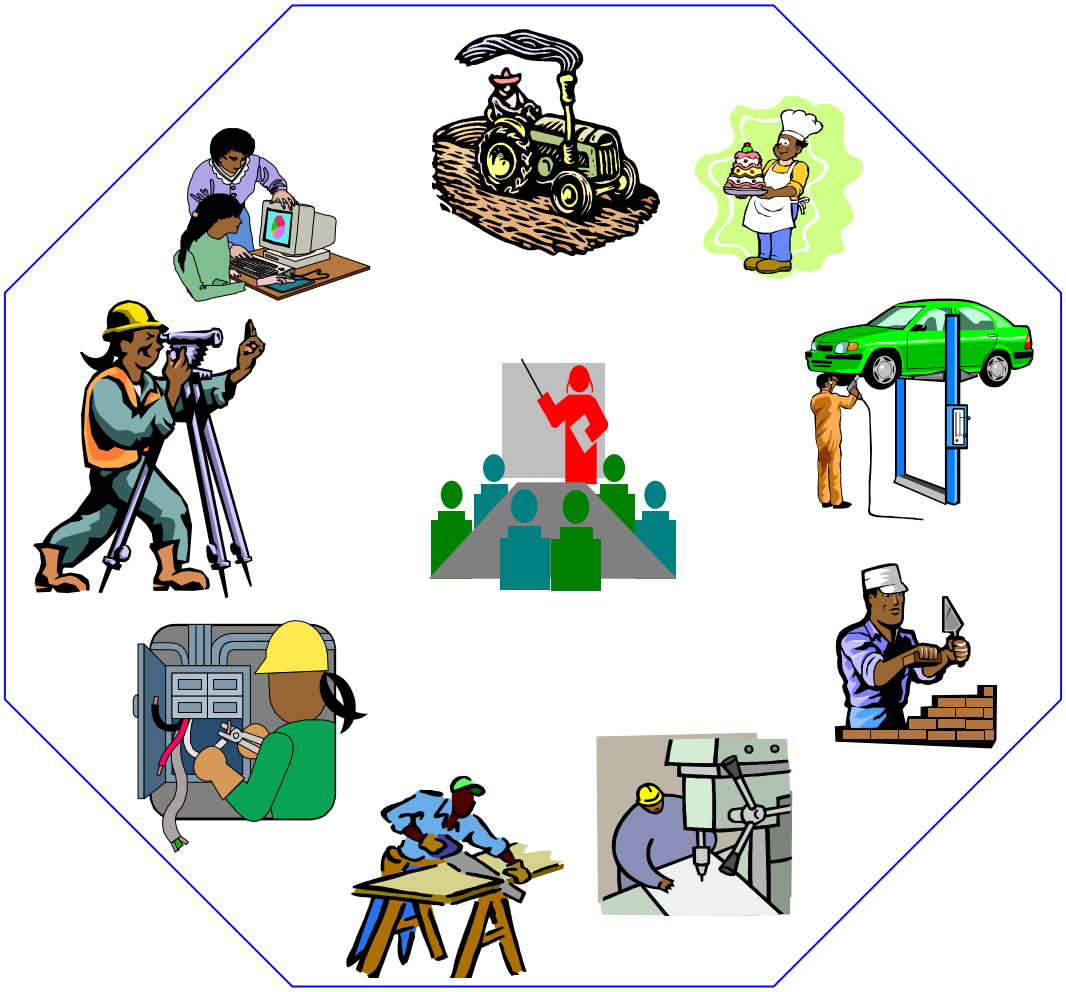
Federal Democratic Republic of Ethiopia

OCCUPATIONAL STANDARD

INSTRUMENTATION AND CONTROL SERVICING

NTQF Level III



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: Instrumentation and Control Servicing

Occupational Code: *EEL ICS*

NTQF Level III

EEL ICS3 01 0511 Install Instrumentation and Control Devices	EEL ICS3 02 0511 Diagnose and Troubleshoot Instrumentation and Control Device	EEL ICS3 03 0511 Calibrate Instrumentation and Control Devices
EEL ICS3 04 0511 Configure Instrumentation and Control Devices	EEL ICS3 05 0511 Maintain and Repair Instrumentation and Control Devices	EEL ICS3 06 0511 Perform Installation of Programmable Logic Control
EEL ICS3 07 0511 Commissioning Instrumentation and Control System	EEL ICS3 08 0511 Train Users/Operators	EEL ICS3 09 0511 Apply Quality Control
EEL ICS3 10 0511 Lead Workplace Communication	EEL ICS3 11 0511 Lead Small Teams	EEL ICS3 12 0511 Improve Business Practice
EEL ICS3 13 1012 Maintain Quality System and Continuous Improvement Processes (Kaizen)		

TOP

Occupational Standard: Instrumentation and Control Servicing Level III	
Unit Title	**Install Instrumentation and Control Devices**
Unit Code	**EEL ICS3 01 0511**
Unit Descriptor	This unit covers the knowledge, skills and attitudes necessary to install instrumentation and control devices.

Elements	Performance Criteria
1. Plan and Prepare Installation work	1.1 Installation is planned and prepared to ensure OH&S policies and procedures are followed, the work is appropriately sequenced in accordance with requirements 1.2 Work instructions are read and interpreted to determine job requirements. 1.3 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. 1.4 Materials necessary to complete the work are obtained in accordance with job requirements.
2. Install instrumentation and control devices	2.1 Appropriate ***personal protective equipment*** is worn in line with standard operating procedures. 2.2 ***OH & S policies*** **and** ***procedures*** for installation are followed in line with the requirements. 2.3 ***Instrumentation and Control standards*** are followed in line with the job requirements. 2.4 Devices are installed in accordance with manufacturer's instructions, requirements, and without damage to the surrounding place or environment 2.5 Unplanned events or conditions are responded to in accordance with established procedure
3. Test installed instrumentation and control devices	3.1 Installed devices are initially inspected for completeness before formal functional tests are conducted 3.2 Devices are tested functionally in accordance with standard procedures. 3.3 Final inspections are undertaken to ensure that the installed devices conforms to technical requirements. 3.4 Report on installation and testing of equipment including as built-in design is prepared according to company's procedures/policies
4. Clean-up	4.1 Work site is cleaned and cleared of all debris and left safe in accordance with the company requirements

Variable	Range
Tools	May include but not limited to: • cutter • shaper • Drill • Threading tool(assorted) • Tapper • File • Pliers (assorted) • Screw drivers (assorted) • Soldering iron/gun • Wrenches, hexagonal wrenches or Allen keys • Water level, tri-square • Measuring tapes • Calipers and gauges
Equipment/testing devices	Equipment and testing devices includes but not limited to: • Communication equipment (e.g., 2-way radio, cell phone) • Lifting equipment • Fastening equipment • Multi-meters • insulation tester or (Megger) • Calibrators
Materials	Include but not limited to: • Wires and cables • Pipes/tubes & fittings • Sealing materials • Fasteners
Personal protective equipment	Include but not limited to: • Ear muffs/plugs • Goggles/glasses/ • face shield • Safety hat • Safety apparel/suit • Safety belt/harness • Safety shoes • Mask • Gloves
OH & S policies and procedures	• OH & S guidelines • Ethiopia environmental standards
Control Standards or Code of practices	Includes but not limited to: • Ethiopian building code standard EBCS -10 and EBCS-11, various Ethiopian ES on electrical materials and standards • OIML (International Organization for Legal Metrology) Standards) or 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 Electrical Code) • IEC (International Electro technical Commission)
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 • Selected and used correct personal protective equipment
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 • 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 • programmable logic controllers • control valves and final control elements
Underpinning Skills	• Interpret work instructions • Interpret and define work procedures • Selection and use of proper tools & equipment • Installation skills • Problem solving in unplanned events
Resource Implication	Include but not limited to: • Workplace location • Instrumentation & Control devices • 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: Instrumentation and Control Servicing Level IV	
Unit Title	**Diagnose and Troubleshoot Instrumentation and Control Devices**
Unit Code	**EEL ICS3 02 0511**
Unit Descriptor	This unit covers the knowledge, skills and attitudes needed to diagnose and troubleshoot defects in instrumentation and control systems.

Elements	Performance Criteria
1. Plan and prepare for diagnosis of faults of instrumentation and control systems	1.1 ***OH & S policies and procedures*** are followed in line with job requirements 1.2 ***Instrumentation and Control standards*** are followed in line with the job requirements 1.3 History cards and relevant information are gathered and analyzed 1.4 ***Materials*** necessary to complete the work are obtained in accordance with established procedures and checked against job requirements 1.5 ***Tools, equipment and testing devices*** needed to carry out the work are obtained in accordance with established procedures and checked for proper operation and safety 1.6 Appropriate personnel are consulted to ensure that the work is effectively coordinated 1.7 ***Instrumentation and control systems*** defects are checked against job requirements 1.8 Diagnosis of faults is planned and prepared in line with job requirements
2. Diagnose faults of instrumentation and control systems	2.1 Appropriate ***personal protective equipment*** is used in line with standard procedures. 2.2 **Faults or problems** in the instrumentation and control systems are diagnosed according to requirements and in line with the standard procedures 2.3 Contingency measures are managed during unplanned events or conditions are responded to in accordance with established procedures 2.4 Faults diagnosis results are recorded
3. Rectify/correct defects in instrumentation control devices and systems	3.1 Appropriate personal protective equipment is used in line with standard procedures 3.2 Systems and associated equipment are isolated where necessary, in accordance with established procedures 3.3 Adjustments, if necessary are made in accordance with established procedures

	3.4 Defective components or parts are replaced or corrected without damage to the surrounding environment or services 3.5 Unplanned events or conditions are responded to in accordance with established procedures 3.6 Rectified/corrected defects/ malfunctions and replaced components and measures taken are recorded
4. Test corrected instrumentation and control systems	4.1 Instrumentation & control systems are tested to ensure safe operation. 4.2 Instrumentation & control systems are tested using standard testing procedures 4.3 Unplanned events or conditions are responded to in accordance with established procedures 4.4 Test results are recorded 4.5 Reports are prepared and completed according to company policy

Variable	**Range**
OH & S policies and procedures	• OH & S guidelines • Ethiopian environmental protection proclamations, regulations and standards
Instrumentation and Control Standards	Includes but not limited to: • Ethiopian building code standard EBCS -10 and EBCS-11, various Ethiopian ES on electrical materials and standards • Regulations for consumers' electrical installations, 1969, issued by Ethiopian Electric Light and power Authority (EELPA), (now EEPCo) • OIML (International Organization for Legal Metrology) Standards) or 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 Electrical Code)
Materials	Include but not limited to: • Sealing materials • Pipes/tubes & fittings • Wires and cables
Tools	Include but not limited to: • Cutter • Shaper • Drill • Threading tool (assorted) • Tapping • pliers (assorted)

	• screw drivers (assorted) • soldering iron/gun • wrenches
Equipment/testing devices	Equipment and testing devices include but not limited to: • communication equipment (e.g. 2-way radio, cell phone) • configuration or programmer • multi-meter • calibrators • signal generators and signal simulators • oscilloscope • Various instruments and control devices
Instrumentation and Control Systems	Include a combination of the following but not limited to: • pressure measurement and control loop • level measurement and control loop • flow measurement and control loop • temperature measurement and control loop • analytical measurement and control loop
Personal protective equipment	Includes the following but not limited to: • ear muffs/plugs • goggles/glasses/face shield • safety hat • safety apparel/suit • safety shoes • safety belt/ harness • mask • gloves
Faults or problems	• mechanical • electrical • electronics • computer-based

Evidence Guide	
Critical Aspect of Competence	Assessment requires evidence that the candidate: • interpreted work instructions according to job requirements • accurately diagnosed the defects in the instrumentation and control systems • properly adjusted/corrected the instrumentation & control systems identified • evaluated diagnosed results and rectified/ corrected systems • checked the diagnosed & corrected systems to insure safety • documented the tasks undertaken • followed OH & S procuders
Underpinning Knowledge	Includes but not limited to: • Occupational health and safety • Instrumentation & Control standards • Use of tools • Mathematical calculations

	• Electrical theory • Electronics theory • Use of test equipment and calibrators • 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 • Programmable logic controllers • Control valves and final control elements • Computer operations • Process and machinery operation • Preventive & predictive maintenance procedures
Underpinning Skills	• Reading skills required to interpret work instructions • Communication skills needed to interpret and define work procedures • Selection & use of proper tools & equipment • System diagnostics & troubleshooting skills • Problem solving in unplanned events.
Resource Implication	Includes but not limited to: • Workplace location • instrumentation & control devices • tools, test equipment, calibrators, configurator or programmer • materials and PPE • technical manuals • instrumentation & control drawings
Method of Assessment	Competence may be assessed through: • Interview / oral questioning / written exam • Demonstration/Observation
Context of Assessment	Assessment may be conducted in the workplace or in a simulated work environment

TOP

Occupational Standard: Instrumentation and Control Servicing Level III	
Unit Title	**Calibrate Instrumentation and Control Devices**
Unit Code	**EEL ICS3 03 0511**
Unit Descriptor	This unit covers the knowledge, skills and attitudes needed to calibrate instrumentation and control devices.

Elements	Performance Criteria
1. Plan and prepare for calibration	1.1 Instrumentation and control devices to be calibrated are identified based on Job/Service Order or instructions 1.2 Calibration is planned and prepared in line with job requirements 1.3 ***Materials*** necessary to complete the work are obtained in accordance with established procedures and checked against job requirements 1.4 ***Instrumentation and control devices*** for calibration are checked against specifications and requirements. 1.5 ***OH& S policies and procedures*** are followed in line with job requirements. 1.6 ***Instruction and calibration standards*** are followed in line with the job requirements. 1.7 ***Tools, equipment and testing devices*** needed for calibration are obtained and checked for correct operation and safety
2. Calibrate instrumentation and control devices	2.1 Appropriate ***personal protective equipment*** is used based on OH& S policies and procedures. 2.2 Normal functions of devices are checked in accordance with manufacturer's instructions & standard procedures. 2.3 Instrumentation and control devices to be calibrated are conditioned according to plan or standards 2.4 Fault/s or problem/s in the device is/are diagnosed in line with the standard operating procedures. 2.5 Instrumentation and control devices are calibrated and / or adjusted in line with the standard operating procedures. 2.6 Unplanned events or conditions are responded to in accordance with established procedures
3. Inspect and test calibrate instruments and control devices	3.1 Final inspections are undertaken to ensure that the calibration done on the device conforms with the manufacturer's instruction/manual 3.2 Instrumentation and control devices are checked and tested based on safety procedures. 3.3 Report is prepared/completed according to company requirements

Variable	Range
Materials	Include but not limited to: • Standard connecting cables with plugs, connectors • Sealing materials • Pipes/tubes & fittings
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
Equipment/testing devices	Include but not limited to: • Calibration bench • Air condition Equipped room • Air supply equipment or instrument • Power supply equipment • Multi-meter • Calibrator or programmer, instrument transducer • Signal generator • Oscilloscope • Standard gauges
OH & S policies and procedures	• OH & S guidelines • Ethiopian environmental proclamations and regulations
Instrumentation and control standards	Include but not limited to: • 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)
Tools	Tool set for dismantling/assembling include but not limited to: • pliers (assorted) • screw drivers (assorted) • soldering iron/gun • wrenches(assorted) • water level • tri-square • measuring tape • calipers • gauges

Personal protective equipment	• Ear muffs/plugs • Goggles/glasses/face shield • Safety hat, mask and gloves • Safety apparel/suit • Safety belt/harness • Safety shoes
Fault/s or problem/s	• Mechanical • electronics • electrical • Computer-based

Evidence Guide	
Critical Aspects of Competence	Assessment requires evidence that the candidate : • interpreted work instructions according to job requirements • conditioned appropriately instrument or device to be calibrated • calibrated and/ or adjusted identified devices diagnosed faults or problems on the devices • checked calibrated devices to ensure safety • documented the tasks undertaken • Performed Operational(Calbrational) standard
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 • 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 • Programmable logic controllers • Control valves and final control elements • Computer operations
Underpinning Skills	• Interpret work instructions • Interpret and define work procedures • Selection & use of proper tools & equipment • Calibration/configuration skills • Problem solving in unplanned events
Resource Implication	Include but not limited to: • Instrumentation & Control devices • Tools • Test equipment and calibrators • Materials and PPE

	• Technical manuals • 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: Instrumentation and Control Servicing Level IV	
Unit Title	**Configure Instrumentation and Control Devices**
Unit Code	**EEL ICS3 04 0511**
Unit Descriptor	This unit covers the knowledge, skills and attitudes needed to configure instrumentation and control devices.

Elements	Performance Criteria
1. Plan and prepare for configuration	1.1 ***OH& S policies and procedures*** are observed in line with job requirements. 1.2 Configuration is planned and prepared in line with job requirements. 1.3 Instrumentation and control devices configured are identified based on the Job/Service Order or instructions 1.4 Instrumentation and Control standards are conditioned according to plan or standards in line with the job requirements 1.5 Instrumentation and control devices for configuration 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 configuration of the instrumentation and control devices are obtained and checked for correct operation and safety
2. Configure instrumentation and control devices	2.1 Appropriate ***personal protective equipment*** is used and OHS policies and procedures are followed 2.2 Normal functioning systems and components are checked in accordance with manufacturer's instructions 2.3 Fault/s or problem/s in the device is/are diagnosed in line with the standard operating procedures. 2.4 Instrumentation and control devices are configured in line with the standard operating procedures. 2.5 Unplanned events or conditions are responded to in accordance with established procedures
3. Inspect and test configured instrumentation and control devices	3.1 Configured devices are initially inspected for accurateness before final functional tests are conducted 3.2 Final inspections are undertaken to ensure that the configuration done on the devices conforms with the manufacturer's instruction/ manual

	3.3 Instrumentation and control devices are checked to ensure safe operation 3.4 Report is prepared/ completed according to company requirements.
Variable	**Range**
OH & S policies and procedures	• OH & S guidelines • Ethiopian environmental proclamations and regulations
Instrumentation and control standards	Include but not limited to: • OIML (International Organization for Legal Metrology) 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)
Instrumentation and control devices	Include but not limited to: • Sensors/Transmitters/ Transducers • Indicators • Controllers • Control valves • Actuators • Recorders • Annunciators • Process switches • Multifunction configurator
Materials	Include but not limited to: • connectors • adaptors • connecting wires and cables • appropriate software • computer storage media
Tools	Include but not limited to: • dismantling/assembling tool set • pliers (assorted • screw drivers (assorted) • soldering iron/gun • wrenches(assorted) • measuring tape • calipers • gauges
Equipment/testing devices	• configurator or programmer • computer • multi-meter • calibrators • signal generator • oscilloscope
Personal protective	Include but not limited to:

equipment	• 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 • diagnosed faults or problems on the device • configured the identified devices • checked configured devices to ensure safety • documented the tasks undertaken • followed OH& S Procedures
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 • 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 • Programmable logic controllers • Control valves and final control elements • Computer operations
Underpinning Skills	Include but not limited to: • Interpret Work Instructions • Interpret and Define Work Procedures • Selection and Use of Proper Tools and Equipment • Configuration Skills • Problem Solving in Unplanned Events
Resource Implication	Include but not limited to: • Workplace location • instrumentation & control devices • tools

	• test equipment and calibrators • materials • PPE • technical manuals • 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: Instrumentation and Control Servicing Level III	
Unit Title	**Maintain and Repair Instrumentation and Control Devices**
Unit Code	**EEL ICS3 05 0511**
Unit Descriptor	This unit covers the knowledge, skills and attitudes needed to maintain and repair instrumentation and control devices.

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 and Control standards*** are identified in line with job requirements 1.4 Instrumentation and control devices to be maintained or repaired are identified based on job/service order or instructions 1.5 Instrumentation and control devices 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 and control devices	2.1 Normal function of instrumentation and control device is checked in accordance with manufacturer's instructions & standard procedures. 2.2 Scheduled/periodic maintenance is performed in accordance with manufacturer's requirements 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 and control devices	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 maintained/ repaired instrumentation and control devices	4.1 Instruments and control devices 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 Test results are recorded in Instrument/ control devices history cards 4.4 Report is prepared and completed according to company requirements
5. Clean-Up	5.1 Work site is cleaned and cleared of all debris and left in safe condition in accordance with company procedures

Variable	**Range**
OH & S policies and procedures	• OH & S guidelines • Ethiopian environmental proclamations and regulations
Instrumentation and control 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 • controllers including plc controlled devices • control valves • actuators

	• recorders • annunciator associated with the installed devices • process switches

Tools	Include but not limited to: • cutter • shaper • drill • threading tool(assorted) • tapping • pliers (assorted) • screw drivers (assorted) • soldering iron/gun • wrenches
Equipment/testing devices	Include but not limited to: • maintenance bench • instrument air supply equipment • power supply equipment • multi-meter • calibrators
Materials	include 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 • programmable logic controllers • control valves and final control elements • computer operations • corrective & preventive maintenance procedures
Underpinning Skills	Include but not limited to: • 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	Include but not limited to: • Workplace location • Instrumentation & Control devices • Tools • Test equipment and calibrators • Materials and PPE • Technical manuals • 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 environment

TOP

Occupational Standard: Instrumentation and Control Servicing Level III	
Unit Title	**Perform Installation and Programming of Programmable Logic Controller (PLC) System**
Unit Code	**EEL ICS3 06 0511**
Unit Descriptor	This unit covers the knowledge, skill and attitudes necessary to install and program a basic programmable logic control.

Elements	Performance Criteria
1. Plan and prepare for installation	1.1 ***OH& S policies and procedures*** are observed in line with job requirements. 1.2 Work instructions are read and interpreted to determine job requirements. 1.3 ***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. 1.4 ***Materials and components*** necessary to complete the work are obtained in accordance with job requirements.
2. Install/Test field and control devices	2.1 Appropriate ***personal protective equipment*** is worn in line with standard operating procedures. 2.2 ***Occupational Health and Safety policies*** **and** ***procedures*** for installation are followed in line with the job requirements. 2.3 ***Devices*** are installed and tested in accordance with manufacturer's instructions and requirements 2.4 Report on installation and testing of equipment is prepared according to company's procedures/policies. 2.5 Unplanned events or conditions are responded to in accordance with established procedures
3. Create/Modify, install and test basic PLC program	3.1 Appropriate ***language*** is used according to applications. 3.2 Created/modified PLC program is tested / run to ensure all syntax errors are corrected. 3.3 Test processes are reviewed to ensure defect-free PLC program. 3.4 External documentation and back-up programs required for users are created/prepared according to company standards.
4. Clean-up	4.1 Work site is cleaned and cleared of all debris and made safe in accordance with the company requirements

Variable	Range

Tools	Includes the following but not limited to: • Pliers (assorted) • Screwdrivers (assorted) • Wrenches (assorted)
Test equipment / instruments	Includes the following but not limited to: • Multi-tester (VOM) • Ammeter • Signal generator • Calibrators • Flow meters • Pressure meter • Thermometer • Low voltage power supply (DC) • Computers (PC/lap)/Programming console
Materials and components	Includes the following but not limited to: • Wires • Terminal lugs • Terminal blocks • Terminal wire marker • Limit switches • Relays • Sensors o Heat/temperature Pressure o Flow o Motion o Proximity
Personal protective equipment	May include but are not limited to: • Safety helmet (hard hat/bump hat) • Safety shoes • Ear muffs • Goggles/Face shield • Safety belt/Harness • Safety Gloves • Safety Mask (gas/fumes, dust) • Proper working clothes
Occupational Health & Safety (OHS)	• Ethiopian Building Code Standards (EBCS) • EELPA Regulations • OH & S guidelines
Field and control devices	Includes the following but not limited to: • Analogue devices o Actuators o Servo Motors o Frequency drives o Transducers o Transmitters o Actuators o Buzzers o Limit switches o Magnetic contactors o Photo-sensors o Proximity sensors • Digital devices
Language	Includes but not limited to: • Standard Programming language o Ladder o Mnemonics o STL (Statement List) o Function chart • Procedure language
Evidence Guide	

Critical Aspects of Competence	Assessment requires evidence that the candidate: • Interpreted work instructions according to job requirements • installed PLC systems to ensure safety • Checked installed devices to ensure safety • Tested installed field and control devices • Gathered and documented information needed for the creation/modification of the basic PLC program • Selected appropriate basic PLC programming language • Tested created/modified basic PLC program • Prepared a user-friendly documentation of the created/modified basic PLC program
Underpinning knowledge	Includes but not limited to: • Occupational health and safety procedures • Electrical theories and Basic electronics • Use of test equipment/instruments • Drawing interpretation • Electromechanical technology • Pneumatics / Electro-Pneumatics • Hydraulics • Industrial motors • Process Automation and Calibration • Basic PLC Programming • Concepts of I/O drivers • Control applications and concepts • Circuit Analysis • Basic Microprocessor Applications • Operating Systems (Basic computer applications) • Sequence control
Underpinning skills	Includes but not limited to: • Reading skills required to interpret diagrams and work instructions • Communication skills needed to interpret and define work procedures • Problem solving in emergency situation • Programming skills
Resource Implication	Include but not limited to: • Workplace location • Field & Control devices • Tools • Test equipment and calibrators • Materials and PPE • Technical manuals • Instrumentation & Control drawings • PLC System

Assessment Methods	Competence may be assessed through: • Interview / Oral questioning / Written exam • Demonstration / Observation
Context of Assessment	Assessment may be conducted in the workplace or in a simulated work process and procedures

TOP

Occupational Standard: Instrumentation and Control Servicing Level IV	
Unit Title	**Commission Instrumentation and Control Systems**
Unit Code	**EEL ICS3 07 0511**
Unit Descriptor	This unit covers the knowledge, skills and attitudes necessary to undertake start-up & commissioning of instrumentation and control systems.

Elements	Performance Criteria
1. Plan and prepare to undertake start-up and commissioning process	1.1 ***OH & S policies and procedures*** are followed in line with job requirements. 1.2 Start-up and commissioning procedures of ***instrumentation and control systems*** are checked against specifications and requirements 1.3 ***Tools*****, *equipment* and *testing devices*** needed to carry out the start-up commissioning work are obtained in accordance with established procedures and checked for correct operation and safety. 1.4 ***Materials*** necessary to complete the work are obtained in accordance with job requirements 1.5 ***Instrumentation and Control standards*** are followed in line with job requirements 1.6 Start-up & Commissioning procedures are planned and prepared in line with job requirements.
2. Start-up and commission instruments and control devices	2.1 Appropriate ***personal protective equipment*** is used in line with standard procedures. 2.2 Initial inspection is performed and compliances checked before startup commissioning 2.3 A step by step start-up and commissioning is done using specified procedures 2.4 Work is performed in accordance with requirements without damage to the surrounding environment or services 2.5 Unplanned events or conditions are responded to in accordance with established procedures 2.6 Correction orders are documented and appropriate personnel are notified, If major defaults occurred 2.7 Start-up and commissioning results are recorded
3. Check commissioned systems and equipment	3.1 Commissioned systems are verified according to established procedures and standards 3.2 Commissioned systems are checked to ensure safety 3.3 Unplanned events or conditions are responded to in accordance with established procedures.

	3.4 Report is prepared and completed according to the company procedures.

Variable	Range
OH & S policies and procedures	• OH & S guidelines • Ethiopian environmental protection proclamations, regulations and standards
Instrumentation and Control Standards	Includes but not limited to: • Ethiopian building code standard EBCS -10 and EBCS-11, various Ethiopian ES on electrical materials and standards • Regulations for consumers' electrical installations, 1969, issued by Ethiopian Electric Light and Power Authority (EELPA), (now EEPCo) • OIML (International Organization for Legal Metrology) Standards) or 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 Electrical Code)
Instrumentation and Control Systems	Include a combination of the following but not limited to: • Pressure measurement and control loop • Level measurement and control loop • Flow measurement and control loop • Temperature measurement and control loop • Analytical measurement and control loop
Tools	Tool set includes but not limited to: • Pliers (assorted) • Screw drivers (assorted) • Soldering iron/gun • Wrenches
Equipment/testing devices	Includes but not limited to: • Communication equipment (e.g. 2-way radio, cell phone) • Configurator or programmer • Multi-meter • Calibrators • Signal simulators • Various instruments and control devices
Materials	Include but not limited to: • Sealing materials • Pipes/tubes & fittings • Wires and cables
Personal protective equipment	Includes but not limited to: • Ear muffs/plugs • Safety apparel/suit

	• Goggles/glasses/face shield • Safety hat • Gloves	• Safety belt/harness • Safety shoes • Mask

Evidence Guide	
Critical Aspect of Competence	Assessment requires evidence that the candidate: • Interpreted work instructions according to job requirements. • Applied the appropriate/correct procedures in commissioning instrumentation and control system • Checked the commissioned instrumentation and control systems to ensure safety • Determined whether safety standards and functionality requirements are complied • Documented the tasks undertaken
Underpinning Knowledge	Include but not limited to: • occupational health and safety • instrumentation & control principles and standards • use of tools, test equipment and calibrators • applicable regulations, code of practices and standards • mathematical calculations • electrical and electronics theories • wiring techniques • schematic diagram / drawing interpretation • soldering techniques • 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 • programmable logic controllers • control valves and final control elements • computer operations • process and machinery operation
Underpinning Skills	Include but not limited to: • Interpret work instructions • interpret and define work procedures • Selection and use of proper tools and equipment • Start-up and commissioning • Problem solving in unplanned events • Decision making skills
Resource Implication	Include but not limited to: • Workplace location • Test equipment and calibrators

	• Materials and PPE • Technical manuals • Instrumentation and control devices • Tools and Test equipment and calibrators • instrumentation drawings
Method of Assessment	Competence may be assessed through: • Interview / oral questioning / written exam • Demonstration/Observation
Context of Assessment	Assessment may be conducted in the workplace or in a simulated work environment

TOP

Occupational Standard: Instrumentation and Control Servicing Level III	
Unit Title	**Train Users / Operators**
Unit Code	**EEL ICS3 08 0511**
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to train users or operators of instrumentation and control devices.

Elements	Performance Criteria
1. Plan and prepare training activities	1.1 Required tools, materials and equipment are prepared in the worksite. 1.2 Stage of development is determined from discussion with the service technician, observation of the service technician and/or a formal assessment being carried out 1.3 Measures are taken to ensure that the service technician understands OH&S requirements and safe working procedures and practices for the particular worksite and the activities to be undertaken 1.4 Preparation for particular training includes deciding which activities are to be undertaken by the service technician and the level of supervision is planned 1.5 Confirmation from the service technician is sought regarding the level of understanding of the training activity to be performed
2. Guide/mentor users	2.1 **Operator** is provided with clear instructions on the work to be done and the respective responsibilities associated with the work and others who are involved 2.2 Operator is ***guided/mentored*** 2.3 Stage check is made at a level appropriate to the stage of development in accordance with industry standards 2.4 Measures are taken to ensure that the user completes relevant documentation of the work performed in accordance with established procedures
3. Document and provide feedback	3.1 **Operator**'s progress is monitored in accordance with ***established procedures*** *and* ***documentation requirements*** 3.2 Work activities and assessment undertaken are documented and verified in accordance with established procedures 3.3 Assessment feedback is provided to service technician and training evaluation report is submitted to responsible person

Variable	Range
OH&S policies and procedures	May include but not limited to: • Arrangements of an organization or enterprise to meet their legal and ethical obligations of ensuring that the workplace is safe and without risk to health. this may include: ▪ hazard and risk assessment mechanisms ▪ implementation of safety regulations ▪ safety training ▪ safety systems incorporating, • work clearance procedures • isolation procedures • gas and vapor • monitoring/testing procedures • use of protective equipment and clothing ▪ use of codes of practice
Training	May include but not limited to: • Knowledge training • Skills training • Attitudinal & work value training
Guide / mentor	May include but not limited to: • coaching • instructions • demonstrating • assessing
Established procedures	• formal arrangements of an organization, enterprise or statutory authority on task performances ▪ quality assurance systems incorporating, for example: ▪ OH&S practices ▪ procedures for operating safety systems, equipment and reporting work activities ▪ maintenance, modification or supply of relevant schematic drawings and technical data ▪ arrangements for dealing with emergency situations
Documentation requirements	May include but not limited to: • GANTT chart • progress chart/report • training evaluation report • training plan

Evidence Guide	
Critical Aspects of Competence	Assessment requires evidence that the candidate: • planned and prepared the training activities • guided/mentored the service technician • monitored and checked the performance of the service technician • document the performance of the service technician • provided feedback to the service technician and training evaluation report is submitted to the responsible person
Underpinning Knowledge and Attitudes	Demonstrates knowledge of: • fundamentals of maintaining and servicing audio-video products and systems • fundamentals of maintaining and servicing cellular phones • fundamentals of maintaining and servicing of electronically-controlled domestic appliances • fundamentals of coaching and mentoring • theories of adult learning • methods of teaching
Underpinning Skills	Demonstrates skills to: • communicate effectively with trainees • applying effective techniques of coaching and mentoring • demonstrate skills in maintaining and servicing consumer electronic products and system • demonstrate positive work values and attitudes • effectively deliver training in accordance to training plan • develop training plan/lesson plan • perform trainee evaluation
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	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: Biomedical Equipment Servicing Level III	
Unit Title	**Apply Quality Control**
Unit Code	**EEL BES3 09 0511**
Unit Descriptor	This unit covers the knowledge, skills and attitudes needed to apply quality standards in the workplace. The unit also includes the application of relevant safety procedures and regulations, organization procedures and client specifications.

Elements	Performance Criteria
1. Assess quality of received equipment	1.1 Work instructions are obtained and work is carried out in accordance with standard operating procedures 1.2 Received ***equipments*** are checked against manufacturer's specifications 1.3 Faulty equipment is identified, isolated and reported 1.4 ***Faults*** and any identified causes are recorded and/or reported in accordance with company procedures 1.5 Faulty equipment are recommended for replacement or returned to supplier following standard procedures
2. Assess quality of service	2.1 Information on the quality and other indicators of production performance is ***documented*** in accordance with workplace procedures 2.2 Completed work is checked against documented workplace standards relevant to the task undertaken 2.3 Faulty items or below standard services are identified and corrected 2.4 Deviations from specified ***quality standards*** and its causes are documented and reported in accordance with the organization standards operating procedures
3. Engage in quality improvement	3.1 Process improvement procedures are participated in relation to workplace assignment 3.2 Work is carried out in accordance with process improvement procedures 3.3 Performance of operation or quality of product or service to ensure customer satisfaction is monitored

Variable	Range
Equipment	May include but not limited to: • Weighing scale, Infant/Adult • 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/Spectroscopy(assorted) • Uninterruptible power supply • Bag valve mask (Pedia and Adult) • Anesthesia bag • Clinical oven
Faults	May include but not limited to: • equipment not according to specification • equipment contain manufacturing defects • equipment do not conform with government regulation • equipment have safety defect
Documentation	May include but not limited to: • Organization work procedures and manuals • Manufacturer's instruction manual • Client requirements/specifications • Forms
Quality standards	May include but not limited to: • Materials • component parts • equipment operation • systems and processes • services

Evidence Guide	
Critical aspects of Competence	Assessment requires evidence that the candidate: • Carried out work in accordance with the company's standard operating procedures • Performed task according to specifications • Reported defects detected in accordance with standard operating procedures • Carried out work in accordance with the process improvement procedures
Underpinning Knowledge and Attitudes	Demonstrates knowledge of: • Relevant production processes, materials and products • Characteristics of materials/component parts used in electronic production processes • Quality checking procedures • Workplace procedures • Safety and environmental aspects of production processes • Fault identification and reporting • Quality improvement process
Underpinning Skills	Demonstrates skills to: • interpret work instruction • interpret and apply defined work procedures • carry out work in accordance with OHS policies and procedures
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 / 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: Biomedical Equipment Servicing Level III	
Unit Title	**Lead Workplace Communication**
Unit Code	**EEL BES3 10 0511**
Unit Descriptor	This unit covers the knowledge, attitudes and skills to lead in the dissemination and discussion of information and issues in the workplace.

Elements	Performance Criteria
1. Communicate information about workplace processes	1.1 Appropriate ***communication method*** is selected 1.2 Multiple operations involving several ics areas are communicated accordingly 1.3 Questions are used to gain extra information 1.4 Correct sources of information are identified 1.5 Information is selected and organized correctly 1.6 Verbal and written reporting is undertaken when required 1.7 Communication skills are maintained in all situations
2. Lead workplace discussion	2.1 Response to workplace issues are sought 2.2 Response to workplace issues are provided immediately 2.3 Constructive contributions are made to workplace discussions on such issues as production, quality and safety 2.4 Goals/objectives and action plan undertaken in the workplace are communicated.
3. Identify and communicate issues arising in the workplace	3.1 Issues and problems are identified as they arise 3.2 Information regarding problems and issues are organized coherently to ensure clear and effective communication 3.3 Dialogue is initiated with appropriate staff/personnel 3.4 Communication problems and issues are raised as they arise

Variable	Range

Methods of communication	• Non-verbal gestures • Verbal • Face to face • Two-way radio • Speaking to groups • Using telephone • Written • Using Internet • Cell phone

Evidence Guide	
Critical aspects of Assessment	Demonstrates skills and knowledge to: • Dealt with a range of communication/information at one time • Made constructive contributions in workplace issues • Sought workplace issues effectively • Responded to workplace issues promptly • Presented information clearly and effectively written form • Used appropriate sources of information • Asked appropriate questions • Provided accurate information
Underpinning Knowledge and Attitudes	Demonstrates knowledge of: • Organization requirements for written and electronic communication methods • Effective verbal communication methods
Underpinning Skills	Demonstrates skills to: • Organize information • Understand and convey intended meaning • Participate in variety of workplace discussions • Comply with organization requirements for the use of written and electronic communication methods
Resources Implication	The following resources must be provided: variety of information, communication tools, simulated workplace
Assessment Methods	Competence may be assessed through: • Interview • Observation/Demonstration
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting

TOP

Occupational Standard: Biomedical Equipment Servicing Level III	
Unit Title	**Lead Small Teams**
Unit Code	**EEL BES3 11 0511**
Unit Descriptor	This unit covers the knowledge, attitudes and skills to lead small teams including setting and maintaining team and individual performance standards.

Elements	Performance Criteria
1. Provide team leadership	1.1 ***Work requirements*** are identified and presented to team members 1.2 Reasons for instructions and requirements are communicated to team members 1.3 ***Team members' queries and concerns*** are recognized, discussed and dealt
2. Assign responsibilities	2.1 Duties and responsibilities are allocated having regard to the skills, knowledge and aptitude required to properly undertake the assigned task and according to company policy 2.2 Duties are allocated having regard to individual preference, domestic and personal considerations, whenever possible
3. Set performance expectations for team members	3.1 Performance expectations are established based on client needs and according to assignment requirements 3.2 Performance expectations are based on individual team members duties and area of responsibility 3.3 Performance expectations are discussed and disseminated to individual team members
4. Supervised team performance	4.1 ***Monitoring of performance*** takes place against defined performance criteria and/or assignment instructions and corrective action taken if required 4.2 Team members are provided with ***feedback***, positive support and advice on strategies to overcome any deficiencies 4.3 ***Performance issues*** which cannot be rectified or addressed within the team are referenced to appropriate personnel according to employer policy 4.4 Team members are kept informed of any changes in the priority allocated to assignments or tasks which might impact on client/customer needs and satisfaction 4.5 Team operations are monitored to ensure that employer/ client needs and requirements are met 4.6 Follow-up communication is provided on all issues affecting the team 4.7 All relevant documentation is completed in accordance with

	company procedures
Variable	**Range**
Work requirements	• client profile • assignment instructions
Team member's concerns	• roster/shift details
Monitor performance	• formal process • informal process
Feedback	• formal process • informal process
Performance issues	• work output • work quality • team participation • compliance with workplace protocols • safety • customer service

Evidence Guide	
Critical aspects of Assessment	Demonstrates skills and knowledge to: • maintained or improved individuals and/or team performance given a variety of possible scenario • assessed and monitored team and individual performance against set criteria • represented concerns of a team and individual to next level of management or appropriate specialist and to negotiate on their behalf • allocated duties and responsibilities, having regard to individual's knowledge, skills and aptitude and the needs of the tasks to be performed • set and communicated performance expectations for a range of tasks and duties within the team and provided feedback to team members

Underpinning Knowledge and Attitudes	Demonstrates knowledge of: • company policies and procedures • relevant legal requirements • how performance expectations are set • methods of monitoring performance • client expectations • team member's duties and responsibilities
Underpinning Skills	Demonstrates skills to: • communication skills required for leading teams • informal performance counselling skills • team building skills • negotiating skills
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: Instrumentation and Control Servicing	
Unit Title	**Improve Business Practice**
Unit Code	**EEL ICS3 12 0511**
Unit Descriptor	This unit covers the skills, knowledge and attitudes required in promoting, improving and growing business operations.

Elements	Performance Criteria
1. Diagnose the business	1.1 ***Data required*** for diagnosis is determined and acquired 1.2 ***Competitive advantage*** of the business is determined from the data 1.3 ***SWOT analysis*** of the data is undertaken
2. Benchmark the business	2.1 Sources of relevant benchmarking data are identified 2.2 ***Key indicators*** for benchmarking are selected in consultation with key stakeholders 2.3 Like indicators of own practice are compared with benchmark indicators 2.4 Areas for improvement are identified
3. Develop plans to improve business performance	3.1 A consolidated list of required improvements is developed 3.2 Cost-benefit ratios for required improvements are determined 3.3 Work flow changes resulting from proposed improvements are determined 3.4 Proposed improvements are ranked according to agreed criteria 3.5 An action plan to implement the top ranked improvements is developed and agreed 3.6 ***Organizational structures*** are checked to ensure they are suitable
4. Develop marketing and promotional plans	4.1 The practice vision statement is reviewed 4.2 Practice ***objectives*** are developed/reviewed 4.3 Target markets are identified/refined 4.4 ***Market research data*** is obtained 4.5 ***Competitor analysis*** is obtained 4.6 ***Market position*** is developed/reviewed 4.7 Practice ***brand*** is developed

	4.8 ***Benefits*** of practice/products/services are identified 4.9 ***Promotion tools*** are selected/developed
5. Develop business growth plans	5.1 Plans to increase ***yield per existing client*** are developed 5.2 Plans to add new clients are developed 5.3 Proposed plans are ranked according to agreed criteria 5.4 An action plan to implement the top ranked plans is developed and agreed 5.5 Practice work practices are reviewed to ensure they support growth plans
6. Implement and monitor plans	6.1 Implementation plan is developed in consultation with all relevant stakeholders 6.2 Indicators of success of the plan are agreed 6.3 Implementation is monitored against agreed indicators 6.4 Implementation is adjusted as required

Variables	**Range**
Data required includes:	• Organization capability • Appropriate business structure • Level of client service which can be provided • Internal policies, procedures and practices • Staff levels, capabilities and structure • Market, market definition • Market changes/market segmentation • Market consolidation/fragmentation • Revenue • Level of commercial activity • Expected revenue levels, short and long term • Revenue growth rate • Break even data • Pricing policy • Revenue assumptions • Business environment • Economic conditions • Social factors • Demographic factors • Technological impacts • Political/legislative/regulative impacts • Competitors, competitor pricing and response to pricing

	• Competitor marketing/branding • Competitor products
Competitive advantage includes:	• Services/products • Fees • Location • Timeframe
Objectives should be 'SMART' , that	• Specific • Measurable • Achievable • Realistic • Time defined

Market research data includes:	• Data about existing clients
	• Data about possible new clients
	• Data from internal sources
	• Data from external sources such as:
	• Trade associations/journals
	• Yellow Pages small business surveys
	• Libraries
	• Internet
	• Chamber of Commerce
	• Client surveys
	• Industry reports
	• Secondary market research
	• Primary market research such as:
	  • telephone surveys
	  • personal interviews
	  • mail surveys

Competitor analysis	• Competitor offerings • Competitor promotion strategies and activities • Competitor profile in the market place
SWOT analysis includes:	• Internal strengths such as staff capability, recognized • Quality • Internal weaknesses such as poor morale, • Under-capitalization, poor technology • External opportunities such as changing market and • Economic conditions • External threats such as industry fee structures, strategic • Alliances, competitor marketing

Key indicators may include:	• Salary cost and staffing • Personnel productivity (particularly of principals) • Profitability • Fee structure • Client base • Size staff/principal • Overhead/overhead control
Organizational structures include:	• Legal structure (partnership, Limited Liability Company, etc.) • Organizational structure/hierarchy • Reward schemes
Market position should include data on:	• Product • The good or service provided • Product mix • The core product - what is bought • The tangible product - what is perceived • The augmented product - total package of consumer • Features/benefits • Product differentiation from competitive products • New/changed products • Price and pricing strategies (cost plus, supply/demand, ability to pay, etc.) • Pricing objectives (profit, market penetration, etc.) • Cost components • Market position • Distribution strategies • Marketing channels • Promotion • Promotional strategies • Target audience • Communication • Promotion budget
Practice brand may include:	• Practice image • Practice logo/letter head/signage • Phone answering protocol • Facility decor • Slogans • Templates for communication/invoicing • Style guide • Writing style

	• AIDA (attention, interest, desire, action)
Benefits may include:	• Features as perceived by the client • Benefits as perceived by the client
Promotion tools include:	• Networking and referrals • Seminars • Advertising • Press releases • Publicity and sponsorship • Newsletters (print and/or electronic) • Websites • Direct mail • Telemarketing/cold calling
Yield per existing client may be increased by:	• Raising charge out rates/fees • Packaging fees • Reduce discounts • Sell more services to existing clients

Evidence Guide	
Critical Aspects of Competence	The candidate must be able to demonstrate: • Ability to identify the key indicators of business performance • Ability to identify the key market data for the business • Knowledge of a wide range of available information sources • Ability to acquire information not readily available within a business • Ability to negotiate required improvements to ensure implementation • Ability to evaluate systems against practice requirements • And form recommendations and/or make recommendations • Ability to assess the accuracy and relevance of information
Underpinning Knowledge and Attitudes	Demonstrates knowledge of: • Data analysis • Communication skills • Computer skills to manipulate data and present information • Negotiation skills • Problem solving • Planning skills • Marketing principles • Ability to acquire and interpret relevant data • Current product and marketing mix • Use of market intelligence • Development and implementation strategies of promotion and growth plans
Underpinning Skills	• Data analysis and manipulation • Ability to acquire and interpret required data • Current practice systems and structures • Sources of relevant benchmarking data • Methods of selecting relevant key benchmarking indicators • Communication skills • working and consulting with others when developing plans for the business • negotiation skills and problem solving • using computers to manipulate, present and distribute information • planning skills
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: Instrumentation and Control Servicing Level III	
Unit Title	**Maintain Quality System and Continuous Improvement Processes (Kaizen)**
Unit Code	**EEL ICS3 13 1012**
Unit Descriptor	This unit of competence covers the skills and knowledge required to prevent process improvements in their own work from slipping back to former practices or digressing to less efficient practices. It covers responsibility for the day- to-day operation of the work/functional area and ensuring that quality system requirements are met and that continuous improvements are initiated and institutionalized.

Elements	Performance Criteria
1. Develop and maintain quality framework within work area	1.1 Distribute and explain information about the enterprise's quality system to personnel 1.2 Encourage personnel to participate in improvement processes and to assume responsibility and authority 1.3 Allocate responsibilities for quality within work area in accordance with quality system 1.4 Provide ***coaching and mentoring*** to ensure that personnel are able to meet their responsibilities and quality requirements
2. Maintain quality documentation	2.1 Identify required quality documentation, including records of improvement plans and initiatives 2.2 Prepare and maintain quality documentation and keep accurate data records 2.3 Maintain document control system for work area 2.4 Contribute to the development and revision of quality manuals and work instructions for the work area 2.5 Develop and implement inspection and test plans for quality controlled products
3. Facilitate the application of standardized procedures	3.1 Ensure all required procedures are accessible by relevant personnel 3.2 Assist personnel to access relevant procedures, as required 3.3 Facilitate the resolution of conflicts arising from job 3.4 Facilitate the completion of required work in accordance with standard procedures and practices

4. Provide training in quality systems and improvement processes	4.1 Analyze roles, duties and current competency of relevant personnel 4.2 Identify training needs in relation to quality system and ***continuous improvement processes (kaizen)*** 4.3 Identify opportunities for skills development and/or training programs to meet needs 4.4 Initiate and monitor training and skills development programs 4.5 Maintain accurate training record
5. Monitor and review performance	5.1 Review performance outcomes to identify ways in which planning and operations could be improved 5.2 Use the organization's systems and ***technology*** to monitor and review progress and to identify ways in which planning and operations could be improved 5.3 Enhance ***customer service*** through the use of quality improvement techniques and processes 5.4 Adjust plans and communicate these to personnel involved in their development and implementation
6. Build continuous improvement process	6.1 Organize and facilitate improvement team 6.2 Encourage work group members to routinely monitor ***key process indicators*** 6.3 Build capacity in the work group to critically review the relevant parts of the value chain 6.4 Assist work group members to formalize improvement suggestions 6.5 Facilitate relevant resources and assist work group members to develop implementation plans 6.6 Monitor implementation of improvement plans taking appropriate actions to assist implementation where required.
7. Facilitate the identification of improvement opportunities	7.1 Analyze the job completion process 7.2 Ask relevant questions of job incumbent 7.3 Encourage job incumbents to conceive and suggest improvements 7.4 Facilitate the trying out of improvements, as appropriate
8. Evaluate relevant components of quality system	8.1 Undertake regular audits of components of the quality system that relate to the work area 8.2 Implement improvements in the quality system in accordance with own level of responsibility and workplace procedures

	8.3 Facilitate the updating of standard procedures and practices 8.4 Ensure the capability of the work team aligns with the requirements of the procedure

Variable	Range
Coaching and mentoring	May refer to: • providing assistance with problem-solving • providing feedback, support and encouragement • teaching another member of the team, usually focusing on a specific work task or skill
Continuous improvement processes may include:	May include: • cyclical audits and reviews of workplace, team and individual performance • evaluations and monitoring of effectiveness • implementation of quality systems, such as International Standardization for Organization (ISO) • modifications and improvements to systems, processes, services and products • policies and procedures which allow the organization to systematically review and improve the quality of its products, services and procedures • seeking and considering feedback from a range of stakeholders • Kaizen • Enterprise-specific improvement systems
Technology	May include: • computerized systems and software such as databases, project management and word processing • telecommunications devices • any other technology used to carry out work roles and responsibilities
Customer service	May be: • internal or external • to existing, new or potential clients
Key process indicators	Key process indicators may include: • statistical process control data/charts • orders • lost time, injury and other OHS records • equipment reliability charts, etc.
Continuous improvement tools	May include: • statistics • cause and effect diagrams • fishbone diagram • Pareto diagrams

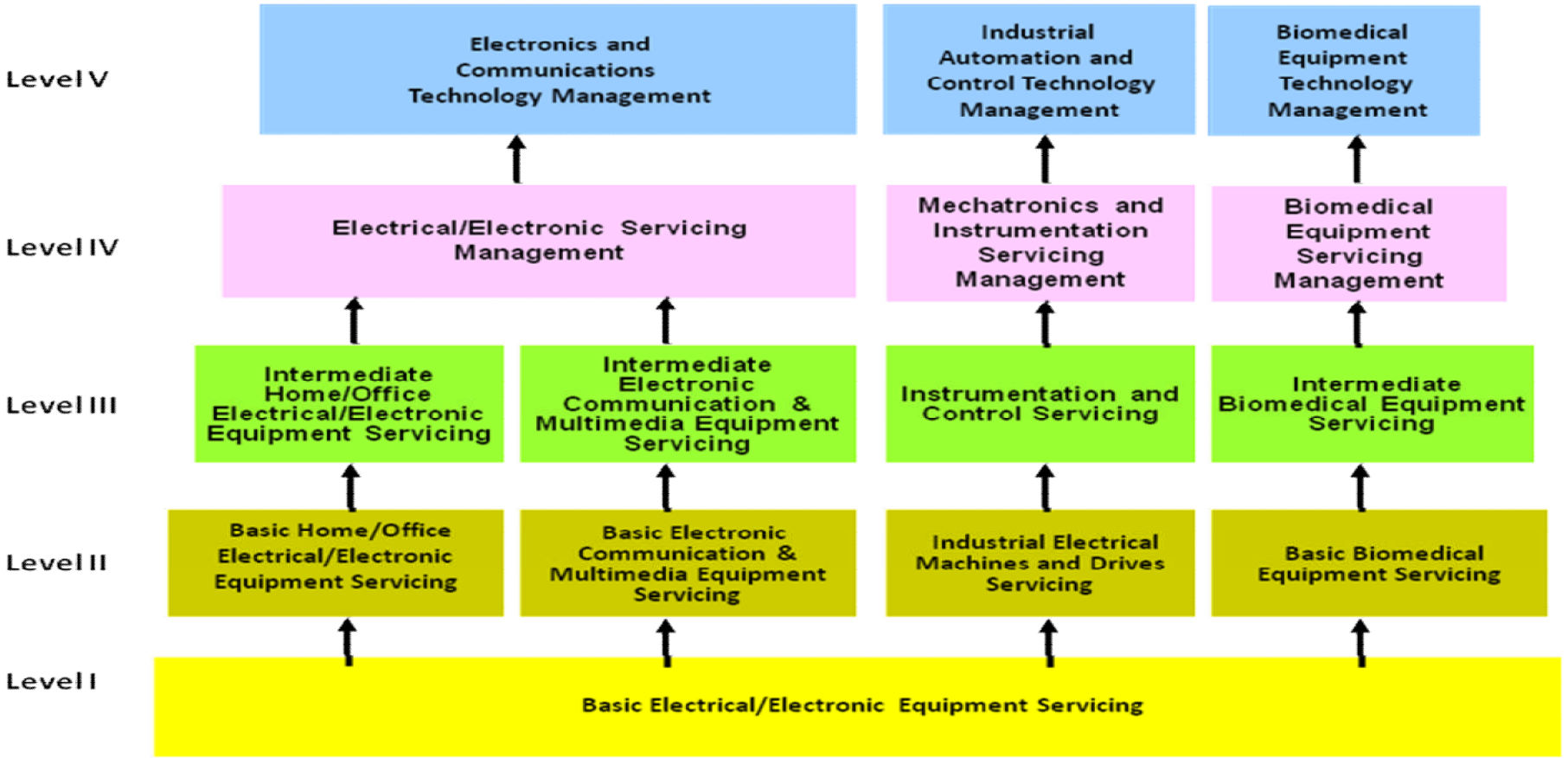
	• run charts • X bar R charts • PDCA • Sigma techniques • balanced scorecards • benchmarking • performance measurement • upstream and downstream customers • internal and external customers immediate and/or final

Evidence Guide	
Critical Aspects of Competence	Evidence of the following is essential: • taking active steps to implement, monitor and adjust plans, processes and procedures to improve performance • supporting others to implement the continuous improvement system/processes, and to identify and report opportunities for further improvement • knowledge of principles and techniques associated with continuous improvement systems and processes • assist others to follow standard procedures and practices • assist others make improvement suggestions • standardize and sustain improvements Assessors should ensure that candidates can: • implement and monitor defined quality system • requirements and initiate continuous improvements within the work area • apply effective problem identification and problem solving techniques • strengthen customer service through a focus on continuous improvement • implement, monitor and evaluate quality systems in the work area • initiate quality processes to enhance the quality of performance of individuals and teams in the work area • gain commitment of individuals/teams to quality principles and practices • implement effective communication strategies • encourage ideas and feedback from team members when developing and refining techniques and processes • analyze training needs and implement training programs • prepare and maintain quality and audit documentation
Underpinning Knowledge and Attitudes	Demonstrates knowledge of: • principles and techniques associated with: – benchmarking – best practice – change management

	– continuous improvement systems and processes – quality systems • range of procedures available and their application to different jobs • applicability of takt time and muda to jobs • identification and possible causes of variability in jobs • continuous improvement process for organization • questioning techniques • methods of conceiving improvements • suggestion and try out procedures • relevant OHS • quality measurement tools for use in continuous improvement processes • established communication channels and protocols • communication/reporting protocols • continuous improvement principles and process • enterprise business goals and key performance indicators • enterprise information systems management • enterprise organizational structure, delegations and responsibilities • policy and procedure development processes • relevant health, safety and environment requirements • relevant national and international quality standards and protocols • standard operating procedures (SOPs) for the technical work performed in work area • enterprise quality system
Underpinning Skills	Demonstrates skills to: • coach and mentor team members • gain the commitment of individuals and teams to continuously improve • innovate or design better ways of performing work • communicate with relevant people • prioritize and plan tasks related to encouraging and improving use of standardized procedures • negotiate with others to resolve conflicts and gain commitment to standardized procedures • facilitate other employees in improvement activities • implement and monitor defined quality system requirements • initiate continuous improvements within the work area • apply effective problem identification and problem solving techniques • strengthen customer service through a focus on continuous improvement • implement, monitor and evaluate quality systems • implement effective communication strategies • encourage ideas and feedback from team members when

	developing and refining techniques and processes • analyze training needs and implementing training programs • prepare and maintain quality and audit documentation
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 • enterprise quality manual and procedures • quality control data/records
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 • oral or written questioning to assess knowledge of procedures and contingency management; principles and techniques associated with change management • review of the audit process and outcomes generated by the candidates 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 underpinning 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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