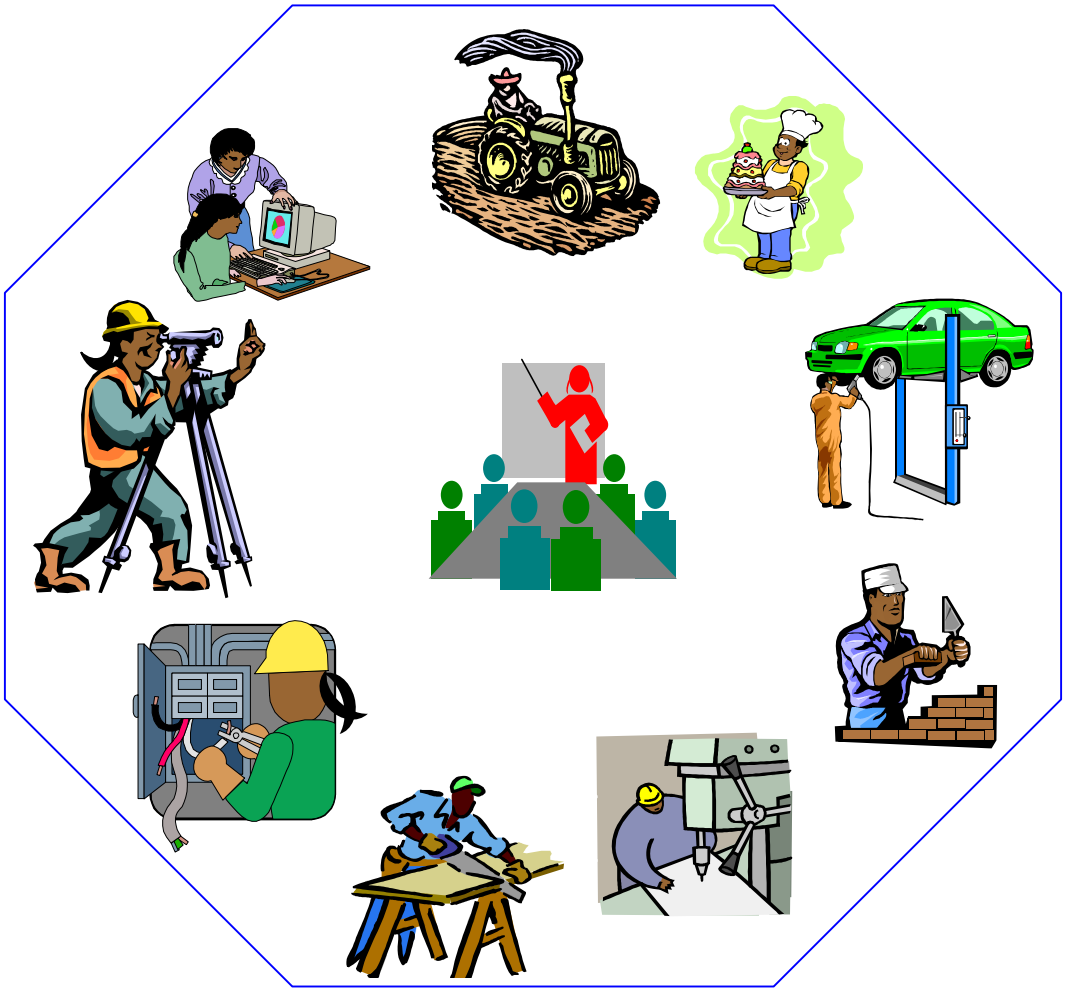
Federal Democratic Republic of Ethiopia

OCCUPATIONAL STANDARD

BASIC BIOMEDICAL EQUIPMENT SERVICING

NTQF Level II



Ministry of Education

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Introduction

Ethiopia has embarked on a process of reforming its TVET-System. Within the policies and strategies of the Ethiopian Government, technology transformation – by using international standards and international best practices as the basis, and, adopting, adapting and verifying them in the Ethiopian context – is a pivotal element. TVET is given an important role with regard to technology transfer. The new paradigm in the outcome-based TVET system is the orientation at the current and anticipated future demand of the economy and the labor market.

The Ethiopia Occupational Standards (EOS) is the core element of the Ethiopian National TVET-Strategy and an important factor within the context of the National TVET Qualification Framework (NTQF).They are national Ethiopia standards, which define the occupational requirements and expected outcome related to a specific occupation without taking TVET delivery into account.

This document details the mandatory format, sequencing, wording and layout for the Ethiopia Occupational Standard which comprised of Units of Competence.

A Unit of Competence describes a distinct work activity. It is documented in a standard format that comprises:

- Occupational title, NTQF level
- Unit code
- Unit title
- Unit descriptor
- Elements and Performance criteria
- Variables and Range statement
- Evidence guide

Together all the parts of a Unit of Competence guide the assessor in determining whether the candidate is competent.

The ensuing sections of this EOS document comprise a description of the occupation with all the key components of a Unit of Competence:

- chart with an overview of all Units of Competence for the respective level including the Unit Codes and the Unit Titles
- contents of each Unit of Competence (competence standard)
- occupational map providing the technical and vocational education and training (TVET) providers with information and important requirements to consider when designing training programs for this standards and for the individual, a career path

UNIT OF COMPETENCE CHART

Occupational Standard: Basic Biomedical Equipment Servicing

Occupational Code: EEL BES

NTQF Level II

EEL BES2 01 0511 Install Simple Biomedical Equipment	EEL BES2 02 0511 Maintain and Repair Simple Biomedical Equipment	EEL BES2 03 0511 Maintain and Repair Basic Electrical Machines and Drives
EEL BES2 04 0511 Demonstrate Human Anatomy and Physiology	EEL BES2 05 0511 Dismantle and Dispose Simple Biomedical Equipment	EEL BES2 06 0511 Maintain and Repair Biomedical Equipment Instrumentation System
EEL BES2 07 0511 Interpret Biomedical Signals	EEL BES2 08 0511 Participate in Workplace Communication	EEL BES2 09 0511 Work in Team Environment
EEL BES2 10 0511 Develop Business Practice	EEL BES2 11 0511 Maintain an Effective Relationship with Client/Customers	EEL BES2 12 1012 Apply Continuous Improvement Processes (Kaizen)

TOP

Occupational Standard: Basic Biomedical Equipment Servicing Level II	
Unit Title	**Install Simple Biomedical Equipment**
Unit Code	**EEL BES2 01 0511**
Unit Descriptor	This unit covers the knowledge, skills and attitudes necessary to install biomedical equipment.

Elements	Performance Criteria
1. Interpret work instructions	1.1 Work instructions are read and interpreted to determine job requirements 1.2 ***Tools*** and ***testing devices*** needed to carry out the installation work are selected in accordance with established procedures and checked for correct operation and safety 1.3 ***Materials*** necessary to complete the work are obtained in accordance with job requirements
2. Install simple biomedical equipment and accessories	2.1 ***Equipment*** and components are prepared for correct sequential installation 2.2 ***OSH policies*** **and** ***procedures*** for installation are followed according to manufacturer's specifications 2.3 ***PPE*** is used according to company requirements 2.4 Electrical cabling and wiring devices of correct loading capacity are selected and safely installed according to National Electrical Code 2.5 Equipment is installed in accordance with manufacturer's instructions, requirements, and without damage to self and others or surrounding place or environment 2.6 ***Unplanned events*** or conditions are responded to in accordance with established institutional procedures
3. Test installed equipment and accessories	3.1 Equipment is tested in accordance with manufacturer's instructions 3.2 Final inspections are undertaken to ensure that the installed device conforms with manufacturer's instructions. 3.3 ***Work site*** is cleaned and cleared of all debris and left safe in accordance with the institution's requirements. 3.4 Report on installation and testing of equipment is prepared and submitted according to institution's procedures. 3.5 Endorse equipment to appropriate end user according to

	institution's requirements

Variable	Range
Tools	Includes but is not limited to: • cutting, shaping, drilling, threading, tapping, finishing, dismantling/assembling tools • pliers (assorted) • screwdrivers (assorted) • soldering gun/iron • electric drill and assorted bits • Wrench and spanners (spanners) • Staple gun
Test devices	Include but are not limited to: • Multi-meter • Signal generator • Oscilloscope • Calibrators • Gauges (assorted) • Frequency Counter
Materials	Include but are not limited to: • Insulation Tape (assorted) • Sealing materials • Cables • Wires • Soldering Lead • Wire tie
Equipment	Include but not limited to: • weighing scale (infant/adult) • clinical weighing scale • gooseneck lamp/examining light • oxygen gauge • sphygmomanometer • nebulizer • rotator/shaker • electro muscular stimulator • spectrophotometer • uninterruptible power supply • bag valve mask (child and Adult)

	• suction apparatus • autoclave • OR/DR light • OR table • Cold chain Equipments • Laryngoscope • Water Bath • BP Apparatus • Clinical oven • Centrifuge • Incubator • Microscope • Water Distiller
Personal protection equipment	• Industrial Mask • Safety goggles • Coveralls • Disinfectant • Mouth cover • Gloves • Shoe cover • Lead apron
OSH policies and procedures	• Ethiopia Electrical Code • OSH guidelines • Environmental protection legislation and regulations
Unplanned events or conditions	Include but are not limited to: • Fire and Flood • Earthquake • Alert levels • Electrical shock • Power interruption • Power overload
Worksite	Include but not limited to: • Laboratory • Clinics • Operating room/Delivery room • Wards/Units/Emergency room

Evidence Guide	
Critical aspects of competence	Assessment requires evidence that the candidate: • Interpreted work instructions according to job requirements. • Appropriately selected electrical cabling and wiring devices used • Installed equipment in accordance with manufacturer's instructions. • Tested installed equipment according to manufacturer's instructions
Underpinning knowledge and attitudes	• Occupational safety and health guidelines • Specifications and proper use of tools • General concepts and principles in electronics and electricity ➢ AC/DC power supplies ➢ Operational amplifiers ➢ Digital electronics ➢ Wiring techniques

	• Use of test equipment and/ or instruments • Clinical application of equipment/instruments/tools • Drawing interpretation • Soldering Knowledge • Knowledge in computer
Underpinning skills	• interpret work instructions, diagrams, schematics • interpret/ demonstrate work procedures • Problem solving in emergency situation(s) • Soldering skills • Troubleshooting • Courtesy and helping attitude • Use of computer
Resources Implication	Access to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace and OHS practices.
Resources Implication	• access to relevant workplace or appropriately simulated environment where assessment can take place • materials relevant to the proposed activity or task
Assessment Methods	Competence may be assessed through: • Interview / Oral questioning / Written Test • Observation/Demonstration
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting

TOP

Occupational Standard: Basic Biomedical Equipment Servicing Level II	
Unit Title	**Maintain and repair simple biomedical equipment**
Unit Code	**EEL BES2 02 0511**
Unit Descriptor	This unit covers the knowledge, skills and attitudes necessary in conducting maintenance and repair.

Elements	Performance Criteria
1 Prepares maintenance protocol and Respond to client/customer service request	1.1 Covered ***biomedical equipment and accessories*** are identified 1.2 Appropriate ***request*** form is received in accordance with institution protocols 1.3 Update basic biomedical equipment inventory on the covered BBE is secured and used as reference for preventive maintenance preparation 1.4 Repair history and equipment consumables are verified in line with the institution's procedure 1.5 Appropriate checklist forms tools, test equipment, calibrating tools, fast moving consumables and personal protective equipment are secured in line with job requirements 1.6 Prompt service is conducted on-site or in the workshop
2 Implements preliminary preventive maintenance protocol	2.1 Preventive maintenance program is properly communicated with the ***appropriate staff*** 2.2 Immediate surroundings of covered BBE are secured from ***unnecessary hazards*** 2.3 Performed basic biomedical equipment ocular inspection in accordance with institution's procedure 2.4 Cleaned and sanitized BBE in accordance with manufacturer standard and/or institution's procedure
3 Prepare the unit/equipment	3.1 Complete assembly check-up and fault symptoms are conducted, identified, and verified against client description and properly documented 3.2 Repair history is verified in line with the institution procedures 3.3 ***Service manuals and service information*** required for the corrective maintenance are made available at the beginning of the corrective maintenance activities 3.4 Workplace is cleaned in accordance with the institution

		procedure
4	Perform electrical safety testing	4.1 Set-up appropriate test equipment and Systematic pre-testing procedure in accordance with equipment manufacturer standards and established occupational health and safety practices 4.2 Line voltage, ground resistance and current leakage of the covered BBE are measured in accordance with manufacturer standards and in strict observance of the established occupational health and safety practices 4.3 Electrical safety test results with equipment manufacturer's safety standards are analyzed 4.4 Electrical faults are corrected in accordance with equipment manufacture standards
5	Diagnose faults	5.1 System detect is identified using appropriate tools and test equipment and in accordance with organizational policies and procedures 5.2 Accurate diagnosis is completed within the specified timeframe 5.3 Diagnosis and findings of Basic Biomedical Equipment failures or technical problems are completely and accurately documented in accordance with institution standard. 5.4 Fault/s, defects and range of the problems are properly and courteously explained to the client in accordance with institution policy
6	Repair biomedical equipment and Perform functional test	6.1 Safety equipment is used to protect self and others in accordance with Established Occupational Health and Safety Practices 6.2 Defective spare parts/components are replaced with equivalent and/or better performing spare parts/components 6.3 Repair and/or replaced parts/components are soldered in accordance to current best industry practice 6.4 Necessary circuit adjustment, re-calibration and testing procedure is done and in conformance with equipment manufacturer specification standards 6.5 Necessary modification, conversion of parts and/or circuits is applied in accordance with industry best practice and equipment manufacturer specifications 6.6 Spare parts substitution is in accordance with the manufacturer's specification or equivalent 6.7 Corrective maintenance activity is accomplished within the

		required time frame 6.8 Care and extreme precaution in handling the unit is observed 6.9 Equipment set-up and start-up operation is performed in accordance with equipment manufacturer specifications 6.10 Equipment controls are set in accordance with manufacture's functional test standard 6.11 Controls and start up signals are checked in accordance with manufacturer standard operating procedure and safety regulations 6.12 BBE operation protocols are simulated in accordance with manufacturer standard 6.13 Equipment lubrication is done in accordance with manufacturer standards 6.14 Accessories of the covered BBE are inspected and set-up in accordance with institution and equipment manufacturer specification respectively 6.15 Appropriate equipment consumables are replaced in accordance with manufacturer specifications 6.16 Functional test is completed within the specified time as provided in the institution BBE preventive maintenance procedures and guidelines
7	Check and calibrate basic biomedical equipment (BBE)	7.1 Appropriate calibration procedures and parameters are determined in accordance with equipment manufacturer standards and/or institution's guidelines 7.2 Calibration equipment is set-up in accordance with manufacturer standard and occupational and health safety procedures 7.3 BBE operation is simulated in accordance with equipment manufacturer standards 7.4 Calibration controls are crossed check and verified in accordance with manufacturer specifications 7.5 Necessary adjustments are made in accordance with equipment manufacturer instruction. 7.6 Covered BBE is subjected to final test in accordance with institution guidelines and procedures. 7.7 Performance and functional test is conducted immediately after re-assembly 7.8 Equipment status and performance is checked and ensured conformance with equipment manufacturer standard and other health safety regulations

		7.9 Complete and accurate documentation is prepared. 7.10 Tools and test instrument are cleaned and cared as per organizational procedure 7.11 Waste materials are disposed in accordance with hospital waste management and other environmental requirements
8	Re-commission BBE	8.1 Reassembled BBE are subjected to final testing in accordance with institution standard 8.2 BBE and its immediate surrounding are cleaned in accordance with institution policy 8.3 Communicated with appropriate staff that preventive maintenance procedure is done and brief's the same on equipment status as per institution standard 8.4 Basic biomedical equipment and its immediate surrounding are cleaned in accordance with institution policy 8.5 Appropriate staff is communicated on the status of the equipment as per institution standards
9	Document preventive and corrective maintenance activities	9.1 Basic biomedical equipment checklist forms and other preventive and corrective maintenance documents are accomplished in strict observance of institution standards 9.2 Reports are submitted to proper officer/office in accordance with institution policy 9.3 Preventive maintenance documents are systematically kept and updated as per institution standards 9.4 Health care equipment corrective maintenance form and other relevant reports are accomplished in strict observance of institution standards 9.5 Reports are submitted to proper officer/offices in accordance with institution policy 9.6 Corrective Maintenance documents are systematically kept and updated as per institution standards

Variable	**Range**
request	Proper service request form • Formal service request letter • Verbal service request (actual or phone) • Electronic communication

	equipment
Biomedical equipment	• Weighing scale (Infant/digital) • Clinical weighing scale • Gooseneck lamp/ Examining light • Oxygen gauge • Sphygmomanometer • Suction apparatus • Autoclave • OR/DR light • OR table • Nebulizer • Rotator/Shaker • Electro muscular stimulator • Spectrophotometer • Uninterrupted power supply • Bag valve mask (Pedia and Adult) • Anesthesia bag • Clinical oven
Checklist form	Covered equipment P.M. checklist form
Tools, test equipment and calibrating tool	Includes but not limited to: • Screwdrivers (assorted) • Soldering iron/gun • De-soldering tool • Wrenches (assorted) • Pliers (assorted) • Cleaning Brush • Thermometer (digital & mercurial) • Electrical Safety Analyzer • Multi-tester (analog/digital) • Utility knife • Alignment tool
Service manuals and information	• Operation's Manuals • Service/Technical Manual • Installation Manual • Parts List Manual • Job Report Sheets • Job Request/Order • Equipment History Card • Supplier Index
Fast moving consumables	• Oil, cleaning agents • Fuses (assorted) • Contact cleaner • Soldering lead • Tape (assorted) • Filters (assorted) • Sealing materials • Screws (assorted) • Wire tie
Appropriate staff	• End-user • Immediate supervisor • Managers
Personal Protective Equipment	• Working clothes • Hand Gloves • Goggles • Mask

	• Shoe cover
Unnecessary hazards	• People • Wet floors • Open electrical wiring • Location

Evidence Guide	
Critical aspects of Competence	Assessment requires evidence that the candidate: • Interpreted work instructions according to job requirements. • Appropriately selected electrical cabling and wiring devices used. • Installed equipment in accordance with manufacturer's instructions. • Tested installed equipment according to manufacturer's instructions
Underpinning knowledge and attitudes	• Occupational safety and health guidelines • Specification and proper use of tools • General concepts and principles of in electronics and electricity ➢ AC/DC power supplies ➢ Operational amplifiers ➢ Digital electronics ➢ Wiring techniques • Use of test equipment/instruments • Clinical application of equipment/instruments/tools • Drawing interpretation • Electronic hand soldering
Underpinning skills	• Reading skills required to interpret work instructions, diagrams, schematics • Communication skills needed to interpret and define and explain work procedures • Problem solving in emergency situation • Soldering skills • Troubleshooting • Courtesy and helping attitude
Resources Implication	Access to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace and OHS practices.
Assessment Methods	Competence may be assessed through: • Interview / Oral Questioning / Written Test • Observation/Demonstration

Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

TOP

Occupational Standard: Basic Biomedical Equipment Servicing Level II	
Unit Title	**Maintain and repair basic electrical machines and drives**
Unit Code	**EEL BES2 03 0511**
Unit Descriptor	This unit covers the basic knowledge, attitudes and skills needed in performing maintenance, troubleshooting and repair works.

Elements	Performance Criteria
1.Idntify the types of basic electrical machine and drives	1.1 ***Types of electrical machine and drives*** are identified based on the job requirements. 1.2 The principles of operation and the construction details of electrical machines and drives explained. 1.3 Correct size and degree of protection of enclosures are verified in line with job requirements. 1.4 ***Main plate data*** are identified and interpreted 1.5 Machines and drives are installed according the specifications
2. Prepare maintenance and repair works	2.1 Maintenance work schedule is prepared in accordance with machine/equipment operating time/condition 2.2 Work instructions are prepared according to machine's manual and established enterprise procedures 2.3 **Materials, tools, equipment**, **testing devices** and **PPE** needed to complete job requirements are identified and requested/obtained in line with prepared work instructions 2.4 **Potential hazards** are identified for prevention and control measures are selected in accordance with the work plan and site procedures 2.5 Safety permit/Hot work permit is secured in accordance with enterprise procedure.
2. Maintain electrical system or equipment	2.1 Safety policies and procedures are followed in accordance with OSHA and enterprise procedure 2.2 ***Electrical system or equipment parts*** are properly tested/ cleaned/lubricated according to manufacturer or enterprise procedure. 2.3 Worn-out/malfunctioning electrical system or equipment parts are identified and replaced in accordance with manufacturer's requirements or enterprise standards 2.4 Readings of ***Electrical measuring instruments*** are checked

	and identified and defective machine, drive and instruments are referred for calibration/replacement in accordance with enterprise procedure. 2.5 Connectors, bolts, nuts and screws are checked and tightened according to sizes and torque requirements 2.6 Routinary/visual/sensory inspection is regularly conducted in line with normal operation 2.7 Unforeseen events are responded in line with established procedures 2.8 Ongoing check of quality and progress of works are undertaken with strict compliance in line with established procedures.
3. Troubleshoot Electrical System or equipment	3.1 Safety policies and procedures are followed 3.2 Availability of ***maintenance records*** are prepared in accordance with established procedure, or based on enterprise ***Quality Management System (QMS).*** 3.3 Circuit or equipment to be diagnosed is isolated (lockout/tag-out) in accordance with established procedure or according to duly accepted standard practices. 3.4 ***Indicators/Symptoms*** of fault or failure are identified. 3.5 Necessary ***electrical test*** on the system or equipment is performed in accordance with established procedure or according to manufacturer's guidelines. 3.6 Extent of the fault to include the time to accomplish the job and the spare parts needed is estimated according to extent of damage. 3.7 ***Other works*** associated with the problem are coordinated with other concerned group. 3.8 Details of fault, possible cause, corrective action, recommendation to eliminate the problem are recorded accordingly. 3.9 ***Unforeseen events*** are responded in line with established procedures

4. Notify completion of work	4.1 Immediate superior is notified upon completion of work. 4.2 ***Performance tests*** are made to ensure that work conforms to instructions and job requirements. 4.3 Tools, equipment and any surplus materials are cleaned, checked and returned to storage area in accordance with established procedures. 4.4 Work area is cleaned up and made safe in accordance with OSHA requirements. 4.5 Service report is prepared and submitted to appropriate officer

Variable	**Range**
Types of electrical machines and drives	May include but not limited to: • DC machines • AC machines • Drives
Main plate data	May include but not limited to: • Voltage ratings • Current ratings • Speed ratings • Power ratings • Types of connections
Maintenance work	• Preventive • Corrective/Breakdown • Routine • Predictive • Condition based
Materials	May include but not limited to: • Contact cleaner • Insulating varnish/materials • Carbon brushes • Sand paper • Waste rugs • Electrical tapes • 4.7Warning tags • Signage • Lockout/tag-out • Lubricants • Insulating oil • Coolant

	• Soldering lead
Tools, equipment and testing devices	Including but not limited to: • Electrical hand tools - Pliers - Screwdrivers - Wrenches - Wire splicer - Knives - Bolt/Cable cutter - Knockout puncher - Torque wrench • Testing instruments/devices - Multi-meter (VOM) - Insulation resistance tester (Megger) - High potential tester - Low resistance tester - Phase sequence meter - Torque meter - Tachometer • Equipment - Labeling machine - Vacuum cleaner - Air blower and Dryer - Welding machine - Pressure washer - Vacuum pump - Soldering Iron/Gun
Personal protective equipment (PPE)	Including but not limited to: • Working gloves • Safety shoes • Hard hat • Face shield • Insulating mat • Lockout tags • Safety goggles • Safety belt • 6.9 Safety ladder

Potential hazards	Including but not limited to: • Live wires • Oil spill • Chemical hazards • Flammable materials • Sources of energy • Moving machine parts • Sharp/pointed objects • Noise hazards
Electrical system or equipment parts	May include but not limited to: • Electrical - Carbon brushes - Brush holders - Slip ring - Commutators - Contactors - Relays - Circuit breakers - Wires - Timers - Switches and push buttons - Indicating lamps - Terminal blocks - Sensors - solenoid • Mechanical - Bearings - Bushings - Shafting - Filters - Bolts and nuts - Belts - Pulley - Couplings - Gears

Maintenance records	May include but are not limited to: • Electrical plans • Equipment electrical diagrams • Historical records - Job orders - Commissioning test record - Preventive Maintenance schedules - Corrective Maintenance records - Manufacturer's maintenance guides - Equipment breakdown records - Periodic monitoring data - Service reports • Log book
Indicators / Symptoms	May include but not limited to: • Heating of parts • Loose connections • Burned or exposed parts • Abnormal/Unusual Noise/Smell/vibration • Intermittent operation • High current reading • Tripping of breakers
Electrical test	May include but not limited to: • Continuity test • Electrical insulation test • High potential test (as the need arises) • Earth resistance test • Phase sequence test • Load test • Winding resistance test • Free running test
Other works	May include but not limited to: • Mechanical works • Computer programs • Communication systems
Unforeseen events	May include but not limited to: • Natural calamities • Emergency situations • Accidents

Performance Test	May include but not limited to: • Simulation Test/No Load Test • Phase sequence • Actual Operation • Temperature

Evidence Guide	
Critical aspects of competency	Assessment requires evidence that the candidate: • Identified or determined faults and troubles • Identified cause of troubles • Performed/Followed maintenance and troubleshooting procedures • Analyzed and interpreted electrical machine circuit diagram • Interpreted and analyzed periodic monitoring data • Demonstrated understanding on safety regulations applicable to worksite operations • Demonstrated understanding on the use of electrical testing equipment • Demonstrated understanding on final inspection procedures • Accomplishment of service report forms • Coordinated effectively with others to ensure safe and effective work operations
Underpinning Knowledge	• Ethiopian Building Code Standard requirements • Maintenance and troubleshooting procedures • Standard operating procedure in energizing electrical system measurement • Interpretation of electrical plans/shop drawings • Interpretation of indicating instrument readings and test instruments • Electrical Laws and principles • Sensors/Actuators • Computer Operations • Types of potential hazards • Safety practices

Underpinning Skills	• Interpreting plan and details • Tracing circuits • Performing basic first-aid • Practicing safe working habits • Using test instruments • Troubleshooting skills • Application of maintenance procedures • Preparing/obtaining materials, PPE, tools, equipment and testing devices in line with established procedures • Estimating the time required to accomplish the job (depending on extent of damage) • Evaluating condition of damage • Selecting prevention and/or control measures • Proper handling of equipment, tools, materials and consumables • Operating computers • Communication skills
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Assessment Methods	Competency may be assessed through: • Interview / questioning / written test • Demonstration / Observation
Context of Assessment	Competency may be assessed in the work place or in a simulated work place setting

TOP

Occupational Standard: Basic Biomedical Equipment servicing Level II	
Unit Title	**Demonstrate human anatomy and physiology**
Unit Code	**EEL BES2 04 0511**
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to demonstrate human anatomy and physiology.

Elements	Performance Criteria
1. Understand basic normal structure and function of the human body.	1.1 Resources needed are identified 1.2 Information regarding normal structure and function of the 1.3 Human body is organized coherently to ensure clear understanding. 1.4 Appropriate personnel are consulted to ensure the programs for understanding basic normal structure and function of the human body are coordinated effectively with others involved in the laboratory *1.5* Materials necessary to complete the work are identified and detailed in accordance with established procedures and checked against job requirements
2. Describe the structure and function of the human body applying medical terms.	2.1 Normal function of human body structure and associated parts are ascertained and detailed in accordance with requirements. 2.2 Information is selected and organized correctly. 2.3 Identify and organize technique and approached for descriptions of human body.
3. Prepare models to demonstrate human anatomy and physiology	3.1 ***OH&S policies and procedures*** to be followed are planned and prepared, and work sequence is in accordance with ***requirements*** 3.2 Appropriate models are prepared 3.3 Different structure of human bodies are analyzed 3.4 Human body systems are analyzed.
4. Identify the different types of physiological signals.	4.1 Different types of Bio-potential signals are identified 4.2 Measurement techniques of bio-potential signals are descried 4.3 Bio-potential signals are measured

Variable	Range

OH&S policies and procedures	May include but not limited to: ▪ hazard and risk assessment mechanisms ▪ implementation of safety regulations ▪ safety training ▪ safety systems incorporating, • work clearance procedures • isolation procedures • monitoring/testing procedures • use of protective equipment and clothing ▪ use of codes of practice
Requirements	Requirements may include: • Statutory regulations • Codes of practice • Job specifications • Procedures and work instructions • Quality assurance systems • specified underpinning knowledge (specified in units' Evidence Guides)
Appropriate person	May include but not limited to: • medical doctors, nurses, laboratory technicians, health officers
Human body structure	May include but not limited to: • The Skeletal system • The Muscular System • The Nervous system • Sensory Organs • endocrine System • Circulatory System (Blood circular system) • Anatomy of Reproductive organs • Anatomy of the Digestive System • Urinary System • Respiratory System
Human body physiology systems	May include but not limited to: • Musculoskeletal system • The Nervous system • Sensory organs • The Endocrine system • The circulatory system • The respiratory system • The Digestive System • The urinary system

	• The reproductive system
models	May include but not limited to: • ATLAS of human body • ATLAS of human skeleton
Established procedures	• formal arrangements of an organization, enterprise or statutory authority on task performances ▪ quality assurance systems incorporating, for example: • specifications, requirements and procedures • work orders / instructions • reporting procedures • improvement mechanisms • compliance requirements • safety management ▪ work clearance systems incorporating, for example: • work permits • monitoring and clearance procedures • isolation procedures ▪ OH&S practices ▪ procedures for operating safety systems, operating plant and equipment and reporting work activities ▪ arrangements for dealing with emergency situations
Unplanned events or conditions	May include but not limited to: • accidents/incidents • brownout/blackout • equipment breakdown • force major e.g., fire, earthquake

Evidence Guide	
Critical Aspects of Competence	Assessment requires evidence that the candidate: • Planned and prepared the servicing and maintenance system in accordance with OH&S policies and procedures • Checked programs to be developed for servicing and maintenance according to job requirements • Identified and detailed tools, equipment and materials needed to carry out work as specified in the user's manual and established procedures • Implemented consumer electronic products and associated circuit servicing and maintenance in accordance with

	requirements • Maintained records and documentation of servicing and maintenance activities • Reported quality management issues and responses in accordance with established procedures
Underpinning Knowledge and Attitudes	• Read charts, wave forms • System and process ▪ Fundamentals of human anatomy and physiology ▪ Fundamentals of Bio- potential signals ▪ Bio-potential signals measuring techniques • Safety ▪ Work safety requirements and economy of materials with durability ▪ Knowledge in 5S application and observation of required timeframe • Materials, Tools and Equipment: Uses and Specifications ▪ Identification of appropriate tools, equipment and devices • Applied mathematics • Laws and regulations ▪ Regional / Local laws or regulations ▪ Ethiopia Environment Authority ▪ Federal legislations
Underpinning Skills	Demonstrates skills to: • work efficiency • Describe human anatomy and physiology • Interoperate bio-potentials signals • skills in the use of tools and equipment • application of work safety practices and time management • skills in operation of basic computer software application • drawing and interpreting schematic block diagrams and flowcharts relative to work flow
Resources Implication	Access is required to real or appropriately simulated situations, including work areas / work table, materials and equipment, and to information on workplace practices and OHS practices.
Assessment Methods	Competence may be assessed through: • Interview / Written exam / Oral questioning • Demonstration / Observation
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting

TOP

Occupational Standard: Basic Biomedical Equipment Servicing Level II	
Unit Title	**Dismantle and Dispose simple Biomedical Equipment**
Unit Code	**EEL BES2 05 0511**
Unit Descriptor	This unit covers the basic knowledge, skills and attitudes in dismantling and disposing of simple laboratory equipment, therapeutic equipment and diagnostic equipment.

Elements	Performance Criteria
1. Ensure decision for dismantling and disposal	1.1 Equipment is identified for ***no more service*** 1.2 Approval for dismantling is obtained from concerned body 1.3 End users are informed about the equipment to be dismantled
2. Plan to dismantle and dispose medical equipment	2.1 Store house for dismantled equipment is prepared, 2.2 Dismantling schedule is fixed and communicated to end users 2.3 Equipment is decontaminated (if necessary)
3. Organize resources needed	3.1 Work force is organize and work assignments finalized 3.2 Financial resources are insured 3.3 Necessary materials, ***tools and equipment*** are prepared
4. Dismantle the equipment	4.1 Equipment is dismantled following correct procedures and ***OHS measures*** 4.2 Dismantled parts are marked and labelled 4.3 Parts are cleaned , checked, and readied for packing 4.4 Parts are identified for reuse and disposal and reusable items are packed
5. Dispose the equipment	5.1 Items to be disposed are identified 5.2 Concerned body is consulted and obtained approval for disposal 5.3 Equipment is disposed off following disposal procedures, 5.4 Disposal report is prepared using approved format 5.5 Equipment is discarded following discarding procedures 5.6 Necessary reports and documentation are accomplished in accordance with the company standard procedures

Variable	Range
No more service	Equipment is obsolete, no spare part available, major damage and not maintainable
Tools and equipment	May include but not limited to: • different sizes of flat screw drivers • different sizes of Allen keys • adjustable wrench and set of box wrenches • pliers • insulating tape • multi-meter • hammer, chisel and knife • hacksaw
OHS	• Use proper safety rules • Proper usage of electrical tool and instruments • Use protective equipment / devices

Evidence Guide	
Critical Aspects of Competence	Assessment requires evidence that the candidate: • Ensured decision for dismantling and disposal • Planned to dismantle and dispose medical equipment • Organized resources needed for activities • Dismantled the equipment • Disposed the equipment and report
Underpinning knowledge	Basic Electricity and Electronics, Basic Digital Electronics, Basic General Mechanics, Basic Technical Drawing, Basic optical, Environmental Science, Workshop practice.
Underpinning skill	• Ensure decision for dismantling and disposal • Plan to dismantle and dispose medical equipment • Organize resources needed for activities • Dismantle the equipment • Dispose the equipment and report
Resource Implication	The following resources must be provided: • materials • tools and test equipment/instrument • equipment to be used in a real or simulated situations
Assessment	Competence may be assessed through:

Methods	• Interview / Oral Questioning / Written Test • Observation/Demonstration
Context of Assessment	Assessment may be conducted in the workplace or in a simulated environment

TOP

Occupational Standard: Basic Biomedical Equipment Servicing Level II	
Unit Title	**Maintain and Repair Biomedical Equipment Instrumentation system**
Unit Code	**EEL BES2 06 0511**
Unit Descriptor	This unit covers the knowledge, skills and attitudes needed to maintain and repair biomedical equipment instrumentation system.

Elements	Performance Criteria
1. Plan and prepare for maintenance/ repair	1.1 Maintenance or repair work is planned and prepared in line with job requirements. 1.2 ***OHS policies and procedures*** are followed in line with job requirements. 1.3 ***Instrumentation systems*** are identified in line with job requirements 1.4 ***Instrumentation system*** to be maintained or repaired are identified based on job/service order or instructions 1.5 ***Instrumentation system*** for maintenance or repair are checked against specifications and requirements. 1.6 ***Materials*** necessary to complete the work are obtained in accordance with established procedures and checked against job requirements. 1.7 ***Tools, equipment and testing devices*** needed for the maintenance/repair are obtained and checked for correct operation and safety
2. Maintain instrumentation system	2.1 Scheduled/periodic maintenance is performed in accordance with manufacturer's requirements 2.2 Normal function of instrumentation and control device is checked in accordance with manufacturer's instructions & standard procedures. 2.3 Necessary adjustments, replacement of components or parts of instruments, control devices and correction measures are responded appropriately. 2.4 Unplanned events or conditions are responded to in accordance with established procedures 2.5 Appropriate ***personal protective equipment*** is used as per OH&S procedure.

3. Repair instrumentation system	3.1 Normal function of instrumentation and control devices is checked in accordance with manufacturer's instructions. 3.2 **Fault/s or problem/s** in system or component is/are diagnosed in line with the standard operating procedures. 3.3 Necessary adjustments including calibrations and other correction measures are responded appropriately 3.4 Unplanned events or conditions are responded to in accordance with established procedures 3.5 Appropriate personal protective equipment is used in line with standard procedures.
4. Inspect and test the repaired instrumentation and control devices	4.1 Instruments are checked/ inspected to ensure safe operation 4.2 Conduct appropriate functional test(s) and inspection to ensure that the testing conducted on the device conforms with the manufacturer's instruction/manual 4.3 Work site is cleaned and cleared of all debris and left in safe condition in accordance with company procedures 4.4 Test results are recorded in Instrument/ control devices history cards 4.5 Report is prepared and completed according to company requirements

Variable	**Range**
OH & S policies and procedures	• OH & S guidelines • Ethiopian environmental proclamations and regulations
Instrumentation standards	Include but not limited to: • OIML (International Organization for Legal Metrology) Standard or ES • Regulations for consumers' electrical installations, 1969, issued by Ethiopian Electric Light and power Authority (EELPA), (now EEPCo) • Ethiopian building code standard EBCS -10 and EBCS-11, various Ethiopian ES on electrical materials and standards • Standards) or Ethiopian Standards (ES) • ISA (Instrumentation, Systems and Automation) Society (formerly Instrument Society of America) • ANSI (American National Standards Institute) • ASME (American Society of Mechanical Engineers) • NEC (National Electric Code)

	• IEC (International Electrotechnical Commission)
Instruments and Devices	Include but not limited to: • sensors/transmitters/transducers • indicators both analogue and digital • biopotential electrodes • control valves • actuators • recorders • biopotential amplifiers • chemical biosensor • annunciator associated with the installed devices • process switches

Tools	• cutting, shaping, drilling, threading, tapping, finishing, dismantling/assembling tools • pliers (assorted) • screw drivers (assorted) • soldering iron/gun • wrenches
Equipment/testing devices	• maintenance bench • instrument air supply equipment • power supply equipment • multimeter • calibrators
Materials	nclude but not limited to: • sealing materials • pipes/tubes & fittings • wires and cables • cleaning materials • lubricating materials • spare parts or components
Personal protective equipment	Include but not limited to: • Ear muffs/plugs • Goggles/glasses/face shield • Safety belt/ harness • Safety shoes • Safety apparel/suit, hat, mask and gloves
Fault/s or problem/s	• mechanical • electrical • electronics • computer-based • pneumatic • hydraulics

Evidence Guide

Critical Aspects of Competence	Assessment requires evidence that the candidate: • interpreted work instructions according to job requirements • conducted maintenance properly on the devices using standard procedures • diagnosed faults on the devices • repaired or replaced defective components and/ or devices • calibrated or adjusted instrument or device to the functional parameters or work requirements • checked the maintained/repaired devices to ensure safety • recorded maintenance/ repair results in history cards • reported the tasks undertaken
Underpinning Knowledge	Include but not limited to: • occupational health and safety • instrumentation & control standards • use of tools and testing devices • mathematical calculations • electrical and electronics theories • measurement and calibration (metrological techniques) • wiring techniques • drawing interpretation • soldering techniques • principles of instrumentation • process variable measurements (pressure, level, flow, temperature, analysis, etc.) • process control theory • process control system (single-loop & multi-loop controllers, DCS, DAS, SCADA, etc) • sensors, transmitters, transducers & converters • control valves and final control elements • computer operations • corrective & preventive maintenance procedures
Underpinning Skills	• Interpret work instructions • Interpret and define work procedures • Selection & use of proper tools & equipment • Diagnosing skills on device level • Problem solving in unplanned events • Recording and reporting maintenance/ repair activities

Resource Implication	nclude but not limited to: • Instrumentation system • Tools • Test equipment and calibrators • Materials and PPE • Technical manuals • Instrumentation system drawings
Method of Assessment	• Observation / Demonstration • Oral Questioning / written test
Context of Assessment	Assessment may be conducted in the workplace or in a simulated environment

TOP

Occupational Standard	Basic Biomedical Equipment Servicing Level II
Unit Title	**Interpret biomedical signals**
Unit Code	**EEL BES2 07 0511**
Unit Descriptor	This unit covers the knowledge, skills and attitudes necessary to interpret biomedical signals in given biomedical equipment.

Elements	Performance Criteria
1. Identify electronic communication system in biomedical equipment	1.1 **Communication concepts** are explained. 1.2 Modulation and Demodulation concepts are described. 1.3 Principles of **Superhetrodyne receiver** is explained 1.4 Basic Principles of fiber optics is described.
2. Describe bio potential signals.	2.1 Basic bioelectric signals are described. 2.2 Sources of **bioelectric potentials** are identified. 2.3 Propagation of action potentials are explained.
3. Identify signal conditioning equipment in the man-instrument system.	3.1 Display equipment is identified. 3.2 Recording , data processing and transmission equipment are described. 3.3 Control devices are identified taking sample medical equipment.
4. Interpret work instructions	4.1 Work instructions are read and interpreted to determine job requirements. 4.2 ***Tools, equipment*** *and* ***testing devices*** needed to carry out the installation work are selected in accordance with established procedures and checked for correct operation and safety. 4.3 ***Materials*** necessary to complete the work are obtained in accordance with job requirements.

Variable	Range
Tools	Include but not limited to • voltage surge protectors • spectrum analyzer • oscilloscope, • multimeter • signal generator

Equipment/testing devices	Equipment and testing devices includes but not limited to: • Communication equipment • Lifting equipment • Fastening equipment • Calibrators
Communication concepts	• Principles of EM wave propagation and reception • Antenna principle
Superhetrodyne receiver	Principles of Superhetrodyne receiver • RF amplifier • Mixer • IF Amplifier
bioelectric potentials	Bioelectric potentials include but not limited to • ECG(electrocardiogram) • ENG(electroneurogram) • EMG(electromayogram) • EEG(electroencephalogram)
OH & S policies and procedures	• OH & S guidelines • Ethiopia environmental standards
Instruments and devices	Include but not limited to: • sensors/transmitters/transducers • indicators both analogue and digital • controllers including plc controlled devices • control valves • actuators • recorders • annunciator associated with the installed devices • process switches

Evidence Guide	
Critical Aspects of Competence	Assessment require evidence that the candidate: • interpreted work instructions according to job requirements • installed Instrumentation & Control devices in accordance with technical requirements • conducted inspection and tests accurately on the devices using standard procedures • documented the tasks undertaken

Underpinning Knowledge	Include but not limited to: • occupational health and safety • instrumentation & control standards • use of tools and test equipment and calibrators • mathematical calculations • electrical and electronics theories • wiring techniques • drawing interpretation • principles of instrumentation • process variable measurements (pressure, level, flow, temperature, analysis, etc.) • process control theory • sensors, transmitters, transducers & converters • components of Man- instrument system • fundamentals of electronic communication • Fundamentals of Am & Fm Receivers • Fundamentals of Electronic Components And Circuits • Fundamentals of Digital Logics, Components & Circuits
Underpinning Skills	• Interpret work instructions • Interpret and define work procedures • Selection and use of proper tools & equipment • Wiring skills • Problem solving in unplanned events
Resource Implication	Include but not limited to: • Biomedical equipment • Tools and test equipment and calibrators • Materials and PPE • Technical manuals and Instrumentation & Control drawings
Method of Assessment	• Observation / Demonstration • Oral Questioning / written test
Context of Assessment	Assessment may be conducted in the workplace or in a simulated work environment

TOP

Occupational Standard: Basic Biomedical Equipment Servicing Level II	
Unit Title	**Participate In Workplace Communication**
Unit Code	**EEL BES2 08 0511**
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to gather, interpret and convey information in response to workplace requirements.

Elements	Performance Criteria
1. Obtain and convey workplace information	1.1 Specific and relevant information is accessed from ***appropriate sources***
	1.2 Effective questioning , active listening and speaking skills are used to gather and convey information
	1.3 Appropriate ***medium*** is used to transfer information and ideas
	1.4 Appropriate non- verbal communication is used
	1.5 Appropriate lines of communication with supervisors and colleagues are identified and followed
	1.6 Defined workplace procedures for the location and ***storage*** of information are used
	1.7 Personal interaction is carried out clearly and concisely
2. Participate in workplace meetings and discussions	2.1 Team meetings are attended on time
	2.2 Own opinions are clearly expressed and those of others are listened to without interruption
	2.3 Meeting inputs are consistent with the meeting purpose and established ***protocols***
	2.4 ***Workplace interactions*** are conducted in a courteous manner
	2.5 Questions about simple routine workplace procedures and maters concerning working conditions of employment are asked and responded to
	2.6 Meetings outcomes are interpreted and implemented

3. Complete relevant work related documents	3.1 Range of ***forms*** relating to conditions of employment are completed accurately and legibly 3.2 Workplace data is recorded on standard workplace forms and documents 3.3 Basic mathematical processes are used for routine calculations 3.4 Errors in recording information on forms/ documents are identified and properly acted upon 3.5 Reporting requirements to supervisor are completed according to organizational guidelines

Variable	**Range**
Appropriate sources	• Team members • Suppliers • Trade personnel • Local government • Industry bodies
Medium	• Memorandum • Circular • Notice • Information discussion • Follow-up or verbal instructions • Face to face communication
Storage	• Manual filing system • Computer-based filing system
Forms	• Personnel forms, telephone message forms, safety reports
Workplace interactions	• Face to face • Telephone • Electronic and two way radio • Written including electronic, memos, instruction and forms, non-verbal including gestures, signals, signs and diagrams
Protocols	• Observing meeting • Compliance with meeting decisions • Obeying meeting instructions
Evidence Guide	

Critical Aspects of Competence	Assessment requires evidence that the candidate: • Prepared written communication following standard format of the organization • Accessed information using communication equipment • Made use of relevant terms as an aid to transfer information effectively • Conveyed information effectively adopting the formal or informal communication
Underpinning Knowledge and Attitudes	• Effective communication • Different modes of communication • Written communication • Organizational policies • Communication procedures and systems • Technology relevant to the enterprise and the individual's work responsibilities
Underpinning Skills	• Follow simple spoken language • Perform routine workplace duties following simple written notices • Participate in workplace meetings and discussions • Complete work related documents • Estimate, calculate and record routine workplace measures • Basic mathematical processes of addition, subtraction, division and multiplication • Ability to relate to people of social range in the workplace • Gather and provide information in response to workplace Requirements
Resource Implications	• Fax machine • Telephone • Writing materials • Internet
Assessment Methods	Competence may be assessed through: • Interview / questioning / written test • Simulation/demonstration • Observation
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting

TOP

Occupational Standard: Basic Biomedical Equipment Servicing Level II	
Unit Title	**Work in Team Environment**
Unit Code	**EEL BES2 09 0511**
Unit Descriptor	This unit covers the skills, knowledge and attitudes to identify role and responsibility as a member of a team.

Elements	Performance Criteria
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
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
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.

Variable	Range
Role and objective of team	• Work activities in a team environment with enterprise or specific sector • Limited discretion, initiative and judgment maybe demonstrated on the job, either individually or in a team environment
Sources of information	• Standard operating and/or other workplace procedures • Job procedures • Machine/equipment manufacturer's specifications and instructions • Organizational or external personnel • Client/supplier instructions • Quality standards • OHS and environmental standards
Workplace context	• Work procedures and practices • Conditions of work environments • Legislation and industrial agreements • Standard work practice including the storage, safe handling and disposal of chemicals • Safety, environmental, housekeeping and quality guidelines

Evidence Guide	
Critical Aspects of competence	Assessment requires evidence that the candidate: • Operated in a team to complete workplace activity • Worked effectively with others • Conveyed information in written or oral form • Selected and used appropriate workplace language • Followed designated work plan for the job • Reported outcomes
Underpinning Knowledge and Attitude	• Communication process • Team structure • Team roles • Group planning and decision making

Underpinning Skills	Communicate appropriately, consistent with the culture of the workplace

Evidence Guide	
Resource Implications	The following resources must be provided: • Access to relevant workplace or appropriately simulated environment where assessment can take place • Materials relevant to the proposed activity or tasks
Methods of Assessment	Competence may be assessed through: • Observation of the individual member in relation to the work activities of the group • Observation of simulation and or role play involving the participation of individual member to the attainment of organizational goal • Case studies and scenarios as a basis for discussion of issues and strategies in teamwork
Context for Assessment	• Competence may be assessed in workplace or in a simulated workplace setting • Assessment shall be observed while task are being undertaken whether individually or in group

TOP

Occupational Standard: Basic Biomedical Equipment Servicing Level II	
Unit Title	**Develop Business Practice**
Unit Code	**EEL BES2 10 0511**
Unit Descriptor	This unit specifies the outcomes required to establish a business operation from a planned concept. It includes researching the feasibility of establishing a business operation, planning the setting up of the business, implementing the plan and reviewing operations once commenced

Elements	Performance Criteria
1. Identify business opportunities	1.1 ***Business opportunities*** are investigated and identified 1.2 Feasibility study is undertaken to determine likely ***business viability*** 1.3 Market research on product or service is undertaken 1.4 Assistance with feasibility study of ***specialist and relevant parties*** is sought as required 1.5 Impact of emerging or changing technology including e-commerce, on business operations are evaluated 1.6 Practicability of business opportunity assessed in line with perceived risks, returns sought and resources available 1.7 Business plan for operation is completed
2. Identify personal business skills	2.1 Financial and business skills available are identified and taken into account when business opportunities are researched 2.2 ***Personal skills/attributes*** are assessed and matched against those perceived as necessary for a particular business opportunity 2.3 Business risks are identified and assessed according to resources available and personal preferences
3. Plan for establishment of business operation	3.1 Business structure and operations are determined and documented 3.2 Procedures to guide operations are developed and documented 3.3 Financial backing for business operation is secured 3.4 Business legal and regulatory requirements are identified and

	complied 3.5 ***Human and physical resources*** required to commence business operation are determined 3.6 Recruitment strategies are developed and implemented
4. Implement establishment plan	4.1 Marketing of business operation is undertaken 4.2 Physical and human resources to implement business operation are obtained 4.3 ***Operational unit*** to support and coordinate business operation is established 4.4 Monitoring process for managing operation is developed and implemented 4.5 ***Legal documents*** are carefully maintained and relevant ***records*** are kept and updated to ensure validity and accessibility 4.6 Contractual procurement rights for goods and services including ***contracts with relevant people***, negotiated and secured as required in accordance with the business plan 4.7 Options for leasing/ownership of business premises identified and contractual arrangements completed in accordance with the business plan
5. Review implementation process	5.1 Review process for implementation of business operation is developed and implemented 5.2 Improvements in business operation and associated management process are identified 5.3 Identified improvements are implemented and monitored for effectiveness

Variable	**Range**
Resources may include:	• staff • money • time • equipment • space
Business goals may include:	• sales targets • budgetary targets • team and individual goals

	• production targets • reporting deadlines
Problem solving techniques may include:	• gaining additional research and information to make better informed decisions • looking for patterns • considering related problems or those from the past and how they were handled • eliminating possibilities • identifying and attempting sub-tasks • collaborating and asking for advice or help from additional sources
Time management strategies may include:	• prioritizing and anticipating • short term and long term planning and scheduling • creating a positive and organized work environment • clear timelines and goal setting that is regularly reviewed and adjusted as necessary • breaking large tasks into smaller tasks • getting additional support if identified and necessary
Internal and external sources may include:	• staff and colleagues • management, supervisors, advisors or head office • relevant professionals such as lawyers, accountants, management consultants • professional associations

Evidence Guide	
Critical Aspects of Competence	A person must be able to demonstrate: • ability to identify daily work requirements and allocate work appropriately • ability to interpret financial documents in accordance with legal requirements
Underpinning Knowledge and Attitudes	• Federal and Local Government legislative requirements affecting business operations, especially in regard to occupational health and safety (OH&S), equal employment opportunity (EEO), industrial relations and anti-discrimination • technical or specialist skills relevant to the business operation • relevant industry code of practice • planning techniques to establish realistic timelines and priorities • identification of relevant performance measures

	• quality assurance principles and methods • relevant marketing, management, sales and financial concepts • methods for monitoring performance and implementing improvements • structured approaches to problem solving, idea management and time management
Underpinning Skills	• literacy skills to interpret legal requirements, company policies and procedures and immediate, day-to-day demands • communication skills including questioning, clarifying, reporting, and giving and receiving constructive feedback • numeracy skills for performance information, setting targets and interpreting financial documents and reports • technical and analytical skills to interpret business documents, reports and financial statements and projections • ability to relate to people from a range of social, cultural and ethnic backgrounds and physical and mental abilities • problem solving skills to develop contingency plans • using computers and software packages to record and manage data and to produce reports • evaluation skills for assessing work and outcomes • observation skills for identifying appropriate people, resources and to monitor work
Resource Implications	The following resources should be provided: • Access to relevant workplace documentation, financial records, and equipment
Methods of Assessment	Competence may be assessed through: • Interview / Written exam • Observation/Demonstration with Oral questioning
Context for Assessment	Competence may be assessed in the workplace or in a simulated work environment

TOP

Occupational Standard: Basic Biomedical Equipment Servicing Level II	
Unit Title	**Maintain an Effective Relationship with Client/Customers**
Unit Code	**EEL BES2 11 0511**
Unit Descriptor	This unit covers the knowledge, skills and attitudes and values required in building and maintaining an effective relationship with clients, customers and the public.

Elements	Performance Criteria
1.Maintain a clean and hygienic environment	1.1 Uniform and personal grooming maintained to assignment requirements. 1.2 ***Personal presence*** maintained according to ***employer standards***. 1.3 Visible work area kept tidy and uncluttered. 1.4 Equipment stored according to assignment requirements.
2.Meet client/ customer requirements	2.1 **Client requirements** identified and understood by referral to the **assignment instructions**. 2.2 Client requirements met according to the assignment instructions. 2.3 Changes to **client's needs and requirements** monitored and **appropriate action taken**. 2.4 All communication with the client or **customer** is clear and complied with assignment requirements.
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.

4.Build credibility with customers/ clients	4.1 Possible causes of client/customer dissatisfaction identified, dealt with recorded according to employer policy. 4.2 Client fully informed of all relevant security matters in a timely manner and according to agreed reporting procedures.

Variable	Range
Client Requirements	May include: • Assignment Instructions • Post Orders • Scope to modify instructions/orders in light of changed situations
Assignment Instructions	May conveyed in: • Writing • Verbally • Electronically
Client Needs and Requirements	May be detected by: • Review of the client brief and/or assignment instructions Discussion with the client/customer
Customers	May include: All members of the public

Evidence Guide	
Critical aspects of competence	Assessment requires that the candidate: • Maintained a professional image. • Interpreted client/customer requirements from information contained in the client brief and/or assignment instructions. • Dealt successfully with a variety of client/customer interactions. • Monitored and acted on changing client or customer needs. • Met client/customer requirements. • Built credibility with customers/clients
Underpinning Knowledge and Attitude	• Uniform and personal grooming requirements f the employer and the client • Occupational health and safety requirement for the assignment • Assignment Instructions
Underpinning Skills	• Attention to detail when completing client/employer documentation • Interpersonal and communication skills required in client contact assignments

	• Customer service skills required to meet client/customer needs • Punctuality • Customer Service • Telephone Technique • Problem Solving and Negotiation • Maintaining Records
Resources Implication	Assessment is required to take place in real or appropriate simulated situations, including work areas, materials & equipment, & information on workplace practices and OHS practices.
Assessment Methods	Competency may be assessed through: • Interview / Written Test / Oral Questioning • Observation / Demonstration
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting

TOP

Occupational Standard: Basic Biomedical Equipment Servicing Level II	
Unit Title	**Apply Continuous Improvement Processes (Kaizen)**
Unit Code	**EEL BES2 12 1012**
Unit Descriptor	This unit of competence covers the exercise of good workplace practice and effective participation in quality improvement teams. Personnel are required to ensure the quality and integrity of their own work, detect non-conformances and work with others to suggest improvements in productivity and quality.

Elements	Performance Criteria
1. Satisfy quality system requirements in daily work	1.1 Access information on quality system requirements for own job function 1.2 Record and report quality control data in accordance with quality system 1.3 Follow ***quality control procedures*** to ensure products, or data, are of a defined quality as an aid to acceptance or rejection 1.4 Recognize and report non-conformances or problems 1.5 Conduct work in accordance with ***sustainable energy work practices*** 1.6 Promote sustainable energy principles and work practices to other workers
2. Analyze opportunities for corrective and/or optimization action	2.1 Compare current work practices, procedures and process or equipment performance with requirements and/or historical data or records 2.2 Recognize variances that indicate abnormal or sub-optimal performance 2.3 Collect and/or evaluate batch and/or historical records to determine possible causes for sub-optimal performance 2.4 Use appropriate quality improvement techniques to rank the probabilities of possible causes
3. Recommend corrective and/or optimization actions	3.1 Analyze causes to predict likely impacts of changes and decide on the appropriate actions 3.2 Identify required changes to standards and procedures and training 3.3 ***Report*** recommendations to designated personnel
4. Participate in the	4.1 Implement approved actions and monitor performance

implementation of recommended actions	following changes to evaluate results 4.2 Implement changes to systems and procedures to eliminate possible causes 4.3 Document outcomes of actions and communicate them to ***relevant personnel***
5. Participate in the development of continuous improvement strategies	5.1 Review all relevant features of work practice to identify possible contributing factors leading to sub-optimal performance 5.2 Identify options for removing or controlling the risk of sub-optimal performance 5.3 Assess the adequacy of current controls, quality methods and systems 5.4 Identify opportunities to continuously improve performance 5.5 Develop recommendations for continual improvements of work practices, methods, procedures and equipment effectiveness 5.6 Consult with appropriate personnel to refine recommendations before implementation of approved improvement strategies 5.7 Document outcomes of strategies and communicate them to relevant personnel

Variable	**Range**
Quality control procedures	Quality control procedures may include: • standards imposed by regulatory and licensing bodies • enterprise quality procedures • working to a customer brief or batch card and associated quality procedures • checklists to monitor job progress against agreed time, costs and quality standards • preparation of sampling plans • the use of hold points to evaluate conformance • the use of inspection and test plans to check compliance
Methods for statistical analysis	Methods for statistical analysis may include: • means • median • mode • ranges • standard deviations • statistical sampling procedures

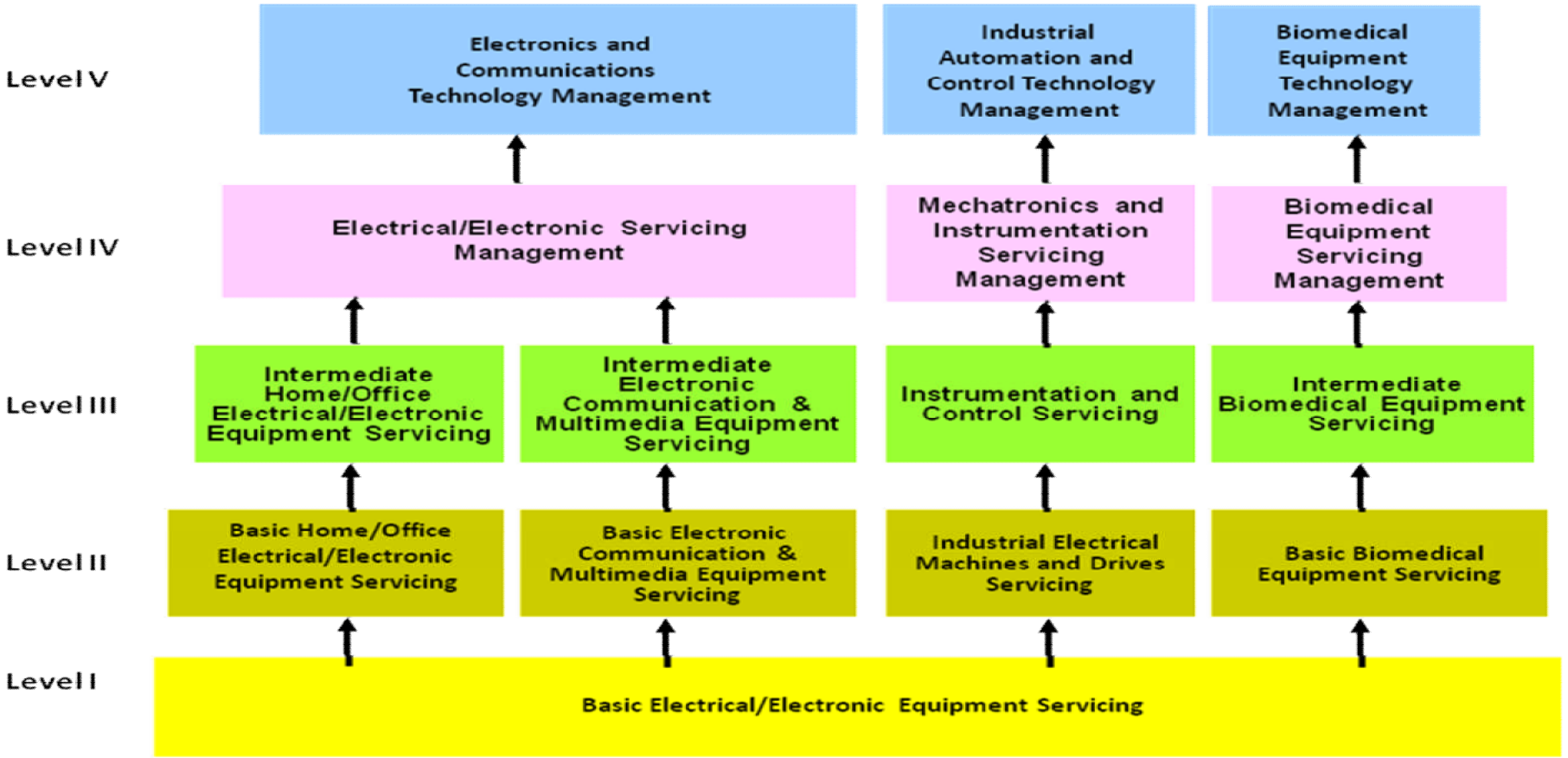
Problem solving techniques	Problem solving techniques may include: • identifying inputs and outputs • sequencing a process • identifying and rectifying a problem step • root cause analysis • implementing preventative strategies
Quality improvement tools and techniques	Quality improvement tools and techniques may include: • run charts, control charts, histograms and scattergrams to present routine quality control data • plan, do, check, act (PDCA) • Ishikawa fishbone diagrams and cause and effect diagrams • logic tree • similarity/difference analysis • Pareto charts and analysis • force field/strength weakness opportunities threats (SWOT) analysis
Sustainable energy principles and work practices	Sustainable energy principles and work practices may include: • examining work practices that use excessive electricity • switching off equipment when not in use • regularly cleaning filters • insulating rooms and buildings to reduce energy use • recycling and reusing materials wherever practicable • minimizing process waste
Relevant personnel	Communication to relevant personnel may involve: • supervisors, managers and quality managers • administrative, laboratory and production personnel • internal/external contractors, customers and suppliers
Reporting	Reporting may include: • verbal responses • data entry into laboratory or enterprise database • brief written reports using enterprise proformas
Quality improvement opportunities	Quality improvement opportunities could include improved: • production processes • hygiene and sanitation procedures • reductions in waste and re-work • laboratory layout and work flow • safety procedures • communication with customers • methods for sampling, testing and recording data
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through regional or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied

	• where relevant, users should access and apply current industry understanding of infection control issued by the Ministry of Health

Evidence Guide	
Critical Aspects of Competence	Assessors should ensure that candidates can: • use the enterprise's quality systems and business goals as a basis for decision making and action • apply all relevant procedures and regulatory requirements to ensure the quality and integrity of the products/services or data provided • apply and promote sustainable energy principles and work practices • detect non-conforming products or services in the work area • follow enterprise procedures for documenting and reporting information about quality • contribute effectively within a team to recognize and recommend improvements in productivity and quality • apply effective problem solving strategies • implement and monitor improved practices and procedures
Underpinning Knowledge and Attitudes	Demonstrates knowledge of: • specifications for laboratory products and services in the candidate's work area • quality requirements associated with the individual's job function and/or work area • scientific and technical knowledge underpinning the processes, procedures, equipment and instrumentation associated with the candidate's work tasks and duties • workplace procedures associated with the candidate's regular technical duties • sustainable energy principles • relevant health, safety and environment requirements • layout of the enterprise, divisions and laboratory • organizational structure of the enterprise • lines of communication • role of laboratory services to the enterprise and customers • methods of making/recommending improvements • Standards, procedures and/or enterprise requirements
Underpinning Skills	Demonstrates skills to: • applying problem solving techniques and strategies • applying statistical analysis and statistical sampling procedures • detecting non-conforming products or services in the work area • documenting and reporting information about quality

	• contributing effectively within a team to recognize and recommend improvements in productivity and quality • implementing and monitoring improved practices and procedures • organizing, prioritizing activities and items • reading and interpreting documents describing procedures • recording activities and results against templates and other prescribed formats • working with others
Resources Implication	Access may be required to: • workplace procedures and plans relevant to work area • specifications and documentation relating to planned, currently being implemented, or implemented changes to work processes and procedures relevant to the candidate • documentation and information in relation to production, waste, overheads and hazard control/management • reports from supervisors/managers • case studies and scenarios to assess responses to contingencies • enterprise quality manual and procedures • quality control data/records • customer complaints and rectifications
Methods of Assessment	Competence in this unit may be assessed by using a combination of the following to generate evidence: • demonstration in the workplace • suitable simulation • case studies/scenarios (particularly for assessment of contingencies, improvement scenarios, and so on) • verified reports of improvements suggested and implemented by the candidate individually Those aspects of competence dealing with improvement processes could be assessed by the use of suitable simulations and/or a pilot plant and/or a range of case studies and scenarios. In all cases, practical assessment should be supported by questions to assess essential knowledge and those aspects of competence which are difficult to assess directly.
Context of Assessment	Competence may be assessed in the work place or in a simulated workplace setting / environment.

Sector: Electrotechnology and Telecommunication
Sub-Sector: Electrotechnology



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