

1 Module Details	
Module Name	Security Systems Programming and Diagnostics
Nominal duration	It is expected that students with the appropriate entry knowledge and skills will successfully complete this module in 36 to 40 hours
Module code	NUE484
Discipline code	0703230 Electronic Installation and Maintenance
2 Module purpose	To enable the student to develop the knowledge and skills required in larger and or more specialised security installations, including the building maintenance system.
3 Prerequisites	Security Systems 1 (NUE480) and Security Systems 2 (NUE483)
4 Relationship to competency standards	This module provides some of the knowledge and skills underpinning competency in the following standards: National Electrotechnology Industry Standards, Units Metals and Engineering Industry Standards, Units
5 Content	<ol style="list-style-type: none">1. Introduction to Control Systems<ul style="list-style-type: none">• block diagram of a Control System (input, process, output)• methods of control<ul style="list-style-type: none">- relay- static logic- programmable• introduction to PLC (programmable logic controller) systems<ul style="list-style-type: none">- brief history of PLCs- modern trends- typical applications• advantages and disadvantages of PLCs• block diagram of PLC system2 Basic PLC operation<ul style="list-style-type: none">• definitions and terminology<ul style="list-style-type: none">- PLC- I/O- memory (RAM, ROM, E²PROM)- CPU- power supply• scan cycle• basic programming rules

- addressing for I/O
 - halt
 - run
- 3 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)
- 4 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
- 5 Upgrading
Firmware
software
- 6 Building maintenance system
- Interface
 - Access control
 - Lift control
 - CCTV control
 - Doors
 - Lights
 - Fire
 - Amenities
 - Energy conservation
- 7 Control equipment
- Programming
 - Loading software using PC (Personal Computer)
 - Partitioning:
 - Zones
 - Areas
 - Systems
 - Operating
 - fault finding
- 8 Laptop computers
- DOS

	<ul style="list-style-type: none"> ▪ Win 3.11 ▪ Win 95 ▪ Win 98
	<p>9 Codepads</p> <ul style="list-style-type: none"> ▪ 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	Note: for learning outcomes 1 through 4, some larger system control panels could be used in lieu of a PLC as the principle of operation is similar.
Learning Outcome 1	Describe the major differences between three basic Forms of electrical control.
Assessment criteria	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 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 systems 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, parallel elements, combination series

	Parallel elements, basic timers and counters by using a hand program loader and a proprietary computer software control system.
Assessment criteria	<ul style="list-style-type: none">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 counters3.5 Use editing features to make minor program Changes.
Learning Outcome 4	Connect I/O devices to a PLC and prove their operation.
Assessment criteria	<ul style="list-style-type: none">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	<ul style="list-style-type: none">5.1 Demonstrate how to access program mode for different types of control panels5.2 Demonstrate how to program different types of control equipment from connected codepads5.3 Demonstrate how to program different types of control equipment from a laptop or a PC5.4 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	<ul style="list-style-type: none">6.1 List the safety precautions required when handling electronic components6.2 Be familiar with the compatibility problems when upgrading firmware or software
Learning outcome 7	Use laptops and PC's 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</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	To 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	<p>9.1 With the aid of a building electrical wiring diagram to AS1100 show how the security system can interface with the control of several building features.</p> <p>9.2 Discuss the need for a licensed electrical contractor to connect to mains power cables and equipment.</p>
Learning outcome 10	Program control equipment to user requirements.
Assessment criteria	<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>
8 Delivery of the	

module**Delivery strategy**

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.

Resource requirements

Resources should be sufficient for students to carry out practical exercises on an individual basis. This will require, as a minimum:

- 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 PC's for programming
- Modems

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.