National Unit specification: general information

Unit title: Green IT (SCQF level 6)

Unit code: FX1R 12

Superclass: CA

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Summary

This Unit provides candidates with the ability to implement strategies that will reduce power consumption of computers, network devices, and office equipment to create a more environmentally-friendly working environment. Candidates will also investigate initiatives that lessen the impact of a company's workforce, and disposal of hazardous materials. Candidates should also gain an understanding of how the need for equipment can be reduced through the use of virtualisation. Ultimately, candidates will be able to apply this knowledge to develop and implement a company-wide Green IT policy.

This is an optional Unit in the NC Computing: Technical Support (SCQF level 6) but is also available for candidates wishing to study the Unit on its own.

This Unit is suitable for a wide range of candidates and it is particularly appropriate for those who are interested in a career in IT resource management.

Outcomes

1 Demonstrate an understanding of efficient energy and power management techniques in the context of IT.
2 Explain different techniques and technologies that will help to reduce an organisation's impact on the environment.
3 Explain the purpose and application of virtualisation technology.
4 Describe and use environmentally sound techniques for the effective disposal of hazardous materials.
5 Develop a Green IT policy for a given scenario.

National Unit specification: general information (cont)

Unit title: Green IT (SCQF level 6)

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:

- Computing Studies (SCQF level 5)
- Information and Communication Technology (SCQF level 5)

Credit points and level

1 National Unit 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

Opportunities to develop aspects of Core Skills are highlighted in the Support Notes of this Unit specification.

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

National Unit specification: statement of standards

Unit title: Green IT (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

Demonstrate an understanding of efficient energy and power management techniques in the context of IT.

Performance Criteria

(a) Create an energy efficient power plan.
(b) Explain power management approaches:

Outcome 2

Explain different techniques and technologies that will help to reduce an organisation's impact on the environment.

Performance Criteria

(a) Identify ways of increasing efficiency and reducing power consumption in the workplace.
(b) Explain strategies employed to develop an energy-conscious workforce.

Outcome 3

Explain the purpose and application of virtualisation technology.

Performance Criteria

(a) Identify the general levels of virtualisation.
(b) Describe server virtualisation, its advantages and disadvantages.
(c) Describe client virtualisation, its advantages and disadvantages.
(d) Identify the security implications of virtualisation.
(e) Identify best practice when utilising virtualisation.

Outcome 4

Describe and use environmentally sound techniques for the effective disposal of hazardous materials.

Performance Criteria

(a) Use EPEAT to evaluate prospective purchases of equipment.
(b) Describe the terms MSDS and RoHS, and how they are utilised in identifying hazardous materials.
(c) Identify the various disposal options available for the disposal of electronic equipment

National Unit specification: statement of standards (cont)

Unit title: Green IT (SCQF level 6)

Outcome 5

Develop a Green IT policy for a given scenario.

Performance Criteria

(a) Identify Green IT-related organisations.
(b) Identify Green IT-related assessment tools.
(c) Identify Green IT-related standards.
(d) Devise a Green IT policy.

Evidence Requirements for this Unit

Evidence is required to demonstrate that candidates meet the requirements of all Outcomes and Performance Criteria. Evidence is required to demonstrate that the candidate can:

For Outcome 1

- Use BIOS and OS settings to create an energy efficient power plan.
- Explain the following power management approaches:
  - The Energy Star Program
  - Consolidation of office equipment
  - Power over Ethernet (PoE)
  - Green cooling strategies

For Outcome 2

- Identify the following environmental beneficial techniques as a means to improving power consumption in the workplace:
  - active and passive heating and cooling
  - HVAC scheduling and monitoring
  - solar energy
  - wind power
  - green rooftops
  - lightbulbs
- Explain the environmental benefits of:
  - carpooling
  - public transport
  - telecommuting
  - remote working

National Unit specification: statement of standards (cont)

Unit title: Green IT (SCQF level 6)

For Outcome 3

- Identify the three general levels of virtualisation (servers, applications, and desktops).
- Describe the use of server virtualisation, and outline as a minimum two advantages and two disadvantages.
- Describe the use of client virtualisation, and outline as a minimum, two advantages and two disadvantages.
- Identify the security implications of using virtualisation, to include:
  - Denial-of-Service attacks on a VM host
  - The need for a hypervisor
  - VM Escaping failures
- Identify five high-level best practice considerations, and two low-level considerations.

For Outcome 4

- Use EPEAT to evaluate three pieces of similar electronic equipment, identifying the most/least environmental friendly.
- Describe the importance of RoHS and MSDS documents when dealing with hazardous substances.
- Identify suitable disposal options for a three common pieces of electronic equipment.

For Outcome 5

- Identify three Green IT-related organisations and the areas they cover.
- Identify three Green IT-related assessment tools and how they are used.
- Identify three Green IT-related standards and how they can be followed.
- Devise a Green IT policy. The policy must include changes to employee behaviour, and benefits to the organisation.

National Unit specification: support notes

Unit title: Green IT (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

At present there are no National Occupational Standards (NOS) which this Unit specifically maps to, however it is intended that it can support NOS and meeting industry standards through contextualised, integrated delivery with other Units, particularly those on the framework of NC Computing: Technical Support (SCQF level 6).

The precise content of this Unit will change over time, as computing technology develops and new green IT strategies are introduced. The following guidance exemplifies the standards in terms of contemporary technology and green IT strategies.

The overall aim of this Unit is to enable candidates to implement Green IT strategies that will reduce power consumption, manage workforce environmental impact, control the disposal of hazardous materials, and utilise new technologies such as virtualisation to limit the effect of IT usage on the environment.

Outcome 1

This Outcome relates to the management of office equipment and networking devices in an economical manner.

Candidates should look at how the use of hardware-based features such as ACPI, CPU states, and link-state power management can be used to save power effectively. Candidates should also gain experience using software-based approaches such as operating modes and power plans.

Organisational procurement practices and the Energy Star program should be examined in terms of how they affect energy efficiency within an organisation.

Outcome 2

This Outcome relates to reducing the impact an organisation and its employees have on the environment. Candidates should learn about how heating and cooling inside a building can have a major impact on an organisation's energy efficiency.

Candidates should learn about alternative energy sources, such as solar and wind power, along with how green rooftops can help to conserve energy.

Candidates should investigate how the workforce may alter their day-today working lives for the benefit of themselves and the environment through methods such as carpooling, alternative transport, and telecommuting using video conferencing.

National Unit specification: support notes (cont)

Unit title: Green IT (SCQF level 6)

Outcome 3

This Outcome relates to the use of virtualisation technologies in modern organisations. Candidates should learn that through server virtualisation it is possible to implement the functionality of multiple servers via software running on one physical host. This is beneficial as it allows for reduced expenditure in terms of hardware/software costs, while also benefiting the environment in terms of reduced power, cooling and disposal requirements. However candidates should also be made aware that server virtualisation has its disadvantages, including increased complexity, increased security requirements, and up-time sustainability.

Client virtualisation should also be investigated, especially the ability to implement client functions such as applications and user environments using software running on a centralised host. Candidates should be made aware that while client virtualisation can save money, reduce power and cooling needs, and improve consistency across an organisation, it also adds complexity, and requires more highly skilled members of staff.

Outcome 4

This Outcome relates to the use of environmentally sound techniques to dispose of hazardous materials.

Candidates should learn how to responsibly dispose of computer equipment and other associated e-waste. In particular candidates should been give the opportunity use EPEAT to evaluate computer equipment. Candidates should also investigate, and become familiar with the RoHS and MSDS frameworks.

Candidates should learn how to dispose of hazardous materials, with an emphasis on how this is done within their own education organisation. This includes among others, the disposal of the following products — toner and ink cartridges, batteries, and cleaning supplies.

Outcome 5

This Outcome relates to Green IT policies, and identifying Green IT framework assessment tools, organisations, and standards.

Candidates should become familiar with common environmental policy organisations by reviewing their websites and/or other literature.

Candidates should gain experience using appropriate assessment tools to ensure compliance with current Green IT policies — such as CSCI tools.

For a given scenario, candidates should be able to construct suitable Green IT policies which will improve current working practices and benefit the environment. This may be done through analysis of real-world examples.

National Unit specification: support notes (cont)

Unit title: Green IT (SCQF level 6)

Guidance on learning and teaching approaches for this Unit

A relevant and up-to-date approach to learning should be adopted to engage learners and exemplify key concepts. Where possible, current examples of real world situations should be used to illustrate the benefits and impact of Green IT strategies.

Scope exists to visit buildings/organisations to see first-hand how various Green IT strategies have been employed, and the benefits this has brought to both employees and the environment.

Candidates should also be encouraged to question their own education organisation's Green IT policy, perhaps having a short discussion with the member(s) of staff responsible for such initiatives.

While much of the content of this Unit is theory based, an effort should be made to allow candidates to gain hands on experience in office environments, inspecting equipment, recycling/materials disposal, and performing independent research.

An important outcome for this Unit is that candidates develop an appropriate vocabulary, terminology and underpinning knowledge which should be introduced in a practical context. The actual distribution of time between Outcomes is at the discretion of the centre. However, one possible distribution of time would be eight hours, per Outcome.

This Unit may be delivered standalone or in conjunction with other Units. Where delivered alongside other Units, there is an opportunity to contextualise in terms of the contents of the others since this Unit's contents are generic and may be contextualised in a variety of ways.

Guidance on approaches to assessment for this Unit

An integrative approach can be taken with the five Outcomes being assessed through four instruments of assessment as recommended below.

The first recommended assessment instrument covers some of the knowledge and understanding requirements for Outcomes 1, 2, 3, 4 and 5. This assessment instrument should consist of a suitable range of content to cover all five of the learning Outcomes evenly. It is recommended that a multiple-choice assessment is used of around 20 questions.

The second recommended assessment instrument is a practical assessment for Outcome 1. This takes the form of scenario-based task, consisting of observation of the candidate over a period of time during which the candidate is required to maintain a log of their work. An assessor observation checklist can be used to record that all the tasks have been undertaken correctly by the candidate. Candidates will be required to create an efficient custom power plan either using existing operating system functionality, or an appropriate piece of third party software, for a given scenario.

The third recommended assessment instrument, to cover Outcomes 2, 4, and 5, is a report of around 1000 words, with candidates asked to produce a Green IT policy for a given scenario. Candidates should clearly address changes to employee behaviour, in areas such as printing, travel and use of telecommuting and video conferencing, and environmentally friendly disposal options. The report should also identify benefits to the organisation such as ROI – power saving, increased productivity, disposal costs and environmental sustainability. Where candidates fail to meet the required standard they should be allowed to remediate their initial report after assessor feedback, before resubmission.

The fourth recommended assessment instrument is a short report for Outcome 3, of around 500 words. Candidates would be required to explain server and client virtualisation, while highlighting the advantages and disadvantages each bring. It should be noted that server and client virtualisation are not mutually exclusive, and a comparison between the two is not expected. Candidates could use diagrams or real-world/hypothetical examples to better explain themselves. Where candidates fail to meet the required standard they should be allowed to remediate their initial report after assessor feedback, before resubmission.

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 Communication Technology (ICT), such as e-testing or the use of e-portfolios or social software. 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)*.

Opportunities for developing Core Skills

In this Unit candidates will develop skills in the construction and implementation of suitable Green IT policies which will improve current working practices and benefit the environment.

Candidates will:

- Identify:
  - how hardware-based features and link-state power management can be used to save power
  - how organisational procurement practices affect energy efficiency within an organisation
  - how the temperature inside a building can impact on an organisation’s energy efficiency
  - ways alternative energy sources can help to conserve energy
  - how alternative energy sources can help to conserve energy
  - working practices that benefit the workforce and the environment
  - the advantages and disadvantages of server virtualisation
  - the correct way of disposing of e-computer equipment and other associated e-waste

- Research common environmental organisations, Green IT policies, standards and framework assessment tools.
- Devise suitable Green IT policies.

This means that as candidates are doing this Unit they will be developing aspects of the Core Skills of *Problem Solving* and *Communication*.

In addition, whilst completing this Unit, candidates may develop aspects of the following Core Skill where specific learning and teaching approaches are adopted:

- *ICT* — Candidates may use the internet to carry out searches for information. They may also make use of different types of software to produce their assessment evidence.

Disabled candidates and/or those with additional support needs

The additional support needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments, or considering whether any reasonable adjustments may be required. Further advice can be found on our website **www.sqa.org.uk/assessmentarrangements**

History of changes to Unit

Version	Description of change	Date