

1. Module details

Module name Security Systems Programming and Diagnostics

Suggested structured learning time 40 hours

Module code NUE 484

Discipline code 0703225 Electrotechnology

2. Module purpose

To enable students to develop the knowledge and skills in larger and or more specialised security installations, including the building maintenance system.

3. Prerequisite modules

NBB 022 Occupational Health and Safety.

4. Relationship to competency standards

This module provides some of the knowledge and skills underpinning competency in the standard: National Electrotechnology Industry Standards, Unit NES209.

5. Content**Introduction to control systems**

- Block diagram of a control system (input, process, output)
- Methods of control
 - Relay
 - Static logic
 - Programmable
- Introduction to PLC (programmable logic controller) systems
 - Brief history of PLCs
 - Modern trends
 - Typical applications
- Advantages and disadvantages of PLCs
- Block diagram of PLC system

Basic PLC operation

- Definitions and terminology
 - PLC
 - I/O
 - Memory (RAM, ROM, E2PROM)
 - CPU
 - Power supply
- Scan cycle

- Basic programming rules
- Addressing for I/O
- Halt
- Run

Programming (using a hand programmer and proprietary computer software control)

- Flowcharts/steps to use when programming
- Clearing memory
- Ladder format
- Boolean/mnemonic/statement list format
- Series circuits
- Parallel circuits
- Latching circuits
- Stack register operation
- Combination series/parallel circuits
- Inversion elements
- Timers
- Monitor discrete I/O and timer/counter values
- Edit (insert and delete elements)

Connect discrete input and output devices to a PLC

- Interfacing PLC to various sensors related to the building security system
- Combining PLC function with control panel operation

Upgrading

- Firmware
- Software

Building maintenance system

- Interface
- Access control
- Lift control
- CCTV control
- Doors
- Lights
- Fire
- Amenities
- Energy conservation

Control Equipment

- Programming
- Loading software using PC (personal computer)
- Partitioning

- Zones
- Areas
- Systems
- Operating
- Fault finding

Laptop computers

- DOS
- Win 3.11
- Win 95
- Win 98

Codepads

- General operations

6 Assessment strategy

Assessment methods

Assessment should be progressive reflecting a holistic approach to ensure the module purpose is met. To assist in ensuring validity, reliability and fairness, assessment instruments should include practical exercises, assignments and written tests consisting of a number of item types, such as multiple choice, short answer and problem solving.

Conditions of assessment

Learning and assessment will take place in a classroom/laboratory environment and in a real or simulated security installation.

7 Learning outcome details

Learning outcome 1

Describe the major differences between three basic forms of electrical control.

Assessment criteria

- 1.1 State the major differences between relay, static and programmable control.
- 1.2 Draw a block diagram representation of a programmable logic controller.
- 1.3 List advantages and/or disadvantages of programmable control over relay control.
- 1.4 List applications for programmable controllers.

Learning outcome 2

State the basic operating principles of PLC.

Assessment criteria

- 2.1 List the steps in a basic scan cycle.

	2.2	Define terms such as I/O, CPU, RAM, ROM.
	2.3	Describe a typical addressing system for a PLC and give examples.
	2.4	For a given PLC, identify inputs and outputs.
Learning outcome 3		Write, test, edit and monitor programs, which include series elements, basic timers and counters by using a hand program loader and a proprietary computer software control system.
Assessment criteria	3.1	Write programs to suit given conditions.
	3.2	Load programs into a PLC.
	3.3	Test the operation of programs written.
	3.4	Use the monitoring function to verify circuit conditions and check the current values of timers and counters.
	3.5	Use editing features to make minor program changes.
Learning outcome 4		Connect I/O devices to a PLC and prove their operation.
Assessment criteria	4.1	With the aid of a diagram connect input and output devices to a PLC.
	4.2	Explain the implications of programming normally closed, field devices.
	4.3	State the hardware changes necessary when converting a relay controlled process, of a programmable controlled process.
	4.4	Interface various sensors to the PLC and the control panel for a specialised system.
Learning outcome 5		Demonstrate the various methods of programming different types of control equipment.
Assessment criteria	5.1	Demonstrate how to access program mode for different types of control panels.
	5.2	Demonstrate how to program different types of control equipment from connected codepads.
	5.3	Demonstrate how to program different types of control equipment from a laptop or PC.

	5.4 Demonstrate the ability to perform fault-finding techniques.
Learning outcome 6	Discuss the correct procedure to perform firmware and software upgrades in electronic security systems.
Assessment criteria	<p>6.1 List the safety precautions required when handling electronic components.</p> <p>6.2 Identify the compatibility problems when upgrading firmware or software.</p>
Learning outcome 7	Use laptops and PCs to program and perform fault-finding diagnostics of different types of control equipment.
Assessment criteria	<p>7.1 Program a control panel from a laptop via a direct connection.</p> <p>7.2 Program a control panel from a laptop or a PC via a modem using a telephone line.</p> <p>7.3 Demonstrate the ability to perform DOS, Win 3.1, Win 95 and Win 98 commands to;</p> <ul style="list-style-type: none"> – Open a file – Save a file – Copy a file – Rename a file – Delete a file – Make a directory – Delete a directory – Format a diskette.
Learning outcome 8	Describe various types of codepads and the commands required for correct operation of the system.
Assessment criteria	8.1 Perform various tasks on a control panel via its codepad.
Learning outcome 9	Demonstrate a working knowledge of the building maintenance system.
Assessment criteria	9.1 With the aid of a building electrical wiring diagram to AS1100, demonstrate how the security system can interface with the control of several building features.

<p>Learning outcome 10</p>	<p>9.2 Discuss the need for a licensed electrical contractor to connect mains power cables and equipment.</p> <p>Program control equipment to user requirements.</p> <p>10.1 In accordance with control equipment installation and programming instructions, set up a system that incorporates partitioning in several zones and areas.</p> <p>10.2 Discuss the limitations with non-dedicated partition codepads in a partitioned system.</p> <p>10.3 Use a PC to download a dedicated or duplicated program to a control panel.</p> <p>10.4 Perform a panel review.</p> <p>10.5 Use codepad to program and review panel.</p> <p>10.6 Demonstrate user functions.</p>
<p>8. Delivery of the module</p> <p>Delivery strategy</p>	<p>Delivery strategies must be suitable for learning both theoretical and practical aspects described in the module purpose. It is considered that the most effective way to achieve this is by the integration of theory and practice where students learn by experimentation and through research and laboratory reports. It is recommended that learning and assessment be facilitated in a holistic manner, which may require a learning outcome sequence other than that indicated in the module.</p>
<p>Recommended resource requirements</p>	<p>Minimum teacher qualifications:</p> <p>Certificate IV Assessment & Workplace Training</p> <p>Trade qualifications in the electrical/electronic discipline and a demonstrated high level of competency in security systems programming and diagnostics. This would normally be achieved by relevant workplace experience in this field.</p> <p>Non human resources:</p> <p>Resources should be sufficient for students to carry out practical exercises on an individual basis. This will require as a minimum:</p> <ul style="list-style-type: none"> • Digital and analogue multimeters

- PLCs
- A selection of alarm control panels and sensors
- A selection of upload/download software
- Rolls of 4 core cable
- Suitable PCs for programming
- Modems

References

Crispin, A. J. (1990). Programmable Logic Controllers and their engineering applications. Sydney: McGrall Hill.

User Guides

Where this module is used in an approved Traineeship or Apprenticeship program students should be advised to obtain, where available, respective EEQSBA¹ *User Guides* (these outline in detail what training and work performance the student is required to undertake for the program).

Occupational health and safety requirements

A safe and healthy environment will be provided for students and teachers, as well as safety procedures followed with regard to teaching/learning activities.

¹ EEQSBA - ElectroComms and EnergyUtilities Qualifications Standards Body of Australia Ltd