



National Unit Specification: general information

UNIT Digitally Integrated Security and Environmental Control Systems
(SCQF level 6)

CODE F5HB 12

SUMMARY

This Unit is intended for candidates with little or no prior knowledge of integrated wiring systems within electrical installations.

The aim of this Unit is to develop the candidate's knowledge and understanding of the centralised digital control systems for an electrical installation and how the subsystems are integrated through a central control. The Unit will introduce candidates to the design requirements of such systems and the equipment required to install them in domestic premises. Candidates will be able to develop their knowledge and understanding of wireless networking techniques for electrical circuits within the domestic environment.

Candidates will be able to develop their knowledge and understanding of the control and management of home security and surveillance systems, heating, ventilation and air-conditioning (HVAC) and access lighting systems.

This Unit may form part of a National Qualification Group Award or may be offered on a free-standing basis.

OUTCOMES

- 1 Describe the networking and digital control techniques of an integrated electrical installation.
- 2 Describe the control and management of home security and surveillance systems.
- 3 Describe the control and management of integrated heating, ventilation and air-conditioning (HVAC) systems.
- 4 Describe the control and management of integrated lighting systems.

Administrative Information

Superclass: XJ

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RECOMMENDED ENTRY

While entry is at the discretion of the centre, candidates would normally be expected to have attained one of the following, or equivalent:

- ◆ Standard Grade Mathematics — Credit level
- ◆ Standard Grade Technological Studies — Credit level
- ◆ Standard Grade Physics — Credit level
- ◆ NQ Unit *Alarm and Communications* (SCQF level 6)
- ◆ NQ Unit *Illumination and Emergency Lighting* (SCQF level 6)

It is recommended that candidates should have a basic knowledge of PC operating systems and be familiar with computing terminology, systems and hardware.

CREDIT VALUE

1 credit at SCQF level 6 (6 SCQF credit points at SCQF level 6*).

**SCQF credit points are used to allocate credit to qualifications in the Scottish Credit and Qualifications Framework (SCQF). Each qualification in the Framework is allocated a number of SCQF credit points at an SCQF level. There are 12 SCQF levels, ranging from Access 1 to Doctorates.*

CORE SKILLS

There is no automatic certification of Core Skills in this Unit.

This Unit provides opportunities for candidates to develop aspects of the following Core Skills:

- ◆ Information Technology (SCQF level 6)
- ◆ Communication (SCQF level 6)

These opportunities are highlighted in the Support Notes of this Unit Specification.

National Unit Specification: statement of standards

UNIT Digitally Integrated Security and Environmental Control Systems (SCQF level 6)

Acceptable performance in this Unit will be the satisfactory achievement of the standards set out in this part of the Unit Specification. All sections of the statement of standards are mandatory and cannot be altered without reference to SQA.

OUTCOME 1

Describe the networking and digital control techniques of an integrated electrical installation.

Performance Criteria

- (a) Describe clearly the principle of central digital control within an integrated electrical installation.
- (b) Identify correctly the subsystems of a central digital control system for a domestic electrical installation.
- (c) Describe correctly the concepts of embedded and PC-based control systems.
- (d) Describe correctly the need for basic networking protocols.
- (e) State correctly network operating systems used in integrated electrical installations.

OUTCOME 2

Describe the control and management of home security and surveillance systems.

Performance Criteria

- (a) Describe correctly the purpose of security monitoring formats.
- (b) Describe correctly the concept of wireless security and surveillance systems.
- (c) Describe correctly the operation of access control devices.
- (d) Identify correctly surveillance camera types.
- (e) Describe correctly camera applications.

OUTCOME 3

Describe the control and management of integrated heating, ventilation and air-conditioning (HVAC) systems.

Performance Criteria

- (a) Describe correctly the terms 'Control Layer' and 'Communication Layer' in relation to HVAC control systems.
- (b) Explain correctly the concept of zoning in HVAC systems.
- (c) Identify correctly HVAC control devices.
- (d) Describe correctly the concept of controller programming HVAC systems including remote control.

National Unit Specification: statement of standards (cont)

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OUTCOME 4

Describe the control and management of integrated lighting systems.

Performance Criteria

- (a) Describe correctly the concepts of centralised and distributed lighting control.
- (b) Identify the benefits of time and event-driven management of lighting schemes.
- (c) Identify correctly lighting control protocols.
- (d) Identify correctly lighting control applications.

EVIDENCE REQUIREMENTS FOR THIS UNIT

Evidence is required to demonstrate that candidates have achieved all Outcomes and Performance Criteria.

Written and/or recorded oral evidence should be produced to demonstrate that the candidate has achieved all the Outcomes and Performance Criteria. The evidence should be produced under supervised, controlled conditions.

An appropriate form of assessment could be a single, holistic exercise incorporating all the Outcomes and Performance Criteria. Alternatively, a series of assessment exercises maybe used to produce evidence for each Outcome or combination of Outcomes. The total assessment time should be no more than two hours irrespective of the Assessment approach used.

The assessment parameters are as follows:

With regard to Outcome 1:

- ◆ subsystems of a central digital control system to include:
 - central processing computer unit
 - keyboard
 - monitor
 - internet connection
 - automated door locks and alarm system
 - access monitor and sensor
 - HVAC control
 - temperature sensor
 - light sensor

National Unit Specification: statement of standards (cont)

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With regard to Outcome 2:

- ◆ THREE security monitoring formats to be described ie
 - Security Industry Association format (SIA)
 - contact ID format
 - 3/1 format

- ◆ THREE access control devices to be described from:
 - keypads
 - card readers
 - biometric readers
 - proximity readers
 - door strikes
 - electronic deadbolts
 - magnetic locks

- ◆ TWO surveillance camera types to be identified from:
 - Internet Protocol (IP) type
 - analogue type
 - hybrid type

- ◆ THREE camera applications to be described from:
 - indoor/outdoor
 - day/night
 - fixed/animated
 - surveillance
 - recording

With regard to Outcome 3:

- ◆ the thermostats and programme control devices to be identified

With regard to Outcome 4:

- ◆ TWO lighting control protocols to be identified from:
 - Z-Wave
 - ZIGBEE
 - X10
 - Universal Powerline Bus (UPB)

- ◆ THREE lighting control application to be identified from
 - indoor
 - outdoor
 - dimming
 - scene lighting occupation/motion sensing
 - window/shade control
 - energy management

National Unit Specification: support notes

UNIT Digitally Integrated Security and Environmental Control Systems (SCQF level 6)

This part of the Unit Specification is offered as guidance. The support notes are not mandatory.

While the exact time allocated to this Unit is at the discretion of the centre, the notional design length is 40 hours.

GUIDANCE ON THE CONTENT AND CONTEXT FOR THIS UNIT

This is an Optional Unit within the National Qualification Group Award in Electrical Engineering at SCQF level 6 but may also be offered as a free-standing Unit.

The aim of this Unit is to provide candidates with an overview of the integrated control and management of security and environmental systems.

The Unit will enable candidates to interpret the basic requirements of integrated control and management systems with particular reference to security and surveillance systems, HVAC systems and lighting systems.

Candidates should have a basic knowledge of PC operating systems and be familiar with computing terminology, systems and hardware.

Candidates will be provided with opportunities to develop their knowledge of control and communication protocols and the sub-systems required to control and manage integrated systems.

The characteristics and requirements of security and surveillance systems, HVAC systems and lighting systems should be taught along with the benefits and limitations of programmed control.

GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS UNIT

This Unit should be delivered in an environment which promotes interactive learning and encourages candidates to become familiar with the techniques and terminology of the control and management systems being considered. This could be a dedicated workshop having appropriate digital security and environmental control technology.

Candidates should be provided with practical devices for the programming and control of electrical installations and should be encouraged to use the technology of PC control.

Control and communication protocols should be explained and discussed along with networking operating systems.

Case studies and discussion groups are some of the methods which could be used to engage with candidates to emphasise the importance of the topics included in this Unit.

National Unit Specification: support notes (cont)

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A practical approach should be used to provide a learning bias which candidates will relate to. This should be through the presentation of typical practical systems showing clearly the features and operating principles of the systems.

The internet is a useful source of information on this topic and candidates should be encouraged to use this resource.

Candidates should be encouraged to discuss and debate the various issues raised by the subject content in order that this interaction might stimulate their thought processes and reinforce the learning.

It is recommended that the Outcomes should be delivered in the sequence given in the ‘statement of standards’.

OPPORTUNITIES FOR CORE SKILL DEVELOPMENT

As candidates undertake this Unit, they are given an overview of the integrated control and management of security and environmental systems which will add to their understanding of terminology, systems and hardware. Access to workshop facilities with opportunities to use digital security and environmental control technology will make them more familiar with control and communication protocols and the sub-systems required for control and management of integrated systems.

Although skills in Communication are not formally assessed candidates have to demonstrate in depth understanding of complex information relating to the management and integration of security and environmental control systems. They could be encouraged to undertake on line research, analysing and evaluating relevant technical information. Group discussion during formative work would reinforce understanding of various systems and develop oral communication skills in a work related context. Guidance should be provided on the standards required for written evidence, which should be coherent, clearly expressed and supported by accurately presented graphics.

GUIDANCE ON APPROACHES TO ASSESSMENT FOR THIS UNIT

Opportunities for the use of e-assessment

E-assessment may be appropriate for some assessments in this Unit. By e-assessment we mean assessment which is supported by information and communications technology (ICT), such as e-testing or the use of e-portfolios or e-checklists. Centres which wish to use e-assessment must ensure that the national standard is applied to all candidate evidence and that conditions of assessment as specified in the Evidence Requirements are met, regardless of the mode of gathering evidence. Further advice is available in *SQA Guidelines on Online Assessment for Further Education (AA1641, March 2003)*, *SQA Guidelines on e-assessment for Schools (BD2625, June 2005)*.

National Unit Specification: support notes (cont)

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The assessment of this Unit could be a single, holistic exercise, lasting not more than two hours, incorporating all the Outcomes and Performance Criteria, or a series of assessment events covering each Outcome on an individual basis, or any combination of Outcomes. The total assessment time should be no more than two hours.

This assessment could contain the four elements specified in the Unit Outcomes ie

- ◆ describe the networking and digital control techniques of an integrated electrical installation
- ◆ describe the control and management of home security and surveillance systems
- ◆ describe the control and management of integrated home access systems
- ◆ describe the control and management of integrated lighting systems

These four elements could be integrated into one assessment with the achievements of each element being clearly recorded for each candidate.

CANDIDATES WITH DISABILITIES AND/OR ADDITIONAL SUPPORT NEEDS

The additional support needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments, or considering alternative Outcomes for Units. Further advice can be found in the SQA document *Guidance on Assessment Arrangements for Candidates with Disabilities and/or Additional Support Needs* (www.sqa.org.uk).