1. Module details

Module name

Refrigeration / HVAC Controls 1

Module duration

One Module (36-40hrs)

Module code

EA132.1

Discipline code

TBA

2. Module purpose

To enable students to understand the basic operation of various Refrigeration / HVAC Control Systems, with an emphasis on the interpretation of electrical control system drawings and specifications

3. Prerequisites

NR15 Air Conditioning Controls

4. Relationship to competency standards

NES 404e, NES503e, NES303e

5. Content

Control Fundamentals

- Control terminology
- Basic Refrigeration and HVAC system characteristics
  - Purpose of refrigeration & HVAC System
  - Purpose of their control system
- Basic control system characteristics
  - open loop, closed loop and cascade
- Overview of Types of Control Systems
  - Electric
  - Electronic
    - Analog
    - Digital
    - PLC
    - BMS / BAS
  - Pneumatic
- Basic Control System Components
  - Sensors
  - Controllers
  - Actuators, including flow control devices

Types of Electrical Control Equipment

- Classification of circuits
- Two position control
- Floating control
- Proportional
- Step Controls
- Sensors
- Controllers

Electrical Control Systems and circuit diagrams
- Electrical control system diagram, drawings
- Electrical control system circuit diagrams

Control Systems Applications
- Air handling system controls
- Ventilation
- Heating
- Humidification
- Cooling
- Dehumidification
- Heating
- Building airflow system control
- Airflow control - singles and multi - zones
- Chiller boiler and distribution system control
- Chilled water
- Boiler
- Distribution systems

6. Assessment strategy

Assessment methods

Short Answer Questions/Assignment

Practical sessions

Conditions of assessment

7. Learning outcome details

Learning outcome 1

Locate and identify the essential elements of a Refrigeration / HVAC control system in industrial applications

Assessment criteria

1.1 Define the various terms

1.2 Differentiate between the various control system characteristics and components

1.3 Identify and describe the different control methods

Learning outcome 2

Identify and explain the function and operation of various electrical control system sensors

Assessment criteria

2.1 Identify and explain the operation of sensors

2.2 Describe the purpose , application and operation of various sensors

Learning outcome 3	**Identify and explain the function and operation of various electrical control system controllers**
Assessment criteria	3.1 Identify various types of controllers 3.2 Describe the purpose and operation of various controllers 3.3 Draw a simple control system circuit using each controller types
Learning outcome 4	**Identify and explain the operation of various electrical control system actuators and flow controls**
Assessment criteria	4.1 Identify the various types of control devices 4.2 Describe the purpose, application and operation of various control devices 4.3 Identify the various types of flow controls 4.4 Describe the purpose, application and operation of various flow controls, valves, dampers etc 4.5 Draw a simple control system circuit using each control device and flow control
Learning outcome 5	**Draw an electrical control system for Refrigeration / HVAC systems**
Assessment criteria	5.1 Draw control system diagrams 5.2 Explain the operation of each of the control systems drawn
Learning outcome 6	**Commission and fault find an electric control system for Refrigeration / HVAC Systems**
Assessment criteria	6.1 Calibrate the controls utilised in the control system according to specifications and job requirements 6.2 Record the results and procedures in accordance with established commissioning procedures 6.3 Final inspections and performance checks to confirm that the equipment is performing to design, and manufactures specification 6.4 Identify various control system faults and rectify

8. Delivery of the module

Delivery strategy	Class room , Practical workshops, on site , by assignment
Resource requirements	**References** Engineering Manual of "Automatic Control" S I Edition for Commercial Buildings, Honeywell 1989. Control Systems for Heating, Ventilating and Air Conditioning. Fourth Edition, R W Haines, Van Wostrand Reinhold.
Occupational health and safety requirements	Students should be made aware of occupational health and safety issues in all situations and be expected to demonstrate safe-working practices at all times.