National Unit Specification: general information

UNIT Computing: Installing and Maintaining Hardware (SCQF level 6)

CODE F3T0 12

SUMMARY

This Unit is designed to enable candidates to work effectively and safely with a range of computer hardware components. Candidates will be involved in maintaining and upgrading computer systems as well as developing their basic knowledge of the structure of a computer system. The content of the Unit includes system components and connections, common faults, and upgrading and preventative maintenance procedures. Safe working and handling practices will also be covered along with the environmentally safe disposal of computer components.

This Unit is suitable for a wide range of candidates but is particularly appropriate for those who are interested in a career in technical support and/or are undertaking the National Certificate in Digital Media Computing.

OUTCOMES

1 Describe the major hardware components in a standard computer system, their roles, interactions and common problems.
2 Create a plan to safely upgrade an existing computer system to a given brief.
3 Install, test and record the upgrade to an existing computer system.
4 Perform, test and record preventative maintenance of computer hardware to a given brief.

Administrative Information

Superclass: CA

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National Unit Specification: general information (cont)

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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:

- *Information Technology* at Intermediate 2
- F1KF 11 *Computing: Install and Maintain Computer Hardware*

CREDIT VALUE

1 credit at Higher (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

While there is no automatic certification of Core Skills in this Unit there may be opportunities for developing aspects of Core Skills.

National Unit Specification: statement of standards

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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 major hardware components in a standard computer system, their roles, interactions and common problems.

Performance Criteria

(a) Describe the major hardware components of a standard computer system and their roles in the system
(b) Describe the interactions between major hardware components in a standard computer system
(c) Describe common problems that occur with computer hardware components

OUTCOME 2

Create a plan to safely upgrade an existing computer system to a given brief.

Performance Criteria

(a) Identify the components that require to be upgraded
(b) Produce a plan for the installation of the upgrade, including safe working practices in handling and disposal of components

OUTCOME 3

Install, test and record the upgrade to an existing computer system.

Performance Criteria

(a) Install the planned upgrade using identified components from the plan
(b) Test the upgraded computer system to ensure correct functionality
(c) Record the upgrade carried out

OUTCOME 4

Perform, test and record preventative maintenance of computer hardware to a given brief.

Performance Criteria

(a) Carry out specified preventative maintenance tasks, in accordance with recognised safe working practices
(b) Test computer system operation after completion of maintenance
(c) Record the preventative maintenance carried out

National Unit Specification: statement of standards (cont)

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EVIDENCE REQUIREMENTS FOR THIS UNIT

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

For Outcome 1 written and/or oral recorded evidence is required which demonstrates that the candidate has achieved the standard specified in the Outcome and Performance Criteria. The assessment will be under closed-book conditions and should last no more than 45 minutes. The instrument of assessment will sample across the mandatory content which is the following range of hardware components:

- BIOS, CPU, Main Memory, I/O devices, storage devices, bus system, interface controllers and cabling

Candidates are required to:

- **describe three** hardware components from the range
- **describe three** roles of hardware components from the range
- for each of **two** hardware components from the range describe an interaction with a different hardware component in the same computer system
- for each of **two** hardware components from the range describe a common problem that would require preventative maintenance
- for each of **two** hardware components from the range describe a common problem that would require hardware component upgrading

For Outcome 2 written and or oral recorded evidence in the form of a plan which will identify the component that requires upgrading and the procedures to be followed in resolving the problem. The brief for the problem should be in the form of a user fault report for a computer system and lead to a requirement to upgrade at least one of the following hardware components: BIOS, CPU; Memory (RAM); Graphics Card; Hard Drive; Optical Drive; Interface Card.

The plan should specify the component to be upgraded, the specification of the new component and the detailed steps, including safe handling, to be followed. The plan should specify the disposal arrangements for any replaced components, and provide details of the tests to be carried out on the upgraded system.

For Outcomes 3 and 4 written and/or oral recorded evidence and performance evidence is required that demonstrates that the candidate can carry out the upgrading of a computer system to the plan specified, and preventative maintenance tasks based on a given brief. The written and/or oral recorded evidence will be in the form of an updated entry to the maintenance log for the computer system. The performance evidence will be supplemented by an assessor observation checklist of the candidate's activity which demonstrates that the candidate has achieved the standard specified in the Outcomes and Performance Criteria.

National Unit Specification: statement of standards (cont)

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For Outcome 4 the candidate must be provided with a brief that contains all of the following: cleaning of the CPU heatsink and all internal case fans; removal and re-seating of an interface card; disconnection, re-routing and reconnection of an internal cable; and hard disk defragmentation.

The assessment for **Outcomes 2, 3 and 4** will be carried out under supervised conditions and will be open-book. Candidates will have access to notes and reference work as well as online help for this assessment. The assessor checklist will provide evidence that the candidate has used safe working practices, tested the system after each activity has been completed, and updated the maintenance record of the computer system to reflect the work that has been carried out.

The Assessment Support Pack (ASP) for this Unit provides sample assessment material including an instrument of assessment for the knowledge, a candidate brief and an assessor checklist for each of Outcomes 2 and 4. The pack will contain marking schemes and completed assessor observation checklists. Centres wishing to develop their own assessments should refer to the Assessment Support Pack to ensure a comparable standard.

National Unit Specification: support notes

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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 Unit is an optional Unit in the National Certificate Group Award Digital Media Computing but may also be taken as a free-standing Unit. This Unit is suitable for a wide range of candidates but is particularly appropriate for those who are interested in a career in technical support and/or are undertaking the National Certificate in Digital Media Computing.

The overall aim of this Unit is to enable candidates to work safely with computer systems, to upgrade them and perform preventative maintenance on them. The Unit aims to provide the candidates with the theoretical and practical knowledge of upgrading, problem identification and preventive maintenance of a computer based system.

The Unit will provide candidates with information about computer systems as well as information on safety and environmental issues when working with or disposing of computer hardware components.

The aim of **Outcome 1** is to familiarise the candidate with the function and role of the hardware components of a computer system and the interactions between the hardware components. It also introduces common problems that can occur with components and how they can be addressed or prevented.

The BIOS will be introduced and its importance to the effective running of the computer system, the functionality the BIOS allows and the limitations of out-of-date BIOS identified, ie limited hard disk and memory capacities. The Central Processing Unit (CPU) should be introduced as a device for executing programs and main memory (RAM) presented as the means by which programs are stored and made available to the CPU. The distinction between memory technologies should be introduced. Candidates should be encouraged to gather technical information relating to these components from a range of sources including the internet and technical manuals to ensure up-to-date information is gathered.

The need for semi-permanent data storage as well as input and output facilities should be explained. Candidates should also be made aware of the following: distinction between storage devices and storage media, different media formats, current capacities of storage media. Furthermore a variety of input and output devices should be discussed and actual examples made available for candidates to inspect and use.

The functional role of a bus system in a computer should be carefully explained. This can be presented by means of a block diagram illustrating the role of the address, data and control buses. Candidates should also be made aware of how a bus system is implemented on a motherboard and some current bus technologies should be named and introduced. Candidates should also understand the basic operation of the common external interface controllers eg USB, FireWire IEEE1394. The physical connections should be introduced and ensure the candidate is able to quickly and accurately identify the connectors (ie power and data cables, ports, motherboard bus system) necessary to upgrade, test and problem solve a computer system.

National Unit Specification: support notes (cont)

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Candidates will be informed about the physical components of a system Unit (PSU, CPU, RAM cards, expansion cards, motherboards, drive bays and drive units, ROM chips etc). The interactions between components should be introduced and the importance of form factors and compatibility of components stressed. This will include aspects such as CPU clock speed, bus speed and memory speed and type. The relevance of memory cache and read/write speeds of storage devices should be introduced.

Candidates will also be made aware of the problems that can commonly occur within a computer system, and the steps that can be taken to prevent them or address them when they occur. Preventive maintenance will be covered here and the importance of preventive maintenance to the overall smooth running of a computer based system as well as identifying faults before they progress causing loss of data. Equipment with known faults (cables, ports, devices etc) should be introduced to give candidates exposure to their identification and resolution.

Candidates will also be introduced to safety and environmental issues associated with computer equipment. Candidates should be aware of the potential electrical hazards associated with working on the internal components of a computer and the means of eliminating or minimising these hazards. Candidates should also be aware of the appropriate procedures for handling delicate electronic components such as printed circuit boards and in particular the need to observe anti-static procedures.

Candidates will be made aware of the nature of the materials used in computer hardware components and the location of sources of information on environmentally safe disposal of components.

Outcome 2 relates to creating a plan to upgrade and test a computer system, from a given brief. The details for the brief are given in the Evidence Requirements for this Unit. Outcome 3 is a practical task based on the identified upgrades from the brief.

The issue of hardware compatibility should be emphasised as components chosen for the upgrade must be compatible with the current installed components in the computer system. Where there is the removal of a hardware component as part of the upgrade procedure the candidate must specify what the safe disposal procedure is for that component, using information sources for this purpose. Candidates should be made aware of the role of device drivers and where appropriate undertake the installation of a driver or upgrade to a driver when a hardware component has been changed. Emphasis should be placed on the need for an installed hardware component to be thoroughly tested after installation.

Outcome 4 relates to practical preventative maintenance tasks for a computer system. Candidates should be introduced to the following basic maintenance and house-keeping procedures: cleaning routines, external cable and plug checks, internal visual inspection of system Unit components to check cable connections and the correct seating of cards in slots, replacement of internal batteries, use of diagnostic software relating to system performance, secondary storage house-keeping.

Candidates will be aware of the health and safety issues arising from setting up and testing computer systems. This should include: safe cabling practices, handling of electronic components, electrical safety. Assessors should ensure that candidates follow safe working practices whilst carrying out the activities.

National Unit Specification: support notes (cont)

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GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS UNIT

A practical hands-on approach to learning should be adopted to engage learners and exemplify key concepts. However, all practical activities should be underpinned with appropriate knowledge before candidates commence these activities.

It is recommended that candidates gain hands-on installation and configuration experience of at least one example of each type of hardware component mentioned in these notes. While teaching will necessarily focus on a specific product, the generic features of the class of components should be emphasised. It is recommended that candidates gain experience of a range of computer systems including laptops, desktops and tower systems. It is also recommended that candidates have access to a range of peripherals such as printers, scanners, webcams, digital cameras, and external drives.

An important aspect of this Unit is that candidates develop an appropriate technical vocabulary relating to computer hardware; terminology and underpinning knowledge should be introduced in a practical context.

Throughout this Unit candidate activities, where possible, should relate to personal and vocational interests. Candidates should be encouraged to think about the ways in which they could economically upgrade their own computing systems or carry out systematic preventative maintenance.

The use of computing magazines, relevant websites and technical reference manuals is recommended.

OPPORTUNITIES FOR CORE SKILL DEVELOPMENT

In this Unit candidates will have the opportunity to gather evidence towards Core Skills. Candidates are required to interpret the requirements of two briefs. These provide opportunity for developing aspects of the Core Skill in *Problem Solving*. In addition, opportunities may arise for candidates to work together as part of the learning process. These opportunities may allow candidates to develop aspects of the Core Skill of *Working with Others.*

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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It may be appropriate for some of the evidence for this Unit to be produced using e-assessment provided the national standard is applied and the conditions of assessment are consistent for all candidates. This may take the form of e-testing (for knowledge and understanding) and/or e-portfolios (for practical abilities).

A suitable assessment for Outcome 1 would be an objective test which provides an opportunity for the Outcomes to be fulfilled by means of sampling across the range of the content. Where re-assessment is required it should contain a different sample from the range of mandatory content.
If a centre is presenting Outcome 1 on-line the following assessment methods, where appropriate, may be selected —

- multiple choice
- multiple response
- extended response

Centres may consider the use of alternative questions types, particularly if using Computer Assisted Assessment approaches. However, care should be taken that the questions are valid and at an appropriate level.

A practical approach has been taken with respect to practical elements of Outcomes 2, 3 and 4 and it is envisaged that the Performance Criteria relating to these Outcomes will be covered by a series of tasks.

The Assessment Support Pack (ASP) for this Unit provides sample assessment material including an instrument of assessment for the knowledge, candidate briefs and assessor checklists. The pack will contain marking schemes and completed assessor observation checklists. Centres wishing to develop their own assessments should refer to the Assessment Support Pack to ensure a comparable standard.

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)**.