

**1. Module details****Module name****Refrigeration / HVAC Direct Digital Controls****Module duration**

It is expected that students with the appropriate entry knowledge and skills will successfully complete this module in 36 - 40 hours.

**Module code**

NUE353

**Discipline code**

0703310

**2. Module purpose**

This module provides the student with the knowledge and skills to effectively develop, configure, commission and fault find commercially available Direct Digital Control Systems used in Refrigeration and HVAC applications.

**3. Prerequisites**

EA132 Refrigeration / HVAC Controls 1.  
NR15 Refrigeration Controls.

**4. Relationship to competency standards**

This module provides part of the underpinning knowledge and skills in the 'Evidence Guide' of specific units of competency in the National Electrotechnology Training Package and provides similar support, where mapped, to equivalent units in the National Metals and Engineering Competency Standards. For details refer to the module to unit maps, available from NUEITAB.

**5. Content****Computer based control fundamentals**

Definitions

Principles

**Controller configuration**

Equipment

Zone level controllers

System level controllers

**Controller software**

Operating software

Application software

**Controller programming**

System diagrams

Control diagrams

Configuration

Programming

Initialisation

EMS, BMS

SCADA System

Lan, Bacnet

	<p><b>Sensors and actuators</b></p> <p><b>Applications</b>  Refrigeration systems  HVAC systems  Logic analysis  Energy management  Asset management  Life cycle</p>
<b>6. Assessment strategy</b>	
<b>Assessment methods</b>	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.
<b>Conditions of assessment</b>	Learning and assessment will take place in an environment that is conducive to a learner's development.
<b>7. Learning outcome details</b>	
<b>Learning outcome 1</b>	<b>Describe Direct Digital Control terminology.</b>
<b>Assessment criteria</b>	1.1 Identify and define the basic Direct Digital Control components. 1.2 Define various terms.
<b>Learning outcome 2</b>	<b>Describe the operation of the basic Direct Digital Control system.</b>
<b>Assessment criteria</b>	2.1 Describe the operating principle of a basic Direct Digital Control. 2.2 List and specify the various controller inputs and outputs. 2.3 Describe the function of A to D and D to A converters.
<b>Learning outcome 3</b>	<b>Identify and explain the operation of various sensors.</b>
<b>Assessment criteria</b>	3.1 Identify various types of sensors. 3.2 Describe the purpose, application and operation of various sensors.

**Learning outcome 4**

**Identify and explain the operation of various controllers.**

**Assessment criteria**

- 4.1 Identify various types of controllers.
- 4.2 Describe the purpose and operating various controllers.
- 4.3 Draw a simple control system circuit using each controller.
- 4.4 Draw control schedules and determine the controllers settings.

**Learning outcome 5**

**Identify and explain the operation of actuators.**

**Assessment criteria**

- 5.1 Identify various types of actuators.
- 5.2 Describe the purpose, application and operation of various actuators.
- 5.3 Draw a simple control system circuit using each type of actuator.

**Learning outcome 6**

**Draw a refrigeration / HVAC direct digital control system.**

**Assessment criteria**

- 6.1 Draw a control system diagram.
- 6.2 Explain the operation of the control system.

**Learning outcome 7**

**Commission and fault find direct digital control systems for refrigeration / HVAC systems.**

**Assessment criteria**

- 7.1 Measure all input and output values at the controller and compare to manufactures specifications.
- 7.2 Calibrate and adjust controller settings.
- 7.3 Adjust actuator setting to system requirement.
- 7.4 Identify various control system faults and rectify.

**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 method to achieve this is by integration of theory and practice where students learn by experimentation, research and reports. It is recommended that learning and assessment be facilitated in a holistic manner that may require learning outcome sequence other than that indicated in the module.

**Resource requirements**

*Recommended Text:*

Engineering Manual of “Automatic Control”, SI Edition for Commercial Building , Honeywell, 1989.

*Additional References:*

Control Systems for Heating, Ventilation and Air.

Conditioning, Forth Edition, R.W. Haines, Van Wostrand Reinhold, 1993.

HVAC Controls and Systems, I. John Lever Hagen, 1993.

Direct Digital Control Systems Diagrams for Air Conditioning Systems.

**Occupational health and safety requirements**

A safe and healthy environment will be provided for students and teachers as well as the particular safety procedures followed as part of the learning / teaching activity and content.