

1. Module details**Module name****Refrigeration / HVAC Electronic 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

NUE354

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 analogue Electronic 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**Control fundamentals**

Electronic control terminology
Definitions

Electronic control basics

Voltage supplies
Analogue control
Controller basics
Inputs and outputs

Controllers

Variable (e.g temperature)
Step
Enthalpy
Compensation
Time proportional

Sensors

Temperature
Humidity
Enthalpy
Pressure

Velocity

Actuators

Water valves

Dampers

Relays

Control systems

Refrigeration systems

Ventilation systems

Mult-zone A/C systems

Variable air volume A/C systems

Face and by-pass system

Economiser system

Chilled water systems

Hot water systems

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 an environment that is conducive to a learner's development.

7. Learning outcome details

Learning outcome 1

Describe analogue electronic control terminology.

Assessment criteria

1.1 Identify and define the basic electronic control components.

1.2 Define various terms.

Learning outcome 2

Describe the operation of the basic electronic control system.

Assessment criteria

2.1 Describe the operating principle of a basic analogue electronic control.

2.2 List and specify the various controller inputs and outputs.

2.3 List and specify analogue and two position / on/off outputs.

Learning outcome 3

Identify and explain the operation of various sensors.

Assessment criteria

- 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 operation of various controllers.
- 4.3 Draw a simple control system circuit using each type of controller.
- 4.4 Draw control schedules and determine the controller 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 actuator type.

Learning outcome 6

Draw a refrigeration / HVAC analogue electronic 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 analogue electronic control systems for refrigeration / HVAC systems.

Assessment criteria

- 7.1 Measure all input and output values at the controller and compare to manufacturers' 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.

Electronic 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.