AUTOMATION AND RADIO FREQUENCY SYSTEMS MAINTENANCE

UNIT CODE: ENG/CU/ET/CR/06/6/A

Relationship to Occupational Standards
This unit addresses the unit of competency: Maintain automation and radio frequency systems

Duration of Unit: 240 hours

Unit Description
This unit covers competencies required to perform automation and radio frequency systems maintenance. Competencies includes: preparing maintenance schedule, inspecting and testing automation and radio frequency system, preparing a list of maintenance tools, equipment and materials, performing maintenance activities, conducting tests on maintained system and documenting maintenance records

Summary of Learning Outcomes

1. Prepare maintenance schedule
2. Inspect and test automation and radio frequency system
3. Prepare a list of maintenance tools, equipment and materials
4. Perform maintenance activities
5. Conduct system tests
6. Document maintenance records

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods

1. Prepare maintenance schedule	• Meaning of term
	• Maintenance checklist
	• Maintenance work plan
	• Identification of maintenance personnel
	• Types of maintenance and procedures e.g.
	  • Periodic service
	  • Preventive
	  • Breakdown
	• Scheduling maintenance based on service
		• Written tests
		• Oral questioning
		• Practical tests
		• Observation

	manuals	

2. Inspect and test automation and radio frequency system	• Meaning of terms
	• Active and passive radio frequency circuit components
	• Active components e.g.
	  • Transmitter
	  • Receivers
	  • Antenna
	  • Modulators and demodulators
	  • Radio frequency amplifiers
	  • Oscillators
	  • Mixers
	  • Data converters
	  • Phase locked looped circuit
	  • RF transistor amplifiers
	  • Noise and noise figures
	Passive components
	  • Resistors
	  • Capacitors
	  • Inductors
	  • Crystals
	  • Transformers
	• Automation system components
	  • Sensors
	  • Transducers
	  • Actuators
	  • Attenuators
	  • Operational amplifiers
	  • Controllers
	  • PLC
	  • Industrial computers
	• Types of faults
	  • Short circuit faults
	  • Open circuit faults
	  • Grounding faults
	• Identification of faulty components
		• Observation
		• Oral questioning
		• Written tests

	• Automation system isolation points e.g.
	  • Circuit breakers
	  • Fuses
	  • Isolators
	• Identification of maintenance activities
	• Types of tests
	• Troubleshooting procedure in RF circuits
	• Troubleshooting procedure in automation systems
	• Recording test findings	

3. Prepare a list of maintenance tools equipment and materials	• Identification and documentation of maintenance tools
	• Specifications of identified maintenance tools
	• Classification of maintenance tools e.g.
	  • Fastening tools
	  • Measuring tools
	  • Cutting tools
	• Calibration of tools
	• Soldering tools e.g.
	  • Soldering guns
	  • Soldering irons
	  • Resistance soldering sets
	  • Pencil iron
	  • Solder sucker
	  • Electrostatic wrist strap
	• Soldering materials eg
	  • Solder wire
	  • PCBs
	  • Labels and tags
	  • Cable ties
	  • Stick glue
	  • Cables
		• Observation
		• Oral questioning
		• Practical tests
		• Written tests

3. Perform maintenance activities	• Identification faulty components in automation and RF systems • Repair/Replacement of faulty components • Maintenance activities e.g.	• Observation • Oral questioning • Practical tests • Written tests

	• Disassembling • Cleaning • Tightening • Soldering • Assembling • Setting system parameters • Fill in maintenance checklist • Disposal of waste materials e.g. • Old batteries • Lugs and screws • Tapes • Cable sheaths • PCBs • Off cuts • EHS regulations • OSHA regulations	
4. Conduct system tests	• Visual inspection • Identification of test points • Types of tests • Continuity tests • Transmitter tests • Receiver tests • Output power • Power spectral density • Frequency stability • Test running the system • Safe test procedures • Recording of test results • IEE regulations	• Observation • Oral questioning • Practical tests • Written tests
5. Document maintenance records	• Maintenance report writing • Procedure of writing maintenance report • Components of maintenance report • Checklist documentation • Test results documentation • Maintenance report documentation	• Observation • Oral questioning • Practical tests • Written tests

Suggested Methods of Instruction

- Demonstration by trainer
- Practice by the trainee
- Field trips
- On-job-training
- Discussions

Recommended Resources

Tools

- Set of screw drivers
- Set of spanners and wrenches
- Power tools
- Cutting tools
- Pliers
- Lifting and tensioning tools
- Tool box
- Phase tester

Materials and supplies

- Stationery
- Cables
- PCBs
- Service parts

Equipment

- PPE –hand gloves, dust coat, dust masks
- Multimeter
- Clamp meter
- Earth electrode resistance meter
- Phase sequence meter

Reference materials

- Service manuals
- IEE regulations
- Organization procedures manual
- EHS regulations
- OSHA regulations