TECHNICAL PROFESSIONAL

IA - ELECTRONICS PRODUCT ASSEMBLY AND SERVICING

Grade 11 or 12

Three-Term Budget Of Work (BOW)
for Learning Competencies

TECHNICAL PROFESSIONAL
IA - INDUSTRIAL TECHNOLOGIES
Grade 11 or Grade 12

Three-Term Budget Of Work
For Learning Competencies

Please note that each elective under TechPro: IA is studied for one term. This is applicable under Grades 11 and 12.

Term	
Elective	**Electronics Product Assembly and Servicing**
Performance Standard	The learners perform procedures in assembling and testing of electronic components, and power supply assembly following existing standard. The learners perform servicing of appliances with electric motors, appliances with heating elements, and rechargeable and electronic-controlled lighting units ensuring adherence to safety standards. The learners perform servicing of Closed-Circuit Television (CCTV) systems, and fire alarm systems ensuring adherence to safety precautions. The learners perform procedures in servicing audio products and systems, control boards and motor controllers, and sensors and actuators ensuring adherence to safety precautions.
Content Standard	• The learners demonstrate understanding of the principles in electronic systems assembling and servicing, identification of electronic components, PCB designing, soldering and desoldering, and assembly of electronic products. • Demonstrate an understanding of the principles of appliances with electric motors, appliances with heating components, and electronic controlled lighting units. • The learners demonstrate an understanding of the principles of Closed-Circuit Television (CCTV) systems, and fire alarm systems. • The learners demonstrate an understanding of the principles of audio products and

	systems, television, control boards and motor controllers, sensors and actuators.

Week	Learning Competency	Suggested Activities
1	• Explain the overview of Electronic Systems Servicing. • Discuss electronic components identification. • Demonstrate procedures in testing electronic components.	• **Electronic Device Disassembly and System Mapping** ○ Learners disassemble a simple electronic device (like a radio, LED lamp, or small fan) to observe and understand how its components work together as a system ○ Carefully open the device, identify its major parts, and create a simple diagram showing how each part contributes to the overall electronic system • **Electronic Systems Case Study Discussion** ○ Learners examine real-life electronic systems (home appliances, gadgets, or circuit modules) and discuss their purpose, operation, and service requirements in a group setting ○ Review a given electronic system, describe its function and key components, and explain the general steps involved in servicing it • **Component Identification Matching Game** ○ Learners are given a set of electronic

		components (resistors, capacitors, diodes, transistors, ICs, etc.) along with their symbols and specifications, and they match each component to its name, function, and symbol ○ Match each physical component to its correct name, symbol, and function using a reference chart • **Component Sorting and Function Analysis** ○ Learners sort a mixed set of electronic components into categories (passive, active, ICs, etc.) and explain the role of each component in a circuit ○ Sort components into their types and briefly describe the purpose of each within an electronic circuit • **Multimeter Hands-On Testing Lab** ○ Learners use a digital multimeter to measure resistance, voltage, and continuity of various electronic components such as resistors, capacitors, diodes, and LEDs ○ Use a multimeter to check each component's value and functionality according to standard testing procedures • **Component Fault Diagnosis Exercise**

		○ Learners are given circuits with deliberately faulty components and must identify which components are defective by performing systematic testing ○ Test each component in the circuit to locate and verify faulty parts using proper measuring tools
2	• Discuss the procedures for PCB designing, including design software and layout transfer techniques. • Discuss soldering and desoldering. • Discuss the different types of power supplies. • Perform variable regulated power supply assembly.	• **PCB Design Software Simulation** ○ Learners use PCB design software (like KiCad or Fritzing) to create a simple circuit layout, placing components and routing connections digitally. ○ Open the PCB design software, create a basic circuit layout, and simulate component placement and routing • **PCB Layout Transfer Demonstration** ○ Learners observe or perform the process of transferring a PCB layout from paper or digital design onto a physical copper board using methods like the toner transfer or UV exposure technique ○ Transfer a designed PCB layout onto a copper board using a chosen method, preparing it for etching • **Soldering Practice on a Simple PCB** ○ Learners practice soldering electronic

		components (resistors, LEDs, capacitors) onto a pre-made PCB to understand proper technique, heat control, and joint quality ○ Carefully solder each component onto the PCB, ensuring secure and clean connections without overheating • **De-soldering and Component Replacement Exercise** ○ Learners practice removing defective components from a PCB using a soldering iron and desoldering pump or wick, then prepare the board for replacement parts ○ Use proper de-soldering tools to safely remove faulty components and clean the pads for reinstallation • **Power Supply Identification and Comparison Lab** ○ Learners examine various types of power supplies (linear, switching, regulated, unregulated, battery-based) to identify their components, characteristics, and typical applications ○ Inspect different power supplies, note their type, voltage/current ratings, and

		compare their advantages and limitations • **Power Supply Function Demonstration** ○ Learners observe demonstrations of how each type of power supply converts and regulates voltage, including practical examples like adapters, bench supplies, and batteries ○ Demonstrate and explain how each type of power supply works and its typical use in electronic circuits • **Component Preparation and Layout Planning** ○ Learners gather all required components (transformer, rectifier, filter capacitors, voltage regulator ICs, potentiometers, etc.) and plan the physical layout on a PCB or breadboard before assembly ○ Arrange and organize all components on the board according to the schematic before starting the assembly • **Step-by-Step Power Supply Assembly and Testing** ○ Learners solder the components in place, connect the circuit, and test the assembled variable regulated power

		supply to ensure proper voltage adjustment and stability ○ Assemble the circuit step-by-step, solder components securely, and test the output voltage using a multimeter to confirm regulation
3	• Discuss the procedures in servicing appliances with electric motors. • Apply procedures in servicing appliances with electric motors.	• **Electric Motor Component Analysis** ○ Examine common appliances with electric motors (fans, blenders) and identify motor parts, wiring, and safety features ○ Observe and describe the motor components, their functions, and standard servicing steps • **Video/Simulation Demonstration** ○ Watch a video or interactive simulation showing step-by-step servicing of an electric motor ○ Discuss each procedure demonstrated, noting the tools and safety measures used • **Motor Lubrication and Cleaning Lab** ○ Students dismantle small motors to clean, lubricate bearings, and check for mechanical wear ○ Perform lubrication and cleaning of a

		motor, ensuring smooth operation • **Motor Fault Diagnosis Exercise** ○ Learners test appliances with motor issues, identify common faults (e.g., worn brushes, loose wiring), and repair them ○ Apply step-by-step troubleshooting to fix motor-related problems safely
4 to 5	• Discuss the procedures in servicing appliances with heating components. • Apply procedure in servicing appliances with heating components. • Discuss the procedures in servicing rechargeable and electronic-controlled lighting units. • Demonstrate the procedure in servicing electronic controlled lighting units. • Discuss the principles of Closed-Circuit Television (CCTV) system.	• **Heating Element Analysis Lab** ○ Examine appliances like irons, toasters, and water heaters to identify heating elements and safety features ○ Discuss the structure, function, and safety precautions for servicing heating components • **Group Discussion with Case Studies** ○ Review case studies of appliance failures due to heating elements and discuss repair procedures ○ Explain the procedures used to inspect, test, and maintain heating components • **Heating Element Replacement Lab** ○ Students remove and replace defective heating elements in small appliances, following manufacturer instructions ○ Safely replace a heating element and

		test the appliance for proper function • **Functional Testing Workshop** ○ Learners check the continuity and operation of heating components using multimeters before and after servicing ○ Measure and verify the functionality of heating elements after maintenance • **Component Identification and Safety Review** ○ Examine LED lamps, rechargeable torches, and other electronic-controlled lighting units to identify batteries, circuits, and controllers ○ Discuss each component's role and the recommended servicing procedures • **Troubleshooting Scenario Discussion** ○ Present scenarios of faulty lighting units (e.g., battery not charging, LED not lighting) and discuss possible servicing approaches ○ Explain the step-by-step troubleshooting and servicing methods for each scenario • **Hands-On Repair Lab** ○ Students open a rechargeable LED lamp or torch, replace batteries or faulty electronic components, and reassemble

		it ○ Perform the repair procedure step-by-step, ensuring proper reassembly and operation • **Functional Testing of Repaired Units** ○ After servicing, learners test lighting units for proper voltage, current, and illumination ○ Demonstrate the operation of the repaired unit and verify all functions are working correctly • **CCTV Components and Function Analysis** ○ Learners examine sample CCTV cameras, DVR/NVR units, and wiring diagrams to identify key components and their functions ○ Observe and describe each CCTV component and explain how it contributes to the system's operation • **CCTV System Theory Discussion** ○ Students analyze a CCTV system schematic or simulation to discuss signal flow, camera types, and coverage strategies ○ Discuss how video signals travel from cameras to recording and monitoring

		units and the purpose of each component

6	• Demonstrate the procedure in CCTV system installation.
	• Perform CCTV system servicing.
		• **Mock CCTV Installation on a Model Board**
		  ○ Students practice mounting cameras, routing cables, and connecting to a DVR/NVR on a classroom or scale model
		  ○ Install cameras and cables on a model setup according to standard CCTV installation procedures
		• **On-Site Installation Demonstration**
		  ○ Learners observe or perform a small-scale installation in a controlled area, learning proper placement, alignment, and wiring techniques
		  ○ Install and configure a CCTV camera system following safety and operational guidelines
		• **CCTV Troubleshooting Lab**
		  ○ Students identify common faults (e.g., camera not recording, poor signal, loose connections) and discuss possible solutions
		  ○ Diagnose and document faults in a CCTV system and suggest the correct servicing procedures
		• **Hands-On Maintenance and Repair**

		○ Learners clean camera lenses, tighten connections, and test DVR/NVR functions to restore proper operation ○ Perform routine maintenance and minor repairs to ensure the CCTV system functions correctly
7	• Discuss the principles of fire alarm systems. • Perform the procedure in fire alarm system installation.	• **Fire Alarm Components Study** ○ Examine smoke detectors, heat detectors, manual call points, and alarm panels to understand how each component works ○ Discuss the function of each component and how they interact in a fire alarm system • **Fire Alarm System Simulation** ○ Analyze a fire alarm wiring diagram or software simulation to study signal detection, activation, and alarm transmission ○ Explain how signals are transmitted from detectors to the control panel and how the alarm activates • **Model Fire Alarm Installation Lab** ○ Students install detectors, alarm panels, and wiring on a mock-up or scale classroom setup

		○ Install and connect fire alarm system components according to standard wiring and placement procedures • **On-Site Installation Demonstration** ○ Observe or perform installation in a controlled area, ensuring proper detector spacing, wiring, and panel configuration ○ Install a functional fire alarm system following safety and operational protocols
8	• Perform the procedure in fire alarm system servicing. • Discuss audio products and systems.	• **Fire Alarm Testing Lab** ○ Learners test smoke detectors, manual call points, and alarm panels to verify signal transmission and alarm activation ○ Perform functional testing of fire alarm components and record results • **Troubleshooting and Maintenance Workshop** ○ Learners identify faults like false alarms, dead batteries, or wiring issues, and perform corrective maintenance ○ Service the fire alarm system by troubleshooting faults and performing preventive maintenance • **Audio System Component Mapping**

		○ Learners examine common audio devices (speaker, amplifier, microphone, mixer) and map how signals flow through an audio system from input to output ○ Provide learners with actual or printed audio components and let them create a signal flow diagram explaining how sound travels through the system • **Sound System Investigation** ○ Learners analyze different types of audio systems used in homes, schools, and events and compare their components and functions ○ Assign groups to research and present one audio system setup (home theater, PA system, recording system) highlighting its key parts and uses
9	• Perform the installation and operation of audio products and systems. • Perform procedure in servicing audio products and systems.	• **Public Address System Setup Simulation** ○ Learners perform a hands-on installation of a basic PA system including microphones, amplifier, mixer, and speakers ○ In groups, assemble and connect a simple PA system and demonstrate proper microphone testing and sound

		level adjustment • **Audio Troubleshooting Drill** ○ Learners operate an audio system while identifying common operational issues such as feedback, loose connections, or improper volume control ○ Present a pre-configured audio setup with minor faults and ask learners to identify and correct the problems before operating the system • **Audio Equipment Preventive Maintenance** ○ Learners inspect and perform routine maintenance tasks on audio devices including cleaning ports, checking cables, and testing outputs ○ Provide an equipment checklist and guide learners to inspect and perform preventive maintenance on a speaker or amplifier unit • **Fault Diagnosis Workshop** ○ Learners analyze malfunctioning audio devices and identify the source of the problem using basic diagnostic tools ○ Present a defective audio unit and ask learners to follow a step-by-step diagnostic procedure to determine the

		fault

10 to 11	• Discuss television.
	• Perform the procedure in servicing television.
	• Discuss control boards and motor controllers.
	• Perform the procedure in servicing control boards and motor controllers.
	• Discuss sensors and actuators.
	• Perform the procedure in servicing sensors and actuators.
		• **Television Technology Timeline**
		  ○ Learners explore the evolution of television technology from CRT to modern smart TVs
		  ○ Ask groups to create a timeline showing major developments in television technology and present key features of each stage
		• **TV System Components Exploration**
		  ○ Learners identify and explain the main internal and external components of a television system
		  ○ Provide a diagram or disassembled TV image and let learners label and explain the functions of its major components
		• **Television Inspection and Safety Check**
		  ○ Learners practice safe handling and inspection procedures before servicing television units
		  ○ Demonstrate proper safety procedures and have learners perform a guided inspection using a servicing checklist
		• **TV Troubleshooting Simulation**
		  ○ Learners diagnose common television problems such as no power, no display,

		or no sound ○ Provide case scenarios of TV malfunctions and let learners identify possible causes and solutions • **Control Board Component Identification** ○ Learners examine control boards and identify components such as relays, resistors, capacitors, and ICs ○ Provide a sample control board and ask learners to label components and explain their functions • **Motor Controller Function Demonstration** ○ Learners explore how motor controllers regulate speed and direction in electrical systems ○ Demonstrate a simple motor control circuit and let learners explain how the controller affects motor performance • **Basic Circuit Testing Activity** ○ Learners test circuits on control boards using tools such as multimeters to check continuity and voltage ○ Provide a sample board and guide learners in measuring voltage and checking for circuit faults • **Motor Controller Troubleshooting Task**

		○ Learners identify problems in a motor controller system and propose repair steps ○ Present a malfunctioning motor control setup and have learners perform step-by-step troubleshooting • **Sensor Application Exploration** ○ Learners explore common sensors (temperature, motion, light) and how they are used in everyday devices ○ Assign groups to demonstrate how a specific sensor works and identify devices that use it • **Actuator Function Demonstration** ○ Learners observe how actuators convert electrical signals into mechanical movement ○ Demonstrate simple actuators (motor, relay, solenoid) and ask learners to explain how each responds to control signals • **Sensor Testing Activity** ○ Learners test sensors using diagnostic tools and observe output changes based on environmental conditions ○ Provide sensors and a multimeter and

		ask learners to measure and record sensor responses • **Actuator Maintenance and Testing** ○ Learners inspect actuators for proper operation and perform basic servicing procedures ○ Provide a working actuator setup and let learners check connections, clean parts, and test its movement
Suggested Performance Tasks	• **INDIVIDUAL PERFORMANCE TASK - Assembly and Testing of a Regulated DC Power Supply** ○ The learner individually assembles a basic regulated DC power supply (transformer, rectifier, filter capacitor, voltage regulator IC, and output terminals) on a project board or PCB, then tests the output voltage and checks for proper component functionality using a multimeter, following standard electronic assembly and safety procedures. ○ Assemble the DC power supply circuit according to the schematic diagram and test its output voltage and polarity using appropriate measuring instruments while following standard assembly and safety practices. • **GROUP PERFORMANCE TASK - Electronic Circuit Assembly and Functional Testing Project** ○ In groups, learners assemble and test an electronic project (e.g., amplifier circuit, LED flasher, or regulated bench power supply) by interpreting the schematic diagram, properly mounting and soldering components, inspecting connections, and performing functional testing to ensure the circuit operates according to specifications and established standards. ○ Collaboratively assemble, solder, inspect, and test the assigned electronic circuit based on the provided schematic while ensuring correct component placement,	

	proper soldering techniques, and safe testing procedures.
	• **INDIVIDUAL PERFORMANCE TASK - Servicing and Functional Testing of a Motor-Operated or Heating Appliance**
	  ○ The learner individually diagnoses and services a common household appliance (e.g., electric fan, blender, flat iron, or rice cooker) by inspecting components such as motor windings or heating elements, checking wiring continuity, replacing defective parts if necessary, reassembling the unit, and performing operational testing while strictly observing electrical safety procedures.
	  ○ Disassemble, diagnose, repair or replace faulty components, reassemble, and safely test the assigned appliance while following proper servicing and electrical safety standards.
	• **GROUP PERFORMANCE TASK - Comprehensive Servicing of Rechargeable and Electronic-Controlled Lighting Units**
	  ○ In groups, learners troubleshoot and service rechargeable lamps or electronic-controlled lighting units by checking the power supply, battery condition, charging circuit, LED components, and control switches, performing necessary repairs or replacements, and conducting final safety and performance testing in accordance with established servicing standards.
	  ○ Collaboratively inspect, troubleshoot, repair, and test the assigned rechargeable or electronic-controlled lighting unit while ensuring safe handling of electrical components and proper use of testing instruments.
	• **INDIVIDUAL PERFORMANCE TASK - Troubleshooting and Servicing of a CCTV Camera Unit**
	  ○ The learner individually diagnoses and services a malfunctioning CCTV unit (camera, power supply, or DVR/NVR connection) by inspecting cables, checking voltage output, testing video signal transmission, correcting faulty terminations, and restoring system operation while strictly observing electrical and low-voltage safety precautions.
	  ○ Inspect, troubleshoot, repair, and test the assigned CCTV unit while following proper servicing procedures and observing electrical safety standards.

	• **GROUP PERFORMANCE TASK - Fire Alarm System (FAS) Inspection, Troubleshooting, and Restoration Project**
	  ○ In groups, learners conduct systematic inspection and servicing of a simulated fire alarm system, including smoke detectors, manual pull stations, alarm notification devices, and control panel connections, by identifying faults (e.g., open circuit, short circuit, device failure), performing corrective actions, and ensuring the system operates safely and reliably.
	  ○ Collaboratively inspect, diagnose, repair, and function-test the fire alarm system while strictly observing safety precautions and proper servicing procedures.
	• **INDIVIDUAL PERFORMANCE TASK - Troubleshooting and Servicing of an Audio Amplifier or Control Board**
	  ○ The learner individually diagnoses and services a defective audio amplifier or basic motor control board by inspecting components, checking power supply output, testing input/output signals, identifying faulty parts (e.g., capacitors, transistors, relays), performing necessary repairs or replacements, and conducting functional testing while strictly observing electrical and ESD safety precautions.
	  ○ Inspect, troubleshoot, repair, and function-test the assigned audio unit or control board following proper servicing procedures and safety standards.
	• **GROUP PERFORMANCE TASK - Integrated System Servicing of Motor Controller with Sensors and Actuators**
	  ○ In groups, learners service and restore the operation of a simulated motor control system integrated with sensors (e.g., limit switch, proximity sensor) and actuators (e.g., relay-controlled motor, solenoid), by analyzing the wiring diagram, diagnosing faults, correcting wiring or component issues, and performing full system testing while ensuring strict compliance with safety precautions.
	  ○ Collaboratively diagnose, repair, and test the motor control system with its sensors and actuators according to the schematic diagram while observing proper electrical and equipment safety procedures.