>1.1. Carried out work in accordance with the company's standard operating procedures<br>1.2. Performed task according to specifications<br>1.3. Reported defects detected in accordance with standard operating procedures<br>1.4. Carried out work in accordance with the process improvement procedures |
|---|---|
| 2. Method of assessment | 2.1. The assessor may select two (2) of the following assessment methods to objectively assess the candidate:<br>  2.1.1. Observation<br>  2.1.2. Questioning<br>  2.1.3. Practical demonstration |
| 3. Resource implication | Materials and component parts and equipment to be used in a real or simulated electronic production situation |
| 4. Context of Assessment | 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<br>*Italicized* 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 in accordance with the required output.<br>1.2. Appropriate **hardware** and **software** are selected according to task assigned and required outcome.<br>1.3. Task is planned to ensure that **OH & S guidelines** and procedures are followed.<br>1.4. Client -specific guidelines and procedures are followed.<br>1.5. Required data security guidelines are applied in accordance with existing procedures. | • Main types of computers and basic features of different operating systems<br>• Main parts of a computer<br>• Information on hardware and software<br>• Data security guidelines | • Reading and comprehension skills required to interpret work instruction and to interpret basic user manuals.<br>• Communication skills to identify lines of communication, request advice, follow instructions and receive feedback.<br>• 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<br>2.2. Accuracy of information is checked and information is saved in accordance with standard operating procedures<br>2.3. Inputted data are stored in **storage media** according to requirements<br>2.4. Work is performed within **ergonomic guidelines** | • Basic ergonomics of keyboard and computer user<br>• Storage devices and basic categories of memory<br>• Relevant types of software | • Technology skills to use equipment safely including keyboard skills.<br>• Entering data |
| 3. Access information using computer | 3.1. Correct program/ application is selected based on job requirements<br>3.2. Program/application containing the information required is accessed according to company procedures<br>3.3. **Desktop icons** are correctly selected, opened and closed for navigation purposes | • General security, privacy legislation and copyright<br>• Productivity Application<br>• Business Application | • Accessing information<br>• Searching and browsing files and data |

| ELEMENT | PERFORMANCE CRITERIA *Italicized* terms are elaborated in the Range of Variables | REQUIRED KNOWLEDGE | REQUIRED SKILLS |
|---|---|---|---|
| | 3.4. Keyboard techniques are carried out in line with OH & S requirements for safe use of keyboards | | |
| 4. Produce/ output data using computer system | 4.1. Entered data are processed using appropriate software commands<br>4.2. Data printed out as required using computer hardware/peripheral devices in accordance with standard operating procedures<br>4.3. Files, data are transferred between compatible systems using computer software, hardware/ peripheral devices in accordance with standard operating procedures | • Computer application in printing, scanning and sending facsimile<br>• Types and function of computer peripheral devices | • Computer data processing<br>• Printing of data<br>• Transferring files and data |
| 5. Maintain computer equipment and systems | 5.1. Systems for cleaning, minor *maintenance* and replacement of consumables are implemented<br>5.2. Procedures for ensuring security of data, including regular back-ups and virus checks are implemented in accordance with standard operating procedures<br>5.3. Basic file maintenance procedures are implemented in line with the standard operating procedures | • Computer equipment/system basic maintenance procedures<br>• Viruses<br>• OH & S principles and responsibilities<br>• Calculating computer capacity<br>• System Software<br>• Basic file maintenance procedures | • Removing computer viruses from infected machines<br>• Making backup files |

## RANGE OF VARIABLES

| VARIABLE | RANGE |
|---|---|
| 1. Hardware and peripheral devices | 1.1. Personal computers<br>1.2. Networked systems<br>1.3. Communication equipment<br>1.4. Printers<br>1.5. Scanners<br>1.6. Keyboard<br>1.7. Mouse<br>1.8. Voice/Data logger |
| 2. Software | Software includes the following but not limited to:<br>2.1. Word processing packages<br>2.2. Data base packages<br>2.3. Internet<br>2.4. Spreadsheets<br>2.5. Client Specific Software |
| 3. OH & S guidelines | 3.1. OHS guidelines<br>3.2. Enterprise procedures |
| 4. Storage media | Storage media include the following but not limited to:<br>4.1. USBs<br>4.2. CDs<br>4.3. External disk drives<br>4.4. hard disk drives, local and remote<br>4.5. optical drives<br>4.6. cloud storage |
| 5. Ergonomic guidelines | 5.1. Types of equipment used<br>5.2. Appropriate furniture<br>5.3. Seating posture<br>5.4. Lifting posture<br>5.5. Visual display unit screen brightness |
| 6. Desktop icons | Icons include the following but not limited to:<br>6.1. directories/folders<br>6.2. files<br>6.3. network devices<br>6.4. recycle bin<br>6.5. program icons |
| 7. Maintenance | 7.1. Creating and managing more space in the hard disk and other peripherals<br>7.2. Reviewing programs<br>7.3. Deleting unwanted files<br>7.4. Backing up files<br>7.5. Checking hard drive for errors<br>7.6. Using up to date anti-virus programs<br>7.7. Cleaning dust from internal and external surfaces |

**EVIDENCE GUIDE**

| 1. Critical aspect of competency | Assessment requires evidence that the candidate: <br> 1.1. Selected and used hardware components correctly and according to the task requirement <br> 1.2. Identified and explain the functions of both hardware and software used, their general features and capabilities <br> 1.3. Produced accurate and complete data in accordance with the requirements <br> 1.4. Used appropriate devices and procedures to transfer files/data accurately <br> 1.5. Maintained computer system in line with the standard operating procedures |
|---|---|
| 2. Method of assessment | 2.1. The assessor may select two of the following assessment methods to objectively assess the candidate: <br>     2.1.1. Observation with oral questioning <br>     2.1.2. Practical demonstration |
| 3. Resource implication | 3.1. Computer hardware   with peripherals <br> 3.2. Appropriate software |
| 4. Context of Assessment | Assessment may be conducted in the workplace or in a simulated work environment |

# CORE COMPETENCIES

**UNIT OF COMPETENCY:** SET UP BACK-END OPERATIONS WORKPLACE FOR ELECTRONICS PRODUCTION LINE

**UNIT CODE** : **ELC313301**

**UNIT DESCRIPTOR** : This unit covers the knowledge, skills and attitudes needed in setting up the back-end operations workplace for electronics production line. This includes gathering production tools and materials, setting-up electronics backend machine parameters and peripherals (including changeover), accomplishing production line checklist and performing daily maintenance activity.

| ELEMENT | PERFORMANCE CRITERIA<br>*Italicized* terms are elaborated in the Range of Variables | REQUIRED KNOWLEDGE | REQUIRED SKILLS |
|---------|------------------------------------------------------------------------------------|--------------------|-----------------|
| 1. Gather tools and materials for electronics production line back-end process | 1.1. *Process* requirements are determined according to production specifications<br>1.2. Appropriate *tools* and materials are selected and completed according to process requirements and *required time*<br>1.3. Quantity and quality of materials are checked in accordance with *production specifications*<br>1.4. Completeness and accuracy of documents are checked in accordance with production specifications | • Awareness of electronics production line systems and processes<br>• Familiarity with electronics production line back-end materials<br>• Understanding bill of materials, travelers, check list and other applicable electronics production line backend documents/ specifications.<br>• Awareness of safe handling of tools and materials i.e. 5S principles, Material Safety Data Sheet (MSDS), Personal Protective Equipment (PPE), Electro Static Discharge (ESD), Environmental Health Systems (EHS), Occupational Health and Safety (OHS), Cleanroom requirements and contamination control<br>• Understanding of IPC standards<br>• Awareness of international quality standards<br>   ○ Quality Management System<br>   ○ Environmental Management System<br>• Familiarity with visual criteria<br>• Familiarity with electronics production line back-end tools | • Reading skills<br>• Basic mathematical skills<br>• Communication skills<br>• Computer skills<br>• Detecting abnormality or non-conformance<br>• Writing skills |

| ELEMENT | PERFORMANCE CRITERIA *Italicized* terms are elaborated in the Range of Variables | REQUIRED KNOWLEDGE | REQUIRED SKILLS |
|---|---|---|---|
| | | • Time consciousness on setup time | |
| 2. Set up electronics back-end machine parameters and peripherals | 2.1 Walk-around check or visual inspection of back-end machine is done prior to production operation <br> 2.2 Electronics back-end *machine parameters* are set correctly according to production specifications <br> 2.3 Electronics back-end machine parameters and *peripherals* are checked according to production specifications <br> 2.4 Any non-conformance to specifications are reported to *appropriate personnel* | • Electronics production line back-end machine set up parameters <br> • Awareness of safety operation of back-end machines <br> • Reading of different gauges <br> • Awareness of set up criteria <br> • Awareness of applicable Out of Control Action Plan (OCAP) | • Skills in basic machine operation and set-up <br> • Detecting abnormality or non-conformance <br> • Communication skills <br>   o Written <br>   o Oral |
| 3. Accomplish electronics production line back-end checklist | 3.1 All check items are performed according to specifications <br> 3.2 Production line checklist are correctly filled-out according to specifications <br> 3.3 Production line checklist is completed based on required time <br> 3.4 Work turnover procedure is performed for next work shift | • Completeness and accuracy of information on production line checklist <br> • Work values and ethics <br>   o Attentiveness <br>   o Time consciousness <br>   o Cost-consciousness <br>   o Quality-consciousness | • Filling up appropriate information on checklist/ lot travelers |
| 4. Perform daily maintenance activity | 4.1 Electronics back-end *machine basic physical condition* are checked according to specifications <br> 4.2 If necessary, daily maintenance activity is performed based on required time <br><br> 4.3 Any non-conformance to specifications are reported to appropriate personnel <br> 4.4 Housekeeping procedures are observed in accordance with 5S discipline and established procedures | • Workplace organization (layout/arrangement of workplace) <br> • Understanding the applicable daily PM checklist <br> • Electronics back-end machine basic physical conditions <br> • Time consciousness <br> • Awareness of applicable out of control action plan (OCAP) <br> • 5S principles | • Checking of machine basic physical conditions <br> • Detecting abnormality or non-conformance <br> • Writing skills <br> • Skills in housekeeping |

**RANGE OF VARIABLES**

| VARIABLE | RANGE |
|---|---|
| 1. Production specifications | May include:<br>1.1 Machine specifications<br>1.2 Set-up checklist<br>1.3 Work Instructions (WI)/Job order<br>1.4 Production procedures<br>1.5 Out of Control Action Plan (OCAP) procedures<br>1.6 Control Plan procedures<br>1.7 Statistical Process Control (SPC) procedures<br>1.8 Work Manuals<br>1.9 Production Process and Flow Diagrams |
| 2. Tools | Tools may include:<br>2.1 Tweezers<br>2.2 Vacuum Pen<br>2.3 Metric Allen Keys<br>2.4 12 Digit Calculator<br>2.5 Torque driver |
| 3. Processes | Electronics back-end processes may include but not be limited to:<br>3.1 Singulation<br>3.2 Soldering<br>3.3 Testing<br>3.4 Final Assembly<br>3.5 Marking<br>3.6 Packaging<br>3.7 Final Visual Inspection |
| 4. Required time | Required time may include:<br>4.1 Production cycle time<br>4.2 Process cycle time<br>4.3 Machine operation cycle time |
| 5. Machine parameters | Machine parameters may include:<br>5.1 Machine type<br>5.2 Machine model<br>5.3 Machine settings<br>5.4 Material/ Product type<br>5.5 Material/ Product model |
| 6. peripherals | Peripherals may include:<br>6.1 Jigs<br>6.2 Fixtures<br>6.3 Boards |

| VARIABLE | RANGE |
|---|---|
| 7. Appropriate personnel | Appropriate personnel may include:<br>7.1 Immediate supervisor<br>7.2 Maintenance personnel<br>7.3 Engineer<br>7.4 Quality Control personnel |
| 8. Machine basic physical conditions | Machine basic physical condition check may include:<br>8.1 Complete screws<br>8.2 Fan is working<br>8.3 No oil leakage<br>8.4 No broken wire<br>8.5 Presence of foreign material<br>8.6 Any physical defect |

**EVIDENCE GUIDE**

| 1. Critical aspects of Competency | Assessment requires evidence that the candidate:<br>1.1 Gathered production tools and materials for electronics back-end process according to approved production specifications<br>1.2 Checked and set up electronics back-end machine parameters and peripherals for production startup and usage<br>1.3 Accomplished electronics back-end production quality checklist according to quality manuals and procedures<br>1.4 Checked machine's basic physical condition in accordance to production line standards and performed daily maintenance activity based on required time |
|---|---|
| 2. Resource Implications | The following resources **MUST** be provided:<br>2.1 Appropriate electronics back-end machine and equipment<br>2.2 Tools (as indicated in the Range Of Variables)<br>2.3 Materials<br>2.4 Work Instructions assessment rating sheet<br>2.5 Sample production checklist<br>2.6 Applicable forms for specific equipment or machines<br>2.7 Procedure and quality manuals<br>2.8 Personal computer<br>2.9 Printer<br>2.10 Reporting forms |
| 3. Methods of Assessment | Competency may be assessed through:<br>3.1 Demonstration with oral questioning<br>3.2 Direct observation with oral questioning<br>3.3 Examinations and tests |
| 4. Context for Assessment | Competency may be assessed in the work place or in a simulated work place setting |

**UNIT OF COMPETENCY:** ANALYZE, CARRY-OUT AND MONITOR BACK-END OPERATION FOR ELECTRONICS PRODUCTION LINE

**UNIT CODE** : ELC313302

**UNIT DESCRIPTOR** : This unit covers the knowledge, skills and attitudes needed in performing back-end operation for electronics production line. This includes operating electronics back-end machine/ equipment, running sample units and loading production units.

| ELEMENT | PERFORMANCE CRITERIA<br>*Italicized* terms are elaborated in the Range of Variables | REQUIRED KNOWLEDGE | REQUIRED SKILLS |
|---|---|---|---|
| 1. Initialize/ Operate electronics back-end machine/ equipment | 1.1 Safety requirements are complied with using the operation manual<br>1.2 Appropriate **PPE** and **ESD apparels** are used in the performance of the job<br>1.3 Appropriate **tools and materials** are used according to **process** requirements<br>1.4 **Electronics back-end machine** settings are checked according to product specifications<br>1.5 Electronics back-end machine is initialized/ operated in accordance with work instructions and company procedures<br>1.6 Electronics back-end machine's troubles/ problems are immediately recorded and reported to the appropriate personnel | • Awareness on safe working conditions<br>• Awareness on electronics back-end machine safety features and guidelines<br>• Electronics production systems<br>  ○ Batch<br>  ○ Continuous<br>• Awareness on the following; 5S, Material Safety Data Sheet (MSDS), Personal Protective Equipment (PPE), Electro Static Discharge (ESD), Environmental Health Systems (EHS), Occupational Health and Safety (OHS)<br>• Awareness on international quality standards<br>  ○ Quality Management System<br>  ○ Environmental Management System<br>• Understanding electronics production line back-end products and processes specifications<br>• Operation of electronics production line back-end machines<br>• Basic machines/ equipment trouble/ breakdowns<br>• Interpreting of different gauges readings<br>• Visual/mechanical criteria | • Reading skills<br>• Communication skills<br>• Computer skills<br>• Observation Skills<br>• Skills in machine settings and safety<br>• Back-end machine operation skills<br>• Detecting abnormality or non-conformance<br>• Writing skills |

| ELEMENT | PERFORMANCE CRITERIA *Italicized* terms are elaborated in the Range of Variables | REQUIRED KNOWLEDGE | REQUIRED SKILLS |
|---|---|---|---|
| 2. Run electronics back-end sample units | 2.1 Electronics back-end sample output is checked in accordance to *product criteria* <br> 2.2 Electronics back-end *sample unit* is loaded to the equipment in accordance to product orientation and specifications <br> 2.3 If applicable, manual electronics back-end process is performed in accordance with work instructions and company procedures <br> 2.4 Out of control action plan (OCAP) is followed in case of any non-conformance or deviation to the process <br> 2.5 Electronics back-end production forms are accomplished based on production procedures | • Product visual/ mechanical criteria <br> • Types of sample units <br> • Product orientation <br> • Understanding of OCAP on running sample units <br> • Completeness and accuracy of information on electronics production line form for sample units | • Reading skills <br> • Observation Skills <br> • Back-end machine operation skills <br> • Detecting abnormality or non-conformance <br> • Writing skills |
| 3. Load electronics back-end production units | 3.1 Production output is checked in accordance to product criteria <br> 3.2 Production units are loaded to the equipment in accordance to product orientation and specifications <br> 3.3 If applicable, manual electronics back-end process is performed in accordance with work instructions and company procedures <br> 3.4 Out of control action plan (OCAP) is followed in case of any non-conformance or deviation to the process <br> 3.5 Electronics back-end *production forms* are accomplished based on production procedures | • Product visual/ mechanical criteria <br> • Electronics back-end operation process controls <br> • Understanding of OCAP on electronics production line back-end operations <br> • Completeness and accuracy of information on electronics production line form for production units <br> • Work values and ethics <br> ○ Attentiveness <br> ○ Time consciousness <br> ○ Cost-consciousness <br> ○ Quality-consciousness | • Reading skills <br> • Communication skills <br> • Computer skills <br> • Observation Skills <br> • Back-end machine operation skills <br> • Detecting abnormality or non-conformance <br> • Writing skills |

**RANGE OF VARIABLES**

| VARIABLE | RANGE |
|---|---|
| 1. PPE | Personal protective equipment may include:<br>1.1 Safety shoes<br>1.2 Gloves<br>1.3 Safety goggles |
| 2. ESD apparels | ESD apparels may include:<br>2.1 Shoes<br>2.2 Smock and Head cap<br>2.3 ESD Jacket<br>2.4 Bunny suit<br>2.5 Face mask<br>2.6 Wrist/Foot ground strap |
| 3. Tools and materials | Appropriate tools and materials may include:<br>3.1 Tools<br>    3.1.1 Tweezers<br>    3.1.2 Vacuum Pen<br>    3.1.3 Allen Keys<br>    3.1.4 Calculator<br>    3.1.5 Torque driver<br>3.2 Materials<br>    3.1.1 Appropriate production components<br>    3.1.2 ESD apparels |
| 4. Process | Electronics production line back-end processes may include:<br>4.1 Singulation- Auto/ Manual<br>4.2 Manual Insertion<br>4.3 Solder Wave<br>4.4 Encapsulation/ Case Mounting<br>4.5 Test<br>4.6 Marking<br>4.7 Packaging<br>4.8 Final Visual Inspection |
| 5. Electronics back-end machines | Electronics back-end machines may include:<br>5.1 Singulation- Auto/ Manual machine<br>5.2 Manual Insertion machine<br>5.3 Solder Wave machine<br>5.4 Case Mounting machine<br>5.5 Test System machine (Insert-Circuit Testing)<br>5.6 Test Handler machine (Functional Circuit Testing)<br>5.7 Marking machine<br>5.8 Packaging machine |

| VARIABLE | RANGE |
|---|---|
| 6. Product criteria | Product criteria may include:<br>6.1 Electrical criteria<br>6.2 Visual criteria<br>6.3 Mechanical criteria |
| 7. Sample Unit | Sample units may include:<br>7.1 Good Unit<br>7.2 Reject Unit<br>7.3 Dummy Unit<br>7.4 Standard Unit |
| 8. Production forms | Production forms may include:<br>8.1 Lot traceability<br>8.2 SPC checklist<br>8.3 Monitoring checklist |

## EVIDENCE GUIDE

| 1. Critical aspects of Competency | Assessment requires evidence that the candidate:<br>1.1 Initialized/Operated electronics back-end machine/ equipment according to production requirements<br>1.2 Run electronics back-end sample units in accordance to product orientation and specifications<br>1.3 Loaded electronics back-end production units in accordance to product orientation and specifications |
|---|---|
| 2. Resource Implications | The following resources **MUST** be provided:<br>2.1 Appropriate electronics back-end machine and equipment<br>2.2 Tools (as indicated in the Range Of Variables)<br>2.3 Appropriate production units and materials<br>2.4 Work instructions assessment rating sheet<br>2.5 Sample production checklist<br>2.6 Applicable forms for specific equipment or machines<br>2.7 Procedure and quality manuals<br>2.8 Personal computer<br>2.9 Printer<br>2.10 Reporting forms |
| 3. Methods of Assessment | Competency may be assessed through:<br>3.1 Demonstration with oral questioning<br>3.2 Direct Observation with oral questioning<br>3.3 Written examination |
| 4. Context for Assessment | Competency may be assessed in the work place or in a simulated work place setting |

**UNIT OF COMPETENCY:** **CHECK QUALITY COMPLIANCE OF BACK-END OPERATIONS FOR ELECTRONICS PRODUCTION LINE**

**UNIT CODE** **:** **ELC313303**

**UNIT DESCRIPTOR** **:** This unit covers the knowledge, skills and attitudes needed in checking quality compliance of back-end operations for electronics production line. This includes monitoring back-end machine/equipment operation, completing lot traceability and performing visual machine inspection in electronics production line.

| ELEMENT | PERFORMANCE CRITERIA<br>*Italicized* terms are elaborated in the Range of Variables | REQUIRED KNOWLEDGE | REQUIRED SKILLS |
|---|---|---|---|
| 1. Monitor electronics production line back-end operation | 1.1 Output and yield are checked in accordance with production requirements<br>1.2 Out of control action plan (OCAP) is followed in case of any non-conformance or deviation to the process<br>1.3 Electronics *production line forms* are accomplished in accordance with process requirements | • Yield requirement<br>• Machine capacity<br>• Understanding of OCAP on machine/ equipment operation<br>• Basic Statistical Process Control (SPC)<br>• Completeness and accuracy of information on electronics production line form for unusual machine operation | • Reading skills<br>• Communication skills<br>• Monitoring skills<br>• Detecting abnormality or non-conformance<br>• Writing skills |
| 2. Perform visual inspection | 2.1 Finished products are checked/ inspected using *appropriate instruments/tools*.<br>2.2 *Physical defects* are identified based on product specifications<br>2.3 Conforming and non-conforming products are identified and segregated in accordance with production line procedures<br>2.4 Housekeeping procedures are observed in accordance with 5S discipline and established procedures | • Finished products judgment criteria on electronics production line back-end processes<br>• Uses of appropriate instruments/tools<br>• Procedures on identification and segregation of non-conforming products in electronics production line back-end operations<br>• 5S principles | • Reading skills<br>• Communication skills<br>• Computer skills<br>• Observation Skills<br>• Detecting abnormality or non-conformance<br>• Writing skills |
| 3. Complete electronics production line back-end lot traceability | 3.1 Lot traceability are *transacted* in accordance with production procedures<br>3.2 Conforming and non-conforming products are identified and segregated in accordance with production line procedures<br>3.3 *Disposition of lots* is determined in accordance with product criteria | • Lot traceability<br>• Types of electronics production line back-end product defects<br>• Process controls on lots transaction | • Communication skills<br>• Computer skills<br>• Observation Skills<br>• Detecting abnormality or non-conformance<br>• Writing skills |

**RANGE OF VARIABLES**

| VARIABLE | RANGE |
|---|---|
| 1. Production line forms | Production forms may include:<br>1.1 Lot summary<br>1.2 SPC checklist<br>1.3 Monitoring checklist |
| 2. Lot traceability transaction | Transaction may include:<br>2.1 Manual<br>2.2 Automated |
| 3. Disposition of lots | Disposition of lots may include:<br>3.1 Pass<br>3.2 Failed<br>3.3 Hold<br>3.4 Scrap<br>3.5 Re-screen/ Re-work/Re-test |
| 4. Appropriate instruments/tools | Appropriate instruments/tools may include:<br>4.1 Stereoscopic microscope<br>4.2 magnifying lens<br>4.3 profile projector/ comparator |
| 5. Physical defects | Physical defects may include:<br>5.1 lead defects<br>5.2 marking defects<br>5.3 mold defects |

**EVIDENCE GUIDE**

| 1. Critical aspects of Competency | Assessment requires evidence that the candidate:<br>1.1 Monitored electronics production line back-end machine/ equipment operation based on product requirements<br>1.2 Performed visual inspection in accordance to electronics production line standards<br>1.3 Completed electronics production line back-end lot transaction in accordance with production procedures |
|---|---|
| 2. Resource Implications | The following resources **MUST** be provided:<br>2.1 Appropriate electronics back-end machine and equipment<br>2.2 Tools (as indicated in the Range Of Variables)<br>2.3 Appropriate production units and materials<br>2.4 Work instructions assessment rating sheet<br>2.5 Sample production checklist<br>2.6 Applicable forms for specific equipment or machines<br>2.7 Procedure and quality manuals<br>2.8 Personal computer<br>2.9 Printer<br>2.10 Reporting forms |
| 3. Methods of Assessment | Competency may be assessed through:<br>3.1 Demonstration with oral questioning<br>3.2 Direct Observation with oral questioning<br>3.3 Written examination |
| 4. Context for Assessment | Competency may be assessed in the work place or in a simulated work place setting |

## SECTION 3.  TRAINING ARRANGEMENTS

These guidelines are set to provide the Technical and Vocational Education and Training (TVET) providers with information and other important requirements to consider when designing training programs for Electronics Back-end Operations NC II.

They include information on curriculum design; training delivery; trainee entry requirements; tools and equipment; training facilities; and   trainer's qualification.

### 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:**  Electronics Production Line Back-end Operations        **NC Level:** NC II

**Nominal Training Duration:**        16 hrs – Basic Competencies
                                      16 hrs – Common Competencies
                                      48 hrs – Core Competencies
                                      ----------
                                      **80 hrs – Total**

**Course Description:**

This course is designed to develop & enhance the knowledge, skills, & attitudes of an Electronics Back-end Operator, in accordance with industry standards. It covers the basic and common competencies in addition to the core competencies such as preparing workplace, analyzing, carrying-out and monitoring back-end machine/equipment operation and checking quality compliance for electronics production line back-end operations.

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

# BASIC COMPETENCIES
(16 HRS.)

| Unit of Competency | Learning Outcomes | Learning Activities | Methodology | Assessment Approach | Nominal Duration |
|---|---|---|---|---|---|
| 1. Participate in workplace communication | 1.1 Obtain and convey workplace information | • Describe Organizational policies | • Group discussion | • Oral evaluation | 4 Hours |
| | | • Read:<br>  o Effective communication<br>  o Written communication<br>  o Communication procedures and systems<br>• Identify:<br>  o Different modes of communication<br>  o Medium of communication<br>  o Flow of communication<br>  o Available technology relevant to the enterprise and the individual's work responsibilities | • Lecture | • Written examination | |
| | | • Prepare different Types of question<br><br>• Gather different sources of information<br><br>• Apply storage system in establishing workplace information<br>• Demonstrate Telephone courtesy | • Demonstration | • Observation | |
| | 1.2 Complete relevant work related documents | • Describe Communication procedures and systems | • Group discussion | • Oral evaluation | |
| | | • Read:<br>  o Meeting protocols<br>  o Nature of workplace meetings | • Lecture | • Written examination | |
| | | | • Lecture | • Written | |

| Unit of Competency | Learning Outcomes | Learning Activities | Methodology | Assessment Approach | Nominal Duration |
|---|---|---|---|---|---|
| | | o Workplace interactions<br>o Barriers of communication | | examination | |
| | | • Complete work related documents | • Demonstration | • Observation | |
| | | • Read instructions on work related forms/documents | • Lecture | • Written examination | |
| | | • Practice:<br>  o Estimate, calculate and record routine workplace measures<br>  o Basic mathematical processes of addition, subtraction, division and multiplication | • Demonstration | • Observation | |
| | | • Demonstrate office activities in:<br>  o workplace meetings and discussions scenario | • Role play | • Oral evaluation<br>• Observation | |
| | | • Perform workplace duties scenario following simple written notices | • Role play | • Oral evaluation<br>• Observation | |
| | | • Follow simple spoken language | • Demonstration | • Observation | |
| | | • Identify the different Non-verbal communication | • Lecture | • Written examination | |
| | | • Demonstrate ability to relate to people of social range in the workplace | • Demonstration | • Observation | |
| | | • Gather and provide information in response to workplace requirements | • Demonstration | • Observation | |
| | 1.3 Participate in workplace meeting and discussion | • Identify:<br>  o types of workplace documents and forms<br>  o kinds of workplace report | • Lecture | • Written examination | |

| Unit of Competency | Learning Outcomes | Learning Activities | Methodology | Assessment Approach | Nominal Duration |
|---|---|---|---|---|---|
| | | o Available technology relevant to the enterprise and the individual's work responsibilities | | | |
| | | • Read and follow instructions in applying basic mathematical concepts | | | |
| | | • Follow simple spoken language | • Demonstration | • Observation | |
| | | • Demonstrate ability to relate to people of social range in the workplace | • Demonstration | • Observation | |
| | | • Gather and provide information in response to workplace requirements | | | |
| 2. Work in a team environment | 2.1 Describe and identify team role and responsibility in a team. | • Describe the team role and scope | • Group discussion | • Oral evaluation | 4 Hours |
| | | • Read<br>o Definition of Team<br>o Difference between team and group | • Lecture | • Written examination | |
| | | o Objectives and goals of team<br>• Identify different sources of information | • Lecture | • Written examination | |
| | 2.2 Describe work as a team | • Describe team goals and objectives | • Group discussion | • Oral evaluation | |
| | | • Perform exercises in setting team goals and expectations scenario | • Role play | • Oral evaluation<br>• Observation | |
| | | • Identify:<br>o individual role and responsibility | • Lecture | • Written examination | |
| | | • Practice Interacting effectively with others | • Group discussion | • Oral evaluation | |

| Unit of Competency | Learning Outcomes | Learning Activities | Methodology | Assessment Approach | Nominal Duration |
|---|---|---|---|---|---|
| | | • Read:<br>  o Fundamental rights at work including gender sensitivity<br>  o Understanding individual competencies relative to teamwork<br>  o Types of individuals<br>  o Role of leaders | • Lecture | • Written examination | |
| 3. Practice career professionalism | 3.1 Integrate personal objectives with organizational goals | • Describe performance evaluation | • Group discussion | • Oral evaluation | 4 Hours |
| | | • Read:<br>  o Work values and ethics (Code of Conduct, Code of Ethics, etc.)<br>  o Understanding personal objectives<br>  o Understanding organizational goals | • Lecture | • Written examination | |
| | | • Demonstrate Intra and Interpersonal skills at work | • Demonstration | • Observation | |
| | | • Demonstrate personal commitment in work | | | |
| | 3.2 Set and meet work priorities | • Describe company policies, operations, procedures and standards | • Group discussion | • Oral evaluation | |
| | | • Read:<br>  o Time Management<br>  o Basic strategic planning concepts<br>  o Resource utilization and management | • Lecture | • Written examination | |
| | | • Apply managing goals and time | • Demonstration | • Observation | |

| Unit of Competency | Learning Outcomes | Learning Activities | Methodology | Assessment Approach | Nominal Duration |
|---|---|---|---|---|---|
| | | • Practice:<br>  o economic use of resources and facilities<br>  o time management | • Demonstration | • Observation | |
| | 3.3 Maintain professional growth and development | • Describe company recognition and incentives | • Group discussion | • Oral evaluation | |
| | | • Read:<br><br>  o Career development opportunities<br>  o Information on relevant licenses and or certifications<br>  o personal career development needs | • Lecture | • Written examination | |
| | | • Identify career opportunities | • Lecture | • Written examination | |
| | | • Determine personal career development needs | • Group discussion | • Oral evaluation | |
| 4. Practice occupational health and safety | 4.1 Identify hazard and risks | • Describe OHS procedures, practices and regulations | • Group discussion | • Oral evaluation | 4 Hours |
| | | • Read<br>  o OHS indicators<br>  o Organizational contingency practices<br>• Practice hazards/risks identification and control | • Lecture | • Written examination | |
| | 4.2 Evaluate hazard and risks | • Describe effects of safety hazards | • Group discussion | • Oral evaluation | |
| | | • Read<br>  o Threshold Limit Value –TLV | • Lecture | • Written examination | |
| | | • Practice reporting safety hazards | • Role play | • Observation | |
| | | • Demonstrate evaluating hazards and risks using communication equipment | • Demonstration | • Observation | |

| Unit of Competency | Learning Outcomes | Learning Activities | Methodology | Assessment Approach | Nominal Duration |
|---|---|---|---|---|---|
| | 4.3 Control hazards and risks | • Describe : <br>   o Organization safety and health protocol <br>   o Company emergency procedure practices | • Group discussion | • Oral evaluation | |
| | | • Practice personal hygiene | • Demonstration | • Observation | |
| | | • Practice drills on responding to emergency | • Demonstration <br> • Simulation | • Observation | |
| | 4.4 Maintain occupational health and safety awareness | • Identify emergency-related drills information | • Lecture | • Written examination | |
| | | • Practice occupational safety and health standards on personal records in the workplace | • Role play | • Observation | |
| | | • Practice emergency related drills in the workplace | • Demonstration <br> • Simulation | • Observation | |

# COMMON COMPETENCIES
(16 hours)

| Unit of Competency | Learning Outcomes | Learning Activities | Methodologies | Assessment Approach | Nominal Duration |
|---|---|---|---|---|---|
| 1. Use Hand Tools | 1.1 Plan and prepare for tasks to be undertaken | ▪ Plan and prepare for task/activity<br>▪ Identify different types and functions of hand tools<br>▪ Identify electronics hand tools and their uses<br>▪ Identify function, operation and common faults in electronics hand tools | ▪ Lecture / Demonstration<br>▪ Distance education<br>▪ Film Showing | ▪ Written/Oral examination<br>▪ Practical demonstration | ½ hour |
|  | 1.2 Prepare hand tools | ▪ Practice proper use of hand tools<br>▪ Practice checking and safety requirements in handling tools<br>▪ Apply standard procedures in checking, identification and marking of safe or unsafe/ faulty tools<br>▪ Perform marking of safe or unsafe/ faulty hand tools | ▪ Lecture / Demonstration<br>▪ Distance education<br>▪ Film Showing | ▪ Written/Oral examination<br>▪ Practical demonstration | ½ hour |
|  | 1.3 Use appropriate hand tools and test equipment. | ▪ Apply safety handling of hand tools and test equipment<br>▪ Identify/Select electronics hand tools for adjusting, dismantling, assembling, finishing, and cutting<br>▪ Use appropriate hand tools and test equipment for the job requirement<br>▪ Read and learn the -<br>  • Proper usage and care of hand tools<br>  • Types and uses of test equipment<br>▪ Identify common faults in the use of hand tools | ▪ Lecture / Demonstration<br>▪ Distance education<br>▪ Film Showing | ▪ Written/Oral examination<br>▪ Practical demonstration | ½ hours |
|  | 1.4 Maintain hand tools | ▪ Apply safety requirements in maintenance of hand tools<br>▪ Read and understand processes, operations & systems for:<br>  • Maintenance of tools<br>  • Storage of hand tools<br>▪ Apply 5S principles in maintenance of hand tools | ▪ Lecture / Demonstration<br>▪ Distance education<br>▪ Film Showing | ▪ Written/Oral examination<br>▪ Practical demonstration | ½ hours |

| Unit of Competency | Learning Outcomes | Learning Activities | Methodologies | Assessment Approach | Nominal Duration |
|---|---|---|---|---|---|
| 2. Apply Quality Standards | 2.1 Assess quality of received materials | ▪ Identify relevant production processes, materials and products<br>▪ Study and interpret characteristics of materials, software and hardware used in production processes<br>▪ Perform quality checking procedures<br>▪ Apply quality Workplace procedures<br>▪ Identify faulty materials<br>▪ Check quality of materials or component parts as per manufacturer's standards<br>▪ Interpret specifications or symbols | ▪ Field trip<br>▪ Symposium<br>▪ Video clips<br>▪ Simulation/ Role playing<br>▪ On the job training | ▪ Written test<br>▪ Demonstration & questioning<br>▪ Observation & questioning | 4 hours |
| | 2.2 Assess own work | ▪ Perform workplace procedure in documenting completed work<br>▪ Perform fault identification and reporting<br>▪ Observe safety and environmental aspects of production processes<br>▪ Utilize workplace quality indicators<br>▪ Document and report deviations from specified quality standards | ▪ Field trip<br>▪ Symposium<br>▪ Film showing<br>▪ Simulation<br>▪ On the job training | ▪ Demonstration & questioning<br>▪ Observation & questioning<br>▪ Third party report | 4 hours |
| | 2.3 Engage in quality improvement | ▪ Participate in quality improvement processes<br>   a. IEC/ISO standards<br>   b. Environmental and safety standards<br>▪ Carry out work as per process improvement procedures<br>▪ Monitor operation performance<br>▪ Implement continuous improvement | ▪ Field trip<br>▪ Symposium<br>▪ Film showing<br>▪ Simulation<br>▪ On the job training | ▪ Demonstration & questioning<br>▪ Observation & questioning<br>▪ Third party report | 4 hours |
| 3. Perform Computer Operation | 3.1 Plan and prepare for task to be undertaken | ▪ Plan and prepare computer operation activity<br>▪ Determine task requirements based on required output<br>▪ Determine appropriate hardware and software<br>▪ Identify/Select types of computers and basic features of different operating systems<br>▪ Interpret and follow client -specific guidelines and procedures | ▪ Modular<br>▪ Film showing<br>▪ Computer based training (e-learning)<br>▪ Project method<br>▪ On the job training | ▪ Demonstration & questioning<br>▪ Observation & questioning<br>▪ Third party report<br>▪ Computer- based assessment | ½ hours |

| Unit of Competency | Learning Outcomes | Learning Activities | Methodologies | Assessment Approach | Nominal Duration |
|---|---|---|---|---|---|
| | | ▪ Plan task as per data security guidelines | | | |
| | 3.2 Input data into computer | ▪ Apply basic ergonomics of keyboard and computer user<br>▪ Enter/Encode data using appropriate computer programs/applications<br>▪ Check accuracy of encoded data/information per SOP<br>▪ Save and store inputted data in storage media<br>▪ Storage devices and basic categories of memory<br>Identify and define relevant types of software | ▪ Modular<br>▪ Film showing<br>▪ Computer based training (e-learning)<br>▪ Project method<br>▪ On the job training | ▪ Demonstration & questioning<br>▪ Observation & questioning<br>▪ Assessment of output product<br>▪ Computer- based assessment | |
| | 3.3 Access information using computer | ▪ Select correct program/ application based on job requirements<br>▪ Access computer data/files<br>▪ Interpret general security, privacy legislation and copyright<br>▪ Use Productivity Application<br>  ▪ Microsoft office applications<br>▪ Learn Business Application<br>  ▪ Introduction to Basic Programming software<br>▪ Apply basic ergonomics of keyboard and computer user | ▪ Modular<br>▪ Film showing<br>▪ Computer based training (e-learning)<br>▪ Project method<br>▪ On the job training | ▪ Demonstration & questioning<br>▪ Observation & questioning<br>▪ Third party report<br>▪ Assessment of output product<br>▪ Computer- based assessment | ½ hour |
| | 3.4 Produce/ output data using computer system | ▪ Identify types and function of computer peripheral devices<br>▪ Print and scan office documents and materials<br>▪ Send office/ business documents through facsimile<br>▪ Transfer files or data between compatible systems using computer software, hardware/ peripheral devices<br>▪ Save documents in storage devices<br>  a. CD/DVD<br>  b. USB drives<br>  c. Hard disk drives | ▪ Modular<br>▪ Film showing<br>▪ Computer based training (e-learning)<br>▪ Project method<br>▪ On the job training | ▪ Demonstration & questioning<br>▪ Observation & questioning<br>▪ Third party report<br>▪ Assessment of output product<br>▪ Portfolio<br>▪ Computer- based assessment | ½ hour |

| Unit of Competency | Learning Outcomes | Learning Activities | Methodologies | Assessment Approach | Nominal Duration |
|---|---|---|---|---|---|
| | 3.5 Maintain computer equipment and systems | ▪ Perform computer equipment/ system basic maintenance procedures<br>  a. Perform basic file maintenance procedures<br>  b. Perform cleaning of PC parts/ hardware components<br>  c. Scan/Debug computer software and applications<br>  d. Perform cleaning and defragmentation of computer files<br>  e. Perform backup of computer files<br>▪ Enumerate and define different types of computer viruses | ▪ Modular<br>▪ Film showing<br>▪ Computer based training (e-learning)<br>▪ Project method<br>▪ On the job training | ▪ Demonstration & questioning<br>▪ Third party report<br>▪ Assessment of output product<br>▪ Portfolio | ½ hour |

## CORE COMPETENCIES
### (48 hours)

| Unit of Competency | Learning Outcomes | Learning Activities | Methodologies | Assessment Approach | Nominal Duration |
|---|---|---|---|---|---|
| 1. Set up back-end operations workplace for electronics production line | | | | | **8 hrs** |
| | 1.1 Gather production tools and materials for electronics back-end processes | • Identify/determine electronics back-end manufacturing systems and processes<br>• Read and understand purpose and background of setup back-end operation workplace for electronics production line<br>• Identify and gather required materials, tools and equipment<br>• Practice/Apply proper handling of materials, tools and equipment<br>• Identify and check required documents<br>• Read and understand:<br>  • 5S principles<br>  • Occupational Health and Safety (OHS)<br>  • Material Safety Data Sheet (MSDS)<br>  • Personal Protective Equipment (PPE)<br>  • Electro Static Discharge (ESD)<br>  • Environmental Health Systems (EHS)<br>  • IPC standards<br>  • Quality Management System (QMS)<br>  • Environmental Management System | • Lecture<br>• Viewing multimedia<br>• Demonstration | • Written exam<br>• Practical exam<br>• Oral questioning | 2 hrs |
| | 1.2 Set up electronics back-end machine parameters and peripherals | • Practice walk-around check or visual inspection of back-end machine<br>• Learn and practice procedures in setting up of electronics back-end machine parameters and peripherals<br>• Learn/Apply safety measures in machine operations | • Lecture<br>• Discussion<br>• Demonstration<br>• Viewing multimedia | • Written exam<br>• Practical exam<br>• Oral questioning | 2 hrs |

| Unit of Competency | Learning Outcomes | Learning Activities | Methodologies | Assessment Approach | Nominal Duration |
|---|---|---|---|---|---|
| | | • Read and record different gauges<br>• Perform required basic operation of equipment/ machine<br>• Learn and determine applicable out-of-control action plan(OCAP)<br>• Use appropriate tools | | | |
| | 1.3 Accomplish electronics production line back-end checklist | • Study the types of production line documents/ checklists<br>• Identify and accomplish required documents/ checklists<br>• implement work turnover procedure | • Lecture<br>• Discussion | • Practical exam<br>• Oral questioning | 2 hrs |
| | 1.4 Perform daily maintenance activity | • Identify and check electronics back-end machine basic physical condition<br>• Perform daily PM activity based on checklist<br>• Identify applicable out-of-control action plan(OCAP)<br>• Apply 5S principles/ housekeeping procedures | • Lecture<br>• Discussion<br>• Demonstration | • Practical exam<br>• Interview | 2 hrs |
| 2. Analyze, carry-out and monitor back-end operations for electronics production line | | | | | **24 hrs** |
| | 2.1 Initialize/Operate electronics back-end machine/ equipment | • Learn and apply safety requirements in the operation manual<br>• Identify and use appropriate PPE and ESD apparels<br>• Use appropriate tools<br>• Learn basic electronics back-end processes<br>• Identify types of electronics back-end sample units<br>• Learn and determine product orientation<br>• Perform procedure in processing sample units<br>• Perform manual electronics back-end process<br>• Identify electronics back-end equipment troubles/ problems<br>• Determine machines alarms/errors | • Lecture<br>• Discussion<br>• Hands-on<br>• Viewing multimedia | • Written exam<br>• Practical exam | 16 hrs |

| Unit of Competency | Learning Outcomes | Learning Activities | Methodologies | Assessment Approach | Nominal Duration |
|---|---|---|---|---|---|
| | | • Study and determine applicable out-of-control action plan(OCAP)<br>• Observe and determine visual/mechanical criteria<br>• Accomplish production line documents<br>• Apply electronics back-end machine safety features and guidelines<br>• Read and understand:<br>  • 5S principles<br>  • Occupational Health and Safety (OHS)<br>  • Material Safety Data Sheet (MSDS)<br>  • Personal Protective Equipment (PPE)<br>  • Electro Static Discharge (ESD)<br>  • Environmental Health Systems (EHS)<br>  • IPC standards<br>  • Quality Management System (QMS)<br>  • Environmental Management System | | | |
| | 2.2 Run electronics back-end sample units | • Identify usage and types of electronics back-end sample units according to product criteria<br>• Study and learn product orientation<br>• Learn usage of appropriate PPE and ESD apparels<br>• Use appropriate tools<br>• Perform/Practice procedure in loading and processing electronics back-end sample units<br>• Practice manual electronics back-end process based on instruction and company procedures<br>• Learn and identify machines alarms/errors<br>• Determine applicable out-of-control action plan(OCAP) for electronics back-end<br>• Perform visual/ mechanical inspection<br>• Accomplish production line documents | • Lecture<br>• Discussion<br>• Hands-on<br>• Viewing multimedia | • Written exam<br>• Practical exam | 4 hrs |

| Unit of Competency | Learning Outcomes | Learning Activities | Methodologies | Assessment Approach | Nominal Duration |
|---|---|---|---|---|---|
| | 2.3 Load electronics back-end production units | • Identify/Determine electronics back-end operations process controls<br>• Study and learn product orientation and specifications<br>• Identify usage of appropriate PPE and ESD apparels<br>• Use appropriate tools<br>• Perform procedures in loading and processing production units based on product orientation and specifications<br>• Check production output based on product criteria<br>• Practice manual electronics back-end process based on instruction and company procedures<br>• Determine machines alarms/errors<br>• Determine applicable out-of-control action plan(OCAP) on electronics back-end operations<br>• Verify product criteria<br>• Perform visual/ mechanical inspection<br>• Accomplish electronics back-end production line documents | • Lecture<br>• Discussion<br>• Hands-on<br>• Viewing multimedia | • Written exam<br>• Practical exam | 4 hrs |
| 3. Check quality compliance of back-end operation for electronics production line | | | | | **16 hrs** |
| | 3.1 Monitor electronics back-end operation | • Check output and yield requirements<br>• Determine machine capacity<br>• Learn and apply Basic Statistical Process Control (SPC) rules / applicable out-of-control action plan(OCAP)<br>• Verify product criteria<br>• Perform visual/ mechanical inspection<br>• Determine abnormality or non-conformance or deviation to the process<br>• Accomplish required production forms<br>• Check completeness and accuracy of information on electronics back-end production form for unusual machine operation | • Lecture<br>• Discussion<br>• Hands-on | • Written exam<br>• Oral questioning | 4 hrs |

| Unit of Competency | Learning Outcomes | Learning Activities | Methodologies | Assessment Approach | Nominal Duration |
|---|---|---|---|---|---|
| | | | | | |
| | 3.2 Perform visual inspection | • Use inspection tools<br>• Identify types of electronics back-end product defects/ reworks<br>• Apply finished products judgment criteria on electronics production line back-end processes<br>• Check/Inspect finished products using appropriate instruments/tools<br>• Identify conforming and non- conforming products<br>• Perform procedures on identification and segregation of non-conforming products in electronics production line back-end operations<br>• Apply 5S principles / housekeeping procedures | • Lecture<br>• Discussion<br>• Hands-on | • Written exam<br>• Practical exam<br>• Oral questioning | 10 hrs |
| | 3.3 Complete electronics production line back-end lot traceability | • Perform lot traceability transaction<br>  ○ Lot accounting steps<br>• Accomplish production forms and documents<br>• Identify and segregate conforming and non-conforming products<br>• Learn and apply process controls on lots transaction | • Lecture<br>• Discussion<br>• Hands-on | • Written exam<br>• Practical exam<br>• Oral questioning | 2 hrs |

## 3.1 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 modality and its variations/components may be adopted singly or in combination with other modalities when designing and delivering training programs:

    ### 2.1. Enterprise-Based:

    *   **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

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### 3.4 LIST OF TOOLS, EQUIPMENT AND MATERIALS

**3.4.1** Recommended list of tools, equipment and materials for the training of 25 trainees for Electronics Back-end Operations NC II:

| TOOLS | | EQUIPMENT | | MATERIAL | |
|---|---|---|---|---|---|
| Qty. | Description | Qty. | Description | Qty. | Description |
| 25 pcs<br><br>5 pcs<br>5 sets<br>25 pcs<br><br>5 pcs | • Tweezers, Stainless<br>• Vacuum Pen<br>• Metric Allen Keys<br>• 12 Digit Calculator<br>• Torque driver, 3-RTD | As required*<br><br><br><br><br><br><br><br><br><br><br><br>5 sets<br><br>2 pcs.<br>1 unit<br>1 unit | Electronics back-end machines:<br>• Singulation- Auto/ Manual<br>• Manual Insertion<br>• Solder Wave<br>• Encapsulation/ Case Mounting<br>• Baking<br>• Test System<br>• Test Handler<br>• Marking<br>• Packaging<br><br>Work tables with chairs<br>White board<br>LCD projector<br>Desktop PC/Laptop | 25 sets<br><br><br><br><br><br><br><br><br><br><br>25 pairs<br>25 pairs<br>25 pcs | Appropriate materials for training purposes: ESD Apparel<br>• Shoes<br>• Smock and Head cap<br>• ESD Jacket<br>• Bunny suit<br>• Face mask<br>• Wrist /Foot ground strap<br><br>Safety shoes<br>Gloves<br>Safety goggles |

### 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

**Electronics Back-end Operations NC II**

- Must be a holder of **Electronics Back-end Operations NC II**
- Must have a TESDA Trainer's Methodology Course certificate or must have passed the Train the Trainers certification process (internal process)
- Must be at least two-year college level or two-year vocational course graduate.
- Must have at least 2-years relevant industry experience in the current field.

## 3.7    INSTITUTIONAL ASSESSMENT

Institutional assessment is undertaken by trainees to determine their achievement of the requirements of the 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. As a matter of policy, graduates of programs registered with TESDA under this training regulation are required to undergo mandatory national competency assessment upon completion of the program.

# 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 either **Electronics Back-end Operations NC II**, the candidate must demonstrate in the appropriate 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 **Electronics Back-end Operations NC II** can be attained through demonstration of competence through project-type assessment covering all the units required in the qualification.

4.1.3. Assessment shall focus on the core units of competency. The basic and common units shall be integrated or assessed concurrently with the core units.

4.1.4. The following are qualified to apply for assessment and certification:

   a. Graduate of formal, non-formal, and informal including enterprise-based education/training programs/courses.
   b. Experienced workers (wage employed or self-employed)

4.1.5. The guidelines on *assessment* and certification are discussed in detail in the "Procedures Manual on Assessment and Certification" and "Guidelines on the Implementation of the Philippine TVET Competency Assessment and Certification System (PTCACS)".

## 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 assessment

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.

**DEFINITION 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**

1) **Cleanroom** or **clean room** is an environment, typically used in manufacturing or scientific research, with a low level of environmental pollutants such as dust, airborne microbes, aerosol particles, and chemical vapors. More accurately, a cleanroom has a **controlled** level of contamination that is specified by the number of particles per cubic meter at a specified particle size.

2) **Electronic manufacturing services** (**EMS**) is a term used for companies that design, test, manufacture, distribute, and provide return/repair services for electronic components and assemblies for original equipment manufacturers (OEMs). The concept is also referred to as electronic contract manufacturing (ECM).

3) **Electrostatic discharge (ESD)** is a swift discharge of electric current between two objects with different charges and different numbers of electrons. This exchange of electrons creates a large electromagnetic field buildup, resulting in ESD. Certain electronic devices are vulnerable to low-voltage ESD. For example, a hard drive is susceptible to just 10 volts. Integrated circuits (IC) are also prone to ESD and may be permanently damaged by high-voltage currents.

4) **Front-end-of-line** (**FEOL**) is the first portion of IC fabrication where the individual devices (transistors, capacitors, resistors, etc.) are patterned in the semiconductor. FEOL generally covers everything up to (but not including) the depositions of metal interconnect layers.

5) **Hard disk drive** (**HDD**) is a data storage device used for storing and retrieving digital information using rapidly rotating disks (platters) coated with magnetic material. An HDD retains its data even when powered off. Data is read in a random-access manner, meaning individual blocks of data can be stored or retrieved in any order rather than sequentially. An HDD consists of one or more rigid ("hard") rapidly rotating disks (platters) with magnetic heads arranged on a moving actuator arm to read and write data to the surfaces.

6) A **head-gimbal assembly** of a hard disk drive includes a load beam connected to a pivot arm, a slider on which a magnetic head is mounted, an elastic support member having one end coupled to the load beam and the other free end portion at which the slider is supported, and a damper provided between the load beam and the slider to attenuate vibration transferred between the load beam and the slider.

7) **IPC**, the **Association Connecting Electronics Industries**, is a trade association whose aim is to standardize the assembly and production requirements of electronic equipment and assemblies. IPC is accredited by the American National Standards Institute (ANSI) as a standards developing organization and is known globally for its standards. It publishes the most widely used acceptability standards in the electronics industry.

8) In manufacturing, **lot traceability** is readily-available access to the complete history of all manufactured **lots**, batches and serialized units, spanning production in multiple plants.

9) **MSDS** (an acronym for Material Safety Data Sheet) - is an important component of product stewardship and occupational safety and health. It is intended to provide workers and emergency personnel with procedures for handling or working with that substance in a safe manner, and includes information such as physical data (melting point, point, flash, etc.), toxicity, health effects, first aid, reactivity, storage, disposal, protective equipment, and spill-handling procedures. It is a written document that outlines information and procedures for handling and working with chemicals. Current MSDS documents contain physical and chemical property information, potential hazard information, emergency procedures, and manufacturer contact information. MSDS formats can vary from source to source within a country depending on national requirements.

10) **Out-of-control action plan (OCAP) -** is a flowchart that guides employees' reactions to out-of-control situations. It consists of activators (which define out-of-control conditions); checkpoints (which are likely causes for the conditions); and terminators (which contain the action that should resolve the conditions). OCAPs are dynamic. For example, Pareto analyses of OCAPs can identify commonly used terminators and suggests methods to eliminate frequent causes of problems or to modify the OCAPs that react to common out-of-control situations. Benefits of OCAPs include the empowerment given to the operators to troubleshoot problems. Other benefits are increased process efficiency and standardization of problem solving techniques.

11) **Personal Protective Equipment (PPE)** - specialized clothing or equipment worn by employees for protection against health and safety hazards. Personal protective equipment is designed to protect many parts of the body, i.e., eyes, head, face, hands, feet, and ears.

12) **Production line -** is a set of sequential operations established in a manufacturing establishment whereby materials are put through a process to produce an end-product. The machines and peripheral equipment are in the order they are used. The process is not stopped and restarted for each new product as the line is dedicated to producing a single or small group of products.

13) **Quality management system** (**QMS**) - is a collection of business processes focused on achieving your quality policy and quality objectives — i.e. what your customer wants and needs. It is expressed as the organizational structure, policies, procedures, processes and resources needed to implement quality management.

14) **Statistical process control** (**SPC**) - is a method of quality control which uses statistical methods. SPC is applied in order to monitor and control a process. Monitoring and controlling the process ensures that it operates at its full potential.

# ANNEX A - COMPETENCY MAP
## Electronics Back-end Operations NC II

## 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 & 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 Devices | Configure & Test Mechatronics Devices | Maintain and Repair Mechatronics Devices |
| Develop Mechatronics Control Circuits & Software Application Programs | Commission Mechatronics Systems | Diagnose and Troubleshoot Mechatronics Systems | 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 |
| **Set up Back-end Operations Workplace for Electronics Production Line** | **Analyze, Carry-out and Monitor Back-end Operations for Electronics Production Line** | Set up Back-end Operations Workplace for Semiconductor Production Line | Perform Back-end Operations for Semiconductor Production Line | Check quality compliance of back-end operations for Semiconductors production line |
| **Check quality compliance of back-end operations for electronics production line** | Set up Front-of-Line (FOL) Operations Workplace for Electronics Production Line | Set up Front-of-Line (FOL) Operations Workplace for Semiconductor Production Line | Perform Front-of-Line (FOL) Operations for Semiconductor Production Line | Check quality compliance of Front-of-Line (FOL) operations for Semiconductors production line |
| Perform Front-of-Line (FOL) Operations for Electronics Production Line | Check quality compliance of Front-of-Line (FOL) operations for electronics production line | Set up Back-end Operations Workplace for HDD Production Line | Perform Back-end Operations for Hard Disk Drives (HDD) Production Line | Check quality compliance of back-end operations for HDD production line |
| | | Set up Front-of-Line (FOL) Operations Workplace for HDD Production Line | Perform Front-of-Line (FOL) Operations for HDD Production Line | Check quality compliance of Front-of-Line (FOL) operations for HDD production line |

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