



HND Computing: Networking (International)

GG5K 16

Course Tutor Guide

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1 Introduction

1.1 Purpose of course Tutor Guide

This Guide is aimed at staff in SQA Approved Centres who are responsible for HND Computing: Networking. It will assist you in the delivery, assessment and internal verification of the HND by providing information on setting up a course, the course framework, centre support with course delivery, teaching plans and guidance on assessment of the Units within the course. It also provides information about Core Skills, Graded Units, Quality Assurance and Verification.

Please note that throughout this guide course students will be referred to as '*learners*' or in the context of assessments as '*candidates*'.

1.2 Introduction to the Award

The title of the Group Award is HND Computing: Networking.

In recent years there have been significant technology developments in the field of ICT which are having a major impact on businesses and business processes. Cloud computing is an example of a technology trend emerging from the congruence of developments such as real-time infrastructure (RTI), virtualisation, browsers and Web 2.0¹.

More than half employers indicate that issues such as security, cloud computing, convergence of communications and IT and the real world web will have a major impact on business in the next three years²

The HND Computing: Networking award has been revised to reflect these changes with the introduction of a number of new Units designed to equip the learner with some of the fundamental knowledge and understanding of these technologies.

This qualification is suitable for the following range of learners:

- ◆ Learners articulating from the generic Computing award wishing to specialise in networking related technologies
- ◆ Any other suitable candidate wishing to achieve this award with a view to further articulation to an appropriate HE award or to pursue employment in the relevant ICT sector

Learners who gain this qualification will be equipped with the necessary skillset to pursue employment in the general category of IT&T engineer/IT&T technician. Learners who achieve HND Computing: Networking should also be able to articulate onto a range of University degree programmes.

¹ Gartner Report, The top 10 Technology trends for 2012

² Technology Insights 2012 e-Skills UK

2 Setting up the course

Centres will have been approved to offer this course and will have internal processes for liaising with appropriate parties. Liaison with SQA is normally via the centre's SQA co-ordinator.

It is recommended that a Course Team is set-up by the Institution/Department appointed to oversee the delivery of the course. The Course Team should comprise of all tutors teaching on the course and one tutor should be nominated as Course Team Leader.

The Course Team would have the responsibility for overseeing the quality of delivery on the course and to ensure that academic standards are maintained. The Course Team would also be responsible for monitoring learner progress and determining the support required for individuals who are not progressing well.

The Course Team should meet to discuss matters relating to course delivery, assessment and internal verification on a regular basis (usually two/three times a year) to ensure that any action points are achieved and that the course is delivered efficiently and effectively. It is good practice to maintain a record of such meetings to ensure that any action points are noted and accomplished. This will benefit centres and their students by ensuring that all learners achieve their full potential whilst maintaining the appropriate standards.

It is good practice for centres to maintain a library of master folders for each of the Units within the course — these may be stored electronically as long as all relevant staff have access to them as and when required. Electronic files on a secure part of the centre's network/intranet are particularly appropriate if the award is delivered across different campuses allowing all tutors to access the most up-to-date materials wherever they are located.

The master folders should contain Unit specifications, teaching materials (including details of learning, teaching and assessment plans; and if appropriate, details of any integration across Units of either teaching or assessment), assessment exemplars and re-assessments. This enables new members of staff to access this valuable resource prior to, and during, delivery of the course.

It is good practice for tutors to familiarise themselves with the Units and specific requirements of the assessments prior to the start of the course. Unit specifications set out the statement of standards and evidence required for achieving each Unit, along with guidance on content and assessment. Assessment exemplars provide an instrument of assessment for each Unit and suggested marking scheme. **The assessment exemplars MUST be kept secure at all times.**

All tutors delivering this course have a collective responsibility to ensure that all learners are supported in a manner that meets their individual needs as they progress through the course.

3 The HND Structure

3.1 General HND Qualification Framework

To be awarded an SQA HND, the candidate is required to achieve **30 SQA HN credits** with a mixture of SCQF level 6, 7 and level 8 Units. The HND Computing: Networking qualification is a mixture of SCQF level 7 and level 8 Units.

Each Unit is assigned a **SQA HN credit** value of either 1 or 2. This credit value is based approximately on 80 hours of study per credit which consists of 40 hours of structured learning and a further 40 hours of candidate led study to consolidate and reinforce learning.

Each Unit is also assigned a **Scottish Credit and Qualifications Framework (SCQF) level and credit point value**. (See below for further details regarding the SCQF).

Each Unit is assigned an agreed number of SCQF credit points. One point represents a notional 10 hours of study by the learner at the identified level.

3.1.1 The Scottish Credit and Qualifications Framework (SCQF)

The SCQF has 12 levels ranging from Access at SCQF level 1, up to Doctorate at level 12. The different levels indicate the level of difficulty of a particular qualification and the difference between levels is dependent on factors such as:

- ◆ the complexity and depth of knowledge and understanding.
- ◆ links to associated academic, vocational or professional practice.
- ◆ the degree of integration, independence and creativity required.
- ◆ the range and sophistication of application/practice.
- ◆ the role(s) taken in relation to other learners/workers in carrying out tasks.

3.1.2 SCQF level Descriptors

The SCQF level Descriptors outline the general outcomes of learning at SCQF levels under five broad headings:

- ◆ Knowledge and understanding (mainly subject based)
- ◆ Practice (applied knowledge and understanding)
- ◆ Generic cognitive skills (eg evaluation, critical analysis)
- ◆ Communication, numeracy and IT skills; and
- ◆ Autonomy, accountability and working with others

The Descriptors allow broad comparisons to be made between the outcomes of any learning and allow learners, employers and the public in general to understand the range of skills and learning that should be achieved at each level. SCQF levels are increasingly used in job advertisements to help employers articulate the skills they require for a particular role and to help potential employees to highlight their skills thus ensuring the right person gets the right job.

For HND courses each Unit is also assigned a SCQF level which will be 6, 7 or 8. These levels indicate the degree of difficulty of the work for that Unit. There are no SCQF level 6 Units within HND Computing: Networking.

SCQF level 7 is approximately equivalent to first year of degree level study and SCQF level 8 approximately equivalent to second year of degree level study.

SCQF level 7 might be given to an introductory Unit in a subject area and SCQF level 8 to the continuing Unit.

Tutors involved in the delivery and assessment of Units would find the SCQF level descriptors helpful in determining the appropriate level of difficulty/complexity required.

For example:

The Unit *Computer Networking: Practical* (H17B 34) has an **HN credit value of 1**. This represents 80 hours of teaching and learning.

These 80 hours will equal **8 SCQF points** (1 point = 10 hours of learning) at **SCQF level 7**.

The Unit *Networking Technology* (FR34 35) follows on from *Computer Networking: Practical* (H17B 34) and has an **HN credit value of 2**. This represents 160 hours of teaching and learning.

These 160 hours will equal **16 SCQF points** at **SCQF level 8**.

This means that the Unit will take longer to study and also progresses the learning to a higher level.

The Unit *Routing Technology* (FR22 35) follows on from *Networking Technology* (FR34 35) and has an **HN credit value of 2**. This represents 160 hours of teaching and learning.

These 160 hours will equal **16 SCQF points** at **SCQF level 8**.

This means that the Unit will take the same time to study and the level is the same.

3.2 Core Skills

The Core Skills are a group of five skills that are key to learning and working in today's world. Employers have identified Core Skills as those that are most likely to be needed in any work environment. This does not mean that every job will need people who are proficient in all five Core Skills but it does mean that every job will require some level of ability in some or all of these skills.

The five Core Skills are: *Communication*, *Numeracy*, *Information and Communication Technology (ICT)*, *Problem Solving* and *Working with Others*. Each Core Skill is available at levels 2 to 6 of the Scottish Credit and Qualifications Framework (SCQF). A brief description of each Core Skill is detailed below. A fuller description of each Core Skill at the SCQF levels 2–6 is available on the SQA's website — www.sqa.org.uk/international.

3.2.1 Communication

Communication skills underpin almost all personal, social, learning, and working activity. They are essential in clarifying one's own thoughts, in interacting and conversing with others, in expressing thoughts and in conveying information, feeling and opinions.

The Core Skill in *Communication* has two components:

- ◆ Oral Communication
- ◆ Written Communication

3.2.2 Numeracy

Numeracy skills are necessary for coping with the demands of everyday life, including work and study. People need to be comfortable with numbers, and with graphs, symbols, diagrams and calculators.

The Core Skill in *Numeracy* has two components:

- ◆ Using Graphical Information
- ◆ Using Number

3.2.3 Information and Communication Technology (ICT)

Information and Communication Technology (ICT) focuses on the ability to use Information Technology (IT) to process information in ways which will be useful in work and in the home — it is not about developing IT specialists.

The Core Skill in *Information and Communication Technology (ICT)* has two components:

- ◆ Accessing Information
- ◆ Providing/Creating Information

3.2.4 Working with Others

Working with Others develops the skills needed to co-operate with others in learning and working situations to identify and achieve shared goals.

The Core Skill in *Working with Others* has two components:

- ◆ Working Co-operatively with Others
- ◆ Reviewing Co-operative Contribution

3.2.5 Problem Solving

Problem Solving develops the skills needed for tackling issues and problems in personal, social, vocational and occupational contexts.

The Core Skill in *Problem Solving* has three components:

- ◆ Critical Thinking
- ◆ Planning and Organising
- ◆ Reviewing and Evaluating

All qualifications offered by SQA are evaluated against the Core Skill framework and where opportunities exist to develop and/or achieve a Core Skill (embedded), these have been noted and a table is provided for each HND showing where these skills are embedded and/or developed. (See Appendices 1a and 1b).

3.3 Assessment

In the HND Computing: Networking award the focus is on teaching and learning to develop skills within the areas of Computing and in particular Computer Networking. Assessment is a natural part of learning and should be seen as a method of measuring learner progress in a Unit. Assessment amounts to approximately 10% of the overall Unit time allocation in the course.

The reduction in time spent on assessment is an important aim of this award. Assessment will cover a variety of knowledge and practical skills as well as the more intellectual skills of planning and evaluating. These together with the Core Skills mean that a large number of different methods are employed to ensure that a learner 'can do what s/he is supposed to do' and 'knows what s/he is supposed to know'.

A large proportion of Units take a 'project' approach using the product of a previous assessment, as the foundation of the next and the purpose is to give the candidate a true reflection of how items being studied integrate and relate to industrial practice. Where this is practical, a holistic approach is encouraged to be taken by centres in assessing across a number of Outcomes within Units or across a number of Units.

The benefit of such so-called 'cross-assessment', if it goes well, is the achievement of several Outcomes on several Units with just one assessment instrument. A matching disadvantage is that a failure results in several Units not being achieved. It would be wise for centres to consider separating out the 'retake' assessments of learners who have failed in their first attempt at a composite assessment instrument. It may be possible to combine the delivery of Units in such a way as to create a thematic delivery of the component Units. The ways in which Units may be integrated is left to centres but thematic delivery, as opposed to discrete Unit delivery, may reduce assessment and improve coherence of content.

The normal rules of re-assessment apply to this award. Candidates are normally permitted one re-assessment, or, in exceptional circumstances, two re-assessments at the discretion of the centre.

3.4 Graded Units

In the framework of every HND there are 3 SQA HN credits of Graded Unit. There are Graded Units built into the framework towards the latter part of Year 1 and Year 2. Depending on the HND, there may be three individual Graded Units of 1 SQA HN credit or there may be two Graded Units — a 1-credit Unit and a 2-credit Unit. The purposes of Graded Units are to:

- ◆ demonstrate that the candidate has achieved the principal aims of the Group Award.
- ◆ demonstrate the candidate's ability to integrate the knowledge and understanding gained from other Units making up the Group Award.
- ◆ grade candidate performance.

Graded Units are specific to the Group Award being delivered, and reflect the principal aims of that Group Award. This means that they will also clearly reflect the uniqueness of the title of the Group Award.

The allocation of grades awarded are as follows:

- ◆ Grade A — Candidate has achieved a mark of 70% or above
- ◆ Grade B — Candidate has achieved a mark of between 60% and 69%
- ◆ Grade C — Candidate has achieved a mark of between 50% and 59%
- ◆ F (Fail) — Candidate has failed to reach the required standard and achieved a mark less than 50%

4 HND Computing: Networking

4.1 Target audience

The HND Computing: Networking develops skills and knowledge in a range of network design, network administration, technical support, problem solving, information and communication technology areas and interpersonal skills. The HND Computing: Networking is designed to lead to employment as a Network Designer, Network Support administrator, IT Support technician, or an IT and Telecoms engineer/IT and Telecoms technician.

Successful candidates should be able to progress to a range of degrees.

4.2 Access to the course

As with all SQA qualifications, access will be at the discretion of the centre and the following recommendations are for guidance only. It should be noted that this qualification will be taught and assessed in English.

Some examples of appropriate formal entry qualifications are specified below. They are not exhaustive or mutually exclusive and may be offered in a variety of combinations.

- ◆ An appropriate level of skill in the English language.
- ◆ Experience in the use of IT applications software.
- ◆ Different combinations of relevant National Qualifications, Vocational Qualifications and equivalent qualifications from other awarding bodies may be acceptable, as would suitable industry standard qualifications at an appropriate level.
- ◆ Mature learners with suitable work experience will be accepted for entry provided the enrolling centre believes that the learner is likely to benefit from undertaking the award.

4.3 Aims of course

The HND Computing: Networking award has a range of aims relating to academic and vocational progression. These are:

The general aims of this award are to:

- (a) Develop the candidate's knowledge and skills such as planning, analysing and evaluating.
- (b) Develop employment skills and enhance candidates' employment prospects.
- (c) Enable progression within the SCQF.
- (d) Develop study and research skills.
- (e) Develop transferable skills including Core Skills.
- (f) Provide academic stimulus and challenge, and foster an enjoyment of the subject.

The specific aims of this award are:

- (g) To develop a range of specialist knowledge and skills in networking technologies.
- (h) Where applicable, to provide learners with the underpinning knowledge and skills that may allow them to sit vendor certification examinations at entry level.
- (i) To prepare candidates for progression to further studies in a related discipline at SCQF level 9.
- (j) To prepare candidates for employment in the general category of IT&T engineer/IT&T technician.

4.4 HND Computing: Networking Framework

The table below shows the whole framework of Units for the HND Computing: Networking and includes their HN credit value and SCQF level.

Unit name	Unit code	Credit value	SCQF level
YEAR 1			
Developing Software: Introduction	H173 34	1	7
Professionalism and Ethics in Computing	H1F7 34	1	7
Computer Systems Fundamentals	H175 34	1	7
Troubleshooting Computer Problems	H177 34	1	7
Team Working in Computing	H178 34	1	7
HND Computing: Graded Unit 1 (Exam)	H40F 34	1	7
Client Operating Systems	H1EM 34	2	7
Security Concepts	H17V 34	2	7
PC Hardware & Operating Systems Essentials	H17E 34	1	7
Computer Forensics Fundamentals	H1EN 34	1	7
Cloud Computing	H179 34	1	7
Mathematics for Computing 1	D76E 34	1	7
Computing: Introduction to Project Management	H17D 34	1	7

YEAR 2			
Computer Networking: Practical	H17B 34	1	7
Networking Technology	FR24 35	2	8
Routing Technology	FR22 35	2	8
Server Administration	H16X 35	2	8
Convergence Technologies	H17G 35	2	8
Switching Technology	FR23 35	2	8
Internetworking Technology	FR25 35	2	8
HND Computing: Networking Graded Unit 2 (Project)	H40G 35	2	8

4.5 Core Skills

All of the revised Units within this award have been assessed and validated against the Core Skills framework.³

Successful learners will exit from the HND Computing: Networking with the following Core Skills profile:

Core Skill	Certificated exit level
Communication	SCQF level 5
Numeracy	SCQF level 5
Information and Communication Technology (ICT)	SCQF level 6
Problem Solving	SCQF level 6
Working with Others	SCQF level 6

A detailed analysis of the Core Skills profile is provided in Appendices 1a and 1b.

4.6 Graded Unit

Learners will take a 1-credit Graded Unit at SCQF level 7 in the first year of the HND Group Award, and a further 2-credit Graded Unit at SCQF level 8 in the second year of the HND Group Award.

The Graded Units take the form of:

HND Computing: Graded Unit 1 (H1J8 34) Examination at SCQF level 7 — 1 SQA HN credit

HND Computing: Networking Graded Unit 2 (H40G 35) Project (Investigation) at SCQF level 8 — 2 SQA HN credits

Further details are provided in Section 8.3.

4.7 Transitional Arrangements

HN awards in Computing have a long tradition of providing detailed guidance on credit transfer between existing and new awards.⁴ This is done, at the request of centres and External Verifiers, to ensure consistency between centres. Credit transfer tables have been provided in this subject area since 1995. However, final decisions relating to credit transfer lies with centres.

HNC Computing was validated by SQA in December 2011 and HND Computing awards are due for validation in March 2013. These courses will replace a number of older Group Awards including:

³ Core Skills Framework: an introduction (SQA, Glasgow, 2008)

⁴ Standard SQA policy is to permit centres to decide on credit transfer.

G7GL 15	HNC Computing
G7DX 15	HNC Computer Networking
G7DY 16	HND Computer Networking and Internet Technology
G7TT 16	HND Computing: Software Development
G7TR 16	HND Computing: Technical Support

These Group Awards have been available since 2004/2005 and themselves replaced older Group Awards, dating back to 2001. This section covers **full** credit transfer from Units in the 2004/2005 Group Awards to Units in the 2012 Group Awards.

When new Group Awards are introduced, learners often wish to transfer between the old and the new frameworks. For example, they may have started on an HNC under an older framework and wish to complete their HND on the new framework, or they may have completed Units some time ago and wish to use these as part of an HNC or HND under the new framework.

To assist in this process, SQA normally provides centres with guidance on Credit Transfer between the old and the new frameworks. SQA have clear criteria for deciding if two syllabuses are equivalent. All the following criteria must be satisfied if full credit transfer is to be recognised between both syllabuses:

- 1 The syllabuses have the same SCQF levels.
- 2 The syllabuses have the similar credit values (or equivalent).
- 3 The syllabuses are equivalent in terms of Core Skill coverage.
- 4 The syllabuses relate to the same subject area and the main topics are common to both.
- 5 The syllabuses present a similar level of cognitive demand.
- 6 The syllabuses encompass similar skill-sets.
- 7 The syllabuses are contemporary in terms of terminology, techniques and technology.
- 8 Employers, admission officers and other users would perceive both syllabuses as broadly equivalent.
- 9 The assessment demands are similar in terms of candidate activity and performance criteria, or candidates would be equally likely to pass both assessments.
- 10 Special conditions (where they exist) are applicable to both syllabuses.

The following table shows some equivalent Units relevant to the Group Award which have been approved by an External Verifier. Many of the 'new' (2011/2012) Units in this table are revisions of the 'old' (2004/2005) Units, making credit transfer more credible and easier to identify.

Units within computing related frameworks prior to 2004 are not eligible for credit transfer into the new framework due to the importance of contemporary skills in this sector.

This guidance is of an advisory nature. **The final decision on whether or not to grant credit transfer must be made by the centre and is subject to external moderation.** However, external moderators are unlikely to raise objections to any credit transfer based on the advice given here.

2004/2005 GROUP AWARD UNITS		2013 GROUP AWARD UNITS	
Unit No	Unit title	Unit No	Unit title
DF9M 34	Client Operating System	H1EM 34	Client Operating Systems
DG0H 35	Computer Networking and Internet Technology: Graded Unit 2 (Project)	H40G 35	HND Computing: Networking Graded Unit 2 (Project)
DF9X 35	Networking Technology	FR24 35	Networking Technology
DF9Y 35	Routing Technology	FR22 35	Routing Technology
DG09 35	Switching Technology	FR23 35	Switching Technology
DG0A 35	Internetworking Technology	FR25 35	Internetworking Technology

5 Course delivery of an HND

5.1 How the course is delivered

All tutors must ensure that they deliver this course using teaching methods that engage learners in 'active learning' to encourage them to participate in the learning activities set. All SQA qualifications are designed to enable learners to develop their knowledge and skills and then they are required to apply this new knowledge/skill to a new situation. Criterion-referenced assessments assume that all parties are fully informed of the criteria that candidates must achieve and the assessment conditions under which the candidates carry out the assessment activity.⁵

To ensure that learners are fully prepared it is essential that tutors provide as many opportunities as possible for learners to be actively engaged throughout the learning process. Learners should:

- ◆ be fully informed of the criteria they must achieve.
- ◆ be offered a range of learning activities to research, analyse and apply new knowledge/skills to new situations.
- ◆ be offered opportunities to experience the type of activity that they will be required to carry out as part of the summative assessment.
- ◆ be able to critically evaluate their personal contribution and to receive feedback from the tutor on how to enhance their understanding.

Tutors should develop a learning, teaching and assessment plan for each Unit within the course and provide activities that learners should undertake.

Each Unit should have a master folder containing the Unit specification, teaching materials, the teaching and assessment plan along with assessment exemplars and re-assessments. The teaching materials and teaching plan should provide details of activities that learners should undertake. Typically they include activities such as small group/whole class discussion, group problem solving, eg analysing a case study and offering solutions based on the new learning, group project work to find examples, to research new knowledge and to present their findings to their fellow learners.

The following is a list of learning activities but it is not exhaustive:

- ◆ Lectures
- ◆ Tutorials
- ◆ Study packs
- ◆ Problem based scenarios
- ◆ Case studies
- ◆ Group/team work
- ◆ Online materials
- ◆ IT based teaching materials

⁵ For further information about different assessment activities — whether they be for formative or summative purposes, tutors may wish to complete the new online course: Produce HN Assessments for successful prior verification OR read the SQA Guide to Assessment

- ◆ Projects
- ◆ Quizzes
- ◆ Research and presentation of findings to fellow learners
- ◆ Role play
- ◆ Short response questions, multiple-choice questions
- ◆ Create questions for other learners (with answers), etc

Tutors should consider the nature of the assessment method as well as the assessment content when planning learning activities so that learners are appropriately prepared.

It is the tutor's responsibility to explain to the learners what is required of them and then to direct, encourage, co-ordinate and support learners to complete the activity. It is also the tutor's responsibility to ensure the resources needed are available to the learners. Materials should be reviewed on a regular basis to ensure they are still relevant.

Some activities could require learners to work in pairs or small groups to discuss issues or to solve a given problem. Other activities could require the learner to undertake some independent research out with the classroom and to bring their findings to the next lesson and present this to the class in a report or presentation format. Some Units will require the learner to undertake independent reading and learners should be prepared to discuss key issues within the classroom as organised and led by the tutor.

In practical skills classes, learners should be directed to use practice exercises to enable them to become proficient. Tutors may demonstrate the skill first and then coach the learners individually when unsure. In terms of developing independent learners, in the case of information technology, learners should be encouraged to independently use the online Help facilities within applications. It should be noted that even in practical classes, learners should be encouraged to work in small groups and to support one another as part of the learning process — by explaining to another; a learner has to reformulate and communicate the learning point thus deepening their learning.

When undertaking group work, learners should be encouraged/directed to work with different groups each time they attempt a new task so that they get to know and work with a wide range of individuals. The groups should be given clear task activities. Tutors should note the various roles assigned to the group members and they should set a time limit for the completion of the task.

At the end of each activity tutors should make time to receive feedback from each group so that they can assess knowledge and understanding and use the feedback session to repeat important key points and to clear up any misunderstandings. Tutors must also provide feedback to learners on their performance in activities, etc.

Where centres have access to electronic resources such as Virtual Learning Environments, Blogs, Wikis, etc — tutors/lecturers are encouraged to use these collaborative tools in the learning process.

5.2 Support for learners

All tutors delivering on a course have a collective responsibility to ensure that all learners are supported in a manner that meets their individual needs as they progress through the course.

Each individual tutor has a role to monitor an individual learner's understanding and progress at Unit level and feed comments to the Course Team. At individual Unit level, tutors may wish to use a range of mechanisms to support learners and to establish if learners are progressing well on the course.

6 HND Computing: Networking course delivery

6.1 Teaching plan

The Units that make up this Group Award are listed in Section 6.2 — ***Overview of Units.***

This Section — ***Teaching plan*** — provides a ***suggested*** delivery schedule for the Units and highlights the best way to sequence the Units over two years.

When constructing this teaching plan consideration was given to the following points:

- ◆ Year 1 will contain Units which are mainly at SCQF level 7.
- ◆ Year 2 will contain Units which are mainly at SCQF level 8 and there should be a natural progression from some of the Units delivered in Year 1 to those being delivered in Year 2.
- ◆ Some Units are 2-credit and thought must be given as to whether the Unit should be covered in one semester or across the whole year.
- ◆ Finally, the Graded Units completed at the end of Years 1 and 2 are based on some of the mandatory Units. The Units being assessed as part of the Graded Unit, must be delivered and assessed to ensure that sufficient learning will have taken place to enable the learners a fair opportunity at achieving the Graded Unit at an appropriate grade.

Learners will study 15 credits worth of Units in each year. One semester will have 7 credits and one semester 8 credits. The weighting of these Units will depend on the relationship of the relevant Unit with other Units in terms of prior knowledge needed and/or complementary knowledge.

Rationale for the suggested delivery schedule

Two suggested delivery schedules have been given for Year 1 and Year 2 of HND Computing: Networking — Option A and Option B.

The majority of the SCQF level 7 Units have been included in Year 1, so that learners are provided with introductory knowledge and understanding in the subject areas of — Computer and Operating system fundamentals, network and security theory, professional issues, teamworking, project management, and software development.

The majority of the Units in Year 2 are SCQF level 8 Units that will develop on the knowledge and understanding gained in Year 1. Learners will be able to extend their knowledge and skills in Routing, Switching, Convergence Technologies, and Network and Server administration.

6.1.1 Year 1: Suggested delivery schedule

Year 1 — Option A

Semester 1	Semester 2
Developing Software: Introduction (H173 34) — SCQF level 7, 1 HN credit	HND Computing: Graded Unit 1 (Exam) (H40F 34) — SCQF level 7, 1 HN credit
Professionalism and Ethics in Computing (H1F7 34) — SCQF level 7, 1 HN credit	PC Hardware & Operating Systems Essentials (H17E 34) — SCQF level 7, 1 HN credit
Computer System Fundamentals (H175 34) — SCQF level 7, 1 HN credit	Cloud Computing (H179 34) — SCQF level 7, 1 HN credit
Troubleshooting Computer Problems (H177 34) — SCQF level 7, 1 HN credit	Mathematics for Computing 1 (D76E 34) — SCQF level 7, 1 HN credit
Teamworking in Computing (H178 34) — SCQF level 7, 1 HN credit	Computer Forensics Fundamentals (H1EN 34) — SCQF level 7, 1 HN credit
Client Operating Systems (H1EM 34) — SCQF level 7, 2 HN credits	
Security Concepts (H17V 34) — SCQF level 7, 2 HN credits	
Computing: Introduction to Project Management (H17D 34) — SCQF level 7, 1 HN credit	
Eight Units studied at SCQF level 7, (6 credits completed)	Seven Units studied at SCQF level 7, (9 credits completed)

Rationale for Year 1 (Option A)

In this option all the core level 7 Units (H173 34, H1F7 34, H175 34, H177 34, and H178 34) are completed in Semester 1. These Units are generic to all HN Computing courses, and include the Core Skills and concepts which will underpin the rest of the course. The Graded Unit exam (H40F 34) which tests knowledge and skills included in the core Units is taken in Semester 2. *Computing: Introduction to Project Management* (H17D 34) is also taken in Semester 1 and will help candidates with both *Teamworking in Computing* (H178 34) and other Units.

The two level 7 Units *Client Operating Systems* (H1EM 34) and *Security Concepts* (H17V 34) are taken over both semesters, allowing more time to complete these double credit Units. The remaining single credit level 7 Units are taken in Semester 2, and along with the previous Units will provide an underpinning foundation for the more advanced Units taken in Year 2.

Key features of Year 1 (Option A)

- ◆ The core generic Units are completed in Semester 1 providing a sound foundation for the rest of the course
- ◆ All subjects necessary for the Graded Unit exam are taken in Semester 1
- ◆ 6 credits are completed in Semester 1 which should help to build learners' confidence for Semester 2
- ◆ the two double credit level 7 Units are taken over both semesters allowing more time for completion

Year 1 — Option B

Semester 1	Semester 2
Developing Software: Introduction (H173 34) — SCQF level 7, 1 HN credit	HND Computing: Graded Unit 1 (Exam) (H40F 34) — SCQF level 7, 1 HN credit
Professionalism and Ethics in Computing (H1F7 34) — SCQF level 7, 1 HN credit	PC Hardware & Operating Systems Essentials (H17E 34) — SCQF level 7, 1 HN credit
Computer System Fundamentals (H175 34) — SCQF level 7, 1 HN credit	Cloud Computing (H179 34) — SCQF level 7, 1 HN credit
Troubleshooting Computer Problems (H177 34) — SCQF level 7, 1 HN credit	Mathematics for Computing 1 (D76E 34) — SCQF level 7, 1 HN credit
Teamworking in Computing (H178 34) — SCQF level 7, 1 HN credit	Computer Forensics Fundamentals (H1EN 34) — SCQF level 7, 1 HN credit
Networking Technology (FR24 35) — SCQF level 8, 2 HN credits	Routing Technology (FR22 35) — SCQF level 8, 2 HN credits
Computing: Introduction to Project Management (H17D 34) — SCQF level 7, 1 HN credit	
Seven Units studied: 6 at SCQF level 7, 1 at SCQF level 8 (8 credits completed)	Six Units studied: 5 at SCQF level 7, 1 at SCQF level 8 (7 credits completed)

Rationale for Year 1 (Option B)

In this option all the core level 7 Units (H173 34, H1F7 34, H175 34, H177 34, and H178 34) are completed in Semester 1. These Units are generic to all HN Computing courses, and include the Core Skills and concepts which will underpin the rest of the course. The Graded Unit exam (H40F 34) which tests knowledge and skills included in the core Units is taken in Semester 2. *Computing: Introduction to Project Management* (H17D 34) is also taken in Semester 1 and will help candidates with both *Teamworking in Computing* (H178 34) and other Units.

In this option the double credit level 8 Unit *Networking Technology* (FR24 35) is taken in Semester 1, and the double credit level 8 Unit *Routing Technology* (FR24 35) is taken in Semester 2. The four double credit level 8 Units FR24 25, FR22 35, FR23 35, and FR25 35 are related and should be taken in the following order:

- 1 *Networking Technology* (FR24 35)
- 2 *Routing Technology* (FR22 35)
- 3 *Switching Technology* (FR23 35)
- 4 *Internetworking Technology* (FR25 35)

Taking the first two of the above four Units in Year 1 will allow a semester to be spent on each of the Units (two years in all), rather than doing all four of the Units in a single year. This may suit some centres and learners. The content in *Networking Technology* (FR24 35) and *Routing Technology* (FR24 35) is also less advanced than that of *Switching Technology* (FR23 35) and *Internetworking Technology* (FR25 35) so should be achievable by Year 1 learners. *Networking Technology* also contains theory which will help with other Year 1 Units.

The remaining single credit level 7 Units are taken in Semester 2, and along with the previous Units will provide an underpinning foundation for the more advanced Units taken in Year 2.

Key features of Year 1 (Option B)

- ◆ The core generic Units are completed in Semester 1 providing a sound foundation for the rest of the course
- ◆ All subjects necessary for the Graded Unit exam are taken in Semester 1
- ◆ 8 credits are completed in Semester 1 which should help to build learners' confidence for Semester 2
- ◆ level 8 Units *Networking Technology* and *Routing Technology* are done in Year 1 allowing more time for the quartet of related Networking Units.

6.1.2 Year 2: Suggested delivery schedule

Year 2 — Option A

Semester 1	Semester 2
Networking Technology (FR24 35) — SCQF level 8, 2 HN credits	Switching Technology (FR23 35) — SCQF level 8, 2 HN credits
Routing Technology (FR22 35) — SCQF level 8, 2 HN credits	Internetworking Technology (FR25 35) — SCQF level 8, 2 HN credits
Computer Networking: Practical (H17B 34) — SCQF level 7, 1 HN credit	HND Computing: Networking Graded Unit 2 (Project) (H40G 34) — SCQF level 8, 2 HN credits
Server Administration (H16X 35) — SCQF level 8, 2 HN credits	Convergence Technologies (H17G 35) — SCQF level 8, 2 HN credits
Four Units studied: 1 at SCQF level 7, three at SCQF level 8 (7 credits completed)	Four Units studied at SCQF level 8, (8 credits completed)

Rationale for Year 2 (Option A)

The four double credit level 8 Units FR24 25, FR22 35, FR23 35, and FR25 35 are related and should be taken in the following order:

- 1 *Networking Technology* (FR24 35)
- 2 *Routing Technology* (FR22 35)
- 3 *Switching Technology* (FR23 35)
- 4 *Internetworking Technology* (FR25 35)

Unit *Networking Technology* (FR24 35) builds upon the 1st year level 7 Units and there is then a natural progression as each of the Units in the sequence above builds upon the previous one.

The double credit level 8 Units *Server Administration* (H16X 35) is taken in Semester 1 so skills and knowledge can be used in the Graded Unit project. The level 7 Unit *Computer Networking: Practical* (H17B 34) is also done in Semester 1 and will provide opportunities for assessment integration with *Networking Technology* (FR24 35).

The Graded Unit *HND Computing: Networking Graded Unit 2 (Project)* (H40G 34) is taken in Year 2 Semester 2 to allow the input of skills and knowledge acquired in Year 1 and from the Year 2 Semester 1 Units *Networking Technology* (FR24 35), *Routing Technology* (FR22 35), and *Server Administration* (H16X 35).

Key features of Year 2 (Option A)

- ◆ Natural progression between Units
- ◆ level 7 *Computer Networking: Practical* (H17B 34) taken in Semester 1
- ◆ 7 credits are completed in Semester 1 which should help to build learners' confidence for Semester 2
- ◆ All subjects recommended for the Graded Unit project are taken in Semester 1

Year 2 — Option B

Semester 1	Semester 2
Client Operating Systems (H1EM 34) — SCQF level 7, 2 HN credits	Security Concepts (H17V 34) — SCQF level 7, 2 HN credits
Switching Technology (FR23 35) — SCQF level 8, 2 HN credits	Internetworking Technology (FR25 35) — SCQF level 8, 2 HN credits
Computer Networking: Practical (H17B 34) — SCQF level 7, 1 HN credit	HND Computing: Networking Graded Unit 2 (Project) (H40G 34) — SCQF level 8, 2 HN credits
Server Administration (H16X 35) — SCQF level 8, 2 HN credits	Convergence Technologies (H17G 35) — SCQF level 8, 2 HN credits
Four Units studied: 1 at SCQF level 7, three at SCQF level 8 (7 credits completed)	Four Units studied: 1 at SCQF level 7, three at SCQF level 8 (8 credits completed)

Rationale for Year 2 (Option B)

In this option the level 7 double credit Units *Client Operating Systems* (H1EM 34), and *Security Concepts* (H17V 34) are done in Semesters 1 and 2 of Year 2 respectively. The inclusion of level 7 Units should make Year 2 less difficult for learners.

Switching Technology (FR23 35) and *Internetworking Technology* (FR25 35) are also done over Semesters 1 and 2 of Year 2 respectively, allowing more time for these advanced Units compared to Option A (where both are done inside a single semester).

The double credit level 8 Units *Server Administration* (H16X 35) is taken in Semester 1 so skills and knowledge can be used in the Graded Unit project. The level 7 Unit *Computer Networking: Practical* (H17B 34) is also done in Semester 1 and will provide opportunities for assessment integration with *Networking Technology* (FR24 35).

The Graded Unit *HND Computing: Networking Graded Unit 2 (Project)* (H40G 34) is taken in Year 2 Semester 2 to allow the input of skills and knowledge acquired in Year 1 and Semester 1 Year 2, from the Units *Networking Technology* (FR24 35), *Routing Technology* (FR22 35), and *Server Administration* (H16X 35).

Key features of Year 2 (Option B)

- ◆ Natural progression between Units
- ◆ The level 7 Unit *Computer Networking: Practical* (H17B 34) Unit taken in Semester 1
- ◆ 7 credits are completed in Semester 1 which should help to build learners' confidence for Semester 2
- ◆ All subjects recommended for the Graded Unit project are taken in Semester 1
- ◆ *Switching Technology* and *Internetworking Technology* done over a semester each
- ◆ Three level 7 Units included

6.2 Overview of Units

An overview of each Unit delivered in Years 1 and 2 is given below. However, tutors should refer to the Unit specification for full details of the Knowledge and/or Skills to be covered and Evidence Requirements. The Evidence Requirements clearly state the type of evidence required, the standard of evidence required and any conditions of assessment. The Unit specification also contains guidance on the delivery and assessment of the Unit.

Year 1 Units

Developing Software: Introduction — H173 34

This 1-credit Unit is designed to enable candidates to develop basic software development skills. The design and implementation of the constructs of programming (variables, sequence, selection, iteration, functions and parameter passing) will be covered in the context of a development environment. Test plans, test cases and program documentation will also be introduced.

This introduction will provide a basis for further study in software development using a range of programming languages.

There are two Outcomes in this Unit:

- 1 Implement and test code to carry out tasks following a given design.
- 2 Prepare technical documentation in line with good practice.

Throughout this Unit candidates will learn to use tools and techniques for basic software development using a suitable development environment determined such as structured C++ or any other language with a structured development environment. The choice of language will be at the discretion of the centre.

Candidates will learn how to code simple tasks and how this code interacts with the system. In addition they will learn to troubleshoot your code so that it runs error free and produces the desired results. This will involve rigorous testing and it is necessary that tutors stress the importance of testing and techniques that can be used and allow candidates to develop skills in testing.

Candidates should be given designs to follow and this should be used to help code solutions.

This Unit is assessed by practical assessment. All theoretical aspects of development should be demonstrated within a practical context.

Content of this Unit is also assessed in Graded Unit 1.

Professionalism and Ethics in Computing — H1F7 34

This 1-credit Unit is designed to allow candidates to gain the knowledge and understanding required to carry out the day to day duties and activities required of a computing professional in an ethical manner with due attention to business, society and legal requirements.

The Unit consists of four Outcomes which inter-relate to one another, to assist in development of a knowledge base and understanding of a computing professional's responsibilities in regard to:

- ◆ Professionalism in duties carried out within job functions including: the advantages of interacting with professional bodies in computing, the need for Continuous Professional Development, awareness of appropriate/acceptable conduct.
- ◆ Contemporary legislative requirements
- ◆ Adherence to appropriate ethical conduct
- ◆ Understanding of potential for and resolution of ethical conflict

The four Outcomes in this Unit are:

- 1 Describe professional bodies relevant to the computing profession.
- 2 Apply principles of codes of conduct relevant to the computing profession.
- 3 Describe contemporary legislative concerns for computing professionals.
- 4 Evaluate ethical considerations in a relevant vocational context.

The knowledge gained through researching the areas included in the Unit will enable candidates to approach future job roles in the computing profession in a responsible and ethical way.

Successful completion of the Unit will be achieved by submission of a single assignment based on questions related to a case study/scenario of a real business situation.

The case study which will form the basis of the assignment should be available to candidates early in the Unit scheduling and as a tutor you should allow candidates to ask questions to clarify their understanding of the details of the case study/scenario issued.

Content of this Unit is also assessed in Graded Unit 1.

Computer Systems Fundamentals — H175 34

This 1-credit Unit is designed to provide candidates with knowledge about the fundamentals of computer systems and focuses on how the various software and hardware elements interact. The Unit has three main areas, the physical and software elements of a computer system, the number systems and logic used within a computer system and the installation of various types of software. The first two areas are theoretical and the third area is practical.

There are three Outcomes in this Unit:

- 1 Explain the purpose of the elements of a computer system.
- 2 Manipulate and explain the uses of number and logic systems used in a computer.
- 3 Install a range of computer software.

Outcome 1 develops knowledge on the ways in which the central processing Unit communicates with memory and input/output devices. Communication channels such as busses will also be covered. This also covers the layers of the operating system. Computer memory can be of many types and you will learn to distinguish the features of different types of memory. Computer software will cover different types of operating systems, application and security software as well as file systems and structures. Some of the many ways to secure a computer system such as rights, permissions and security software will be introduced.

The main focus of Outcome 2 is in the application of number systems and logic. This introduces binary and hexadecimal number systems and operations such as add and subtract in these systems and to convert between these systems and decimal numbers. This also covers computer logic and the applications in which it can be used such as using masks in calculating network addresses and changing the case of letters.

Outcome 3 focuses on the practical tasks of installing software. Candidates will have the opportunity to apply the theory that they have learned in Outcome 1 to install operating system, application and security software.

Assessments for Outcomes 1 and 2 may be combined into a single assessment. All assessments are open-book — candidates may have access to unlimited notes and on-line materials.

Content of this Unit is also assessed in Graded Unit 1.

Troubleshooting Computing Problems — H177 34

This 1-credit Unit is designed to provide the skills required to develop a possible solution to a computing problem in the context of computer networking or software development. Topics covered will cover how to investigate the problem, plan and implement a solution, test and amend it until the problem is resolved and document each step taken to solve the problem.

There are three Outcomes in this Unit:

- 1 Investigate a computing problem.
- 2 Plan and implement a solution to a computing problem.
- 3 Document the steps taken to resolve a computing problem.

In the first Outcome candidates will learn how to investigate a computing problem. This will cover approaches to problem solving, test strategies and techniques and problem solving tools and techniques.

In the second Outcome candidates will learn how to plan and implement a solution to a computing problem. This will cover planning a solution, implementing a solution and testing the solution.

In the third Outcome candidates will learn how to document the steps taken to resolve a computing problem. This will include documenting the investigation, documenting the solution and documenting the testing.

For assessment purposes candidates will be presented with a problem to investigate. The problem will be drawn from one or more of the following areas: networking or software development. Candidates should develop skills in troubleshooting naturally occurring problems that they may encounter during their course. Candidates should be shown how to approach the diagnosis in a logical manner and completed relevant documentation. Documentation could take the form of error logs, test logs or any other appropriate form.

Content of this Unit is also assessed in Graded Unit 1.

Team Working in Computing — H178 34

This 1-credit Unit will provide the opportunity to develop effective skills for team working in the context of computing. Candidates will develop co-operative working skills which will include negotiation of goals, roles and responsibilities in the development of a team based Information and Communication Technology (ICT) project. Candidates, both individually and as a team, will present the project outcomes within the timescale prescribed by the team. Individual progress will be tracked against a project plan and the team will develop skills in updating the plan to ensure that the project is delivered on time. Individual team members will contribute to any necessary research and to documentation of the group's activities.

Candidates will also develop skills in evaluation and will be required to critically evaluate the contributions of themselves and fellow team members.

This Unit is aimed at developing the necessary skills for effective team working within the computing industry.

There are three Outcomes in this Unit:

- 1 Effectively participate in planning and organising a co-operative ICT project.
- 2 Participate in the management of a co-operative ICT project and research and carry out agreed project tasks against the schedule and within the remit of the project role.
- 3 Review own and group skills demonstrated throughout the co-operative ICT project.

HND Computing: Graded Unit 1 (Exam) — H40F 34

This 1-credit Unit is designed to assess a candidate's knowledge of key facts and concepts relating to computing. The assessment is a written examination lasting 3 hours.

This Unit is the only one in HND Year 1 Computing that is graded; all other Units are simply assessed on a pass/fail basis. Candidates must achieve at least 50% to be awarded a pass. The grading is carried out as follows:

- A = 70%–100%
- B = 60%–69%
- C = 50%–59%

The examination will be taken under supervised conditions. Candidates are not permitted to bring any reference material into the examination room. Calculators are not permitted.

The question paper consists of three sections. Each section uses different types of questions and assesses different knowledge and skills.

Section 1

This section is worth 15% of the total marks and consists of 15 multiple-choice or multiple-response questions with each question being worth 1 mark. This section covers:

Computer Systems Fundamentals (five questions worth 1 mark each)

Developing Software: Introduction (five questions worth 1 mark each)

Professionalism and Ethics in Computing (five questions worth 1 mark each)

Section 2

This section is worth 15% of the total marks and consists of one written response integrated question covering two or more of the topics listed in Section 3. Candidates must attempt this question.

Section 3

This section is worth 70% of the total marks and consists of written response questions. There are eight questions which cover individual Units and are each worth 10 marks. Candidates should answer any seven of the eight 10 mark questions. This section covers:

Computer Systems Fundamentals (two questions worth 10 marks each)

Developing Software: Introduction (two questions worth 10 marks each)

Professionalism and Ethics in Computing (two questions worth 10 marks each)

Troubleshooting Computing Problems (two questions worth 10 marks each)

There is no minimum score in any section.

Security Concepts — H17V 34

This 2-credit Unit is designed to introduce candidates to the issues involved in designing and constructing secure contemporary computer networks and is aimed at candidates undertaking an HN in Computing with Networking or Technical Support that require an understanding of the concepts underpinning network security.

On completion of the Unit the candidate should be able to:

- 1 Demonstrate network security, compliance and operational security.
- 2 Identify and describe threats and vulnerabilities.
- 3 Implement basic application, data, host security and access control mechanisms.
- 4 Identify suitable methods of cryptography.

There are four Outcomes in this Unit:

Outcome 1 focuses on the fundamentals of network security and design, devices, ports, protocols, risk management concepts disaster recovery and environmental controls.

Outcome 2 focuses on threats and vulnerabilities such as malware, spyware, social engineering techniques, penetration testing and the tools that can be used for security threat avoidance and ethical hacking techniques.

Outcome 3 focuses on application, data, host and access control mechanisms along with authentication services, operating system security controls account and password management.

Outcome 4 focuses on cryptographic methodologies such as cryptographic tools public key/private key infrastructure, digital signatures, certificate management and data encryption tools and techniques.

There will be one closed-book restricted-response assessment covering all Outcomes. Candidates will be presented with a total of 50 questions and expected to answer 60% of these correctly. They will also be expected to keep a log book, or equivalent, recording the practical tasks they have carried out during the Unit. They must satisfy the requirements for these assessments in order to achieve the Unit.

This Unit may assist candidates in preparing for CompTIA examination SY0-301: Security+. Vendor certifications can change rapidly and candidates should be encouraged to check the current details at www.comptia.org to ensure that all objectives have been covered.

Client Operating Systems — H1EM 34

This 2-credit HN Unit at SCQF level 7 is designed to develop an understanding of the issues involved in installing and administering a client operating system. On completion of the Unit candidates should be able to:

- 1 Install a client operating system.
- 2 Administer resources.
- 3 Implement, manage and troubleshoot hardware devices and drivers.
- 4 Monitor and optimise system performance and reliability.
- 5 Configure and troubleshoot the desktop environment.
- 6 Implement network protocols and services.
- 7 Implement, monitor and troubleshoot security.

In the first part of the course, candidates will study manual and automated installation of client operating systems, upgrading from older versions, applying post-installation upgrades and troubleshooting installation problems.

The second section covers implementing and administering resources, including monitoring, managing, and troubleshooting access to files and folders (including shared folders), connecting to local and network print devices and configuring and managing file systems.

The third section covers implementing, managing and troubleshooting hardware devices and drivers. This includes disk devices, display devices, input and output (I/O) devices, updating drivers and monitoring and configuring multiple processing Units.

The fourth section covers monitoring and optimising system performance and reliability, including monitoring, optimising and troubleshooting system performance, managing and troubleshooting the use of offline files, managing hardware profiles and recovering system and user data.

The fifth section covers configuring and managing user profiles, managing applications by using automatic installation software, configuring and troubleshooting desktop settings and configuring and troubleshoot accessibility services.

The sixth section covers implement network protocols and services, including configuring and troubleshooting the TCP/IP protocol, connecting to computers by using a web browser and configuring, managing and troubleshooting a firewall.

The final section covers implementing, monitoring and troubleshooting security, including configuring, managing and troubleshooting file encryption, security configuration, local security policy, local user and group accounts and web browser security settings.

PC Hardware & Operating Systems Essentials — H17E 34

This 1-credit Unit is designed to develop basic competencies necessary for an entry level IT Professional working as a field, service or PC technician, upgrading, configuring, troubleshooting, and performing preventative maintenance on PC hardware and operating systems. It is intended for candidates undertaking an HNC/HND in Computing, Computer Networking or a related area which requires an understanding of computer hardware and operating systems.

On completion of the Unit the candidate should be able to:

- 1 Describe PC and laptop fundamentals.
- 2 Identify troubleshooting, repair and maintenance methods.
- 3 Identify operating systems and software features.
- 4 Describe networking and security.
- 5 Describe operational procedures in PC support.

There are two forms of assessment. The first is a multi-choice assessment that tests the candidate's knowledge of computer hardware, troubleshooting, operating systems, networks, security and user support. The minimum pass mark is 60%. The second contains a series of short assignments testing practical abilities, and requires candidates to produce short design reports and complete a number of tasks to document practical work.

All assessment will be carried out in supervised conditions, and the written assessments will be closed-book, (ie candidates will not be allowed to bring any notes with them to the assessment event). Candidates will produce evidence to demonstrate competence in practical tasks by maintaining a log using pro-forma record sheets.

This Unit may assist candidates in preparing for CompTIA Examination A+ 220–701 2009 Exam Objectives. Vendor certifications can change rapidly and candidates should be encouraged the check the current details at www.comptia.org to ensure that all objectives have been covered. Where candidates produce evidence of a current A+ certification 2009 objective or A+ 2006 objectives, credit transfer may be offered for underlying theory and knowledge only.

Computer Forensics: Fundamentals — H1EN 34

This 1-credit Unit is designed to enable candidates to identify the main factors involved in carrying out a computer/digital based investigation. In order to work effectively as a digital forensic investigator, professionals need to identify the elements that comprise the life cycle of an investigation. The aim of this Unit is to enable candidates to gain an understanding and appreciation of a number of areas of concerns to investigators and organisations alike.

This Unit has four Outcomes:

In Outcome 1 candidates will learn how to perform incident response procedures; what to do upon arrival at a crime scene, where to look for digital evidence, based on the type of incident and/or crime that has been committed and how to apply best practice procedures when recording evidence.

Outcome 2 takes the investigation a step further with initiation of the Chain of Custody process and subsequent management, how to safeguard digital evidence through forensic acquisition and the type of tools and methodologies used in forensic duplication.

Outcome 3 deals with the analysis of different types of evidence based on the source of evidence; system information, hard disk information and network/internet information.

Outcome 4 deals with the production of a forensic report that will be based on the investigation and analysis carried out during the previous Outcomes and aims to identify the skills needed in the production of a formal report for use by business executives or law enforcement in a court of law.

Work for all Outcomes will be assessed by using one case study in which candidates will be confronted by a scenario and then carry out various practical investigatory tasks. They will then produce a written report of approximately 1,000 words based on the findings of the practical tasks.

Computing: Introduction to Project Management — H17D 34

This 1-credit Unit will enable candidates to develop the basic knowledge and skills required to plan, implement, monitor, manage and report on a small scale project.

There are three Outcomes in this Unit:

- 1 Understand Project Management terminology.
- 2 Plan and implement a project plan.
- 3 Monitor, manage, and report change of cost/quality/time impact on a project.

Outcome 1 will cover many of the fundamentals of project management such as the terminology of project management; the range of skills required by project managers; the stages of the project management development cycle; software available to assist the management of projects.

To aid fuller understanding of Critical path analysis it would be advisable to show/demonstrate/worked examples of how critical path analysis is carried out manually.

Discussions on project management methodologies could encompass any of the following examples (Agile, Prince2, Waterfall, ITIL, Rapid Application Development — RAD, Software Development Life Cycle — SDLC, PMBOK).

In Outcome 2 candidates will learn how to plan the development and progress of a project by scheduling the phases and tasks, including resources (human and physical), milestone points, team meetings, and identifying critical and non-critical tasks. This may be achieved either manually or by making use of suitable software.

In Outcome 3 candidates will be required to modify an existing project schedule in response to an external influence (cost/time/quality change). After modification they will be expected to integrate the effects of the changes into suitable documents that could facilitate effective communication to project stakeholders.

Outcomes 2 and 3: These Outcomes should be delivered in a practical fashion, ensuring that points of learning are maintained throughout the Outcomes. Candidates should be encouraged to work with project specifications and use these to learn about the various aspects of project management. Outcome 3 is likely to create a significant amount of problem solving.

Cloud Computing — H179 34

The 1-credit Unit is aimed at providing candidates with a broad knowledge base in the essentials of cloud computing along with conceptual understanding of the elements associated with cloud computing.

On completion of this Unit, candidates should be able to:

- 1 Identify and describe cloud computing fundamentals.
- 2 Identify and describe different cloud delivery and deployment models.
- 3 Devise and implement a cloud strategy for a small to medium sized enterprise.

Outcome 1 is aimed at introducing candidates to the fundamentals of cloud computing, including the identification of IT components and how they map to hardware and software elements found in the cloud. Candidates are also asked to identify the basics of virtualisation.

Outcome 2 is geared more towards the operational aspects of cloud computing and introduces candidates to the different cloud computing services and how they are deployed.

Outcome 3 deals with candidates devising a strategy for moving to the cloud, examining the security and management aspects of cloud computing, identifying cloud vendors as well as demonstrating the practical elements of cloud computing.

Mathematics for Computing 1 — D76E 34

This is a 1-credit Unit which teaches methods that are very useful for candidates who want to be programmers. Whilst the Unit begins from first principles, in practice the contents are too much for someone to learn in the hours that will normally be allocated. Candidates should have a foundation mathematics or numeracy qualification as a pre-requisite to this Unit. This Unit covers mathematical methods and skills appropriate to computing.

There are four Outcomes in this Unit:

- 1 Demonstrate an understanding of scientific notation and manipulate numbers in scientific notation.
- 2 Demonstrate an understanding of co-ordinate systems and vectors, and apply linear transformations.
- 3 Demonstrate a knowledge of simple functions and the ability to perform basic algebraic operations.
- 4 Demonstrate the application of Boolean algebra to problem situations.

In the first Outcome, candidates will learn about scientific notation and rounding. This is important because it is similar to the way computers store numbers. When programming, candidates need to be aware of what is happening in the computer memory when declaring variables.

The second Outcome covers Co-ordinates and transformations. These are the skills required to create computer graphics.

Outcome 3 focuses on functions and algebra. This is useful when you have to use a computer to perform calculations or manipulate numbers.

In Outcome 4, candidates will be introduced to design with logic gates. Computers are based entirely on logic gates and seeing how a few gates can be combined to perform a useful function gives a good insight into the workings of a computer.

This Unit may be assessed either by four separate 45-minute open-book tasks, or by a single set of questions for the whole Unit, which may be given out one week in advance of the submission deadline. In all cases, the assessment instruments should be in the context of computing and presented as a problem situation. Whichever assessment method is adopted, the candidate should attain a minimum of 60% of the available marks for each Outcome to reach the standard required for a pass.

Year 2 Units

Computer Networking: Practical — H17B 34

This 1-credit Unit is designed to introduce candidates to the basic components of contemporary local area networks (LAN) and wide area networks (WANs). Candidates will gain practical experience of implementing a client server local area network using industry-standard equipment and protocols. Candidates will also learn how to configure appropriate devices to allow a remote computer to gain access to the LAN.

On completion of the Unit the candidates should be able to:

- 1 Implement a client server local area network.
- 2 Diagnose and rectify network problems.
- 3 Provide a remote computer with access to the LAN.

Outcome 1 covers the practical skills involved in implementing a small client server local area network. Candidates will participate in exercises to configure and connect clients and servers and should be able to gain first-hand experience of the range of industry-standard equipment used to connect and configure devices on a LAN.

Outcome 2 covers the use of diagnostic tools to locate and rectify network faults. Candidates should be introduced to the range of utility programs such as ipconfig, ping, arp, getmac, netstat and, where appropriate, cable testing tools. These tools should be discussed and appropriately demonstrated in the context of fault diagnosis and resolution.

Outcome 3 covers the use of appropriate technologies to connect a remote computer to a LAN. There are a variety of methods for connecting a client computer, ideally through VPN connection, to a LAN to access network resources. Candidates will participate in exercises to configure a remote computer to connect to a LAN using the preferred technology for your centre.

The Unit will be assessed by two instruments of assessment: a multiple-choice/multiple-response test covering the knowledge and understanding of the TCP/IP component of Outcome 2 and a skills test covering all the Unit Outcomes. The multiple-choice/multiple-response test shall comprise a total of twenty questions and will be undertaken in closed-book conditions. With regard to the skills test competence can be demonstrated by a series of observation checklists relating to the respective tasks undertaken within the assessment.

Convergence Technologies — H17G 35

This 2-credit Unit is designed to provide candidates with the necessary knowledge to perform basic requirements analysis, and specify, implement and manage basic components of data, voice and multimedia convergence applications and understand basic problem analysis and resolution for converged technologies. On completion of the Unit candidates should be able to:

- 1 Describe data networking for convergent networks.
- 2 Describe telephony networking services, functions and technologies.
- 3 Describe convergence technologies.

The first Outcome candidates will learn how to relate networking models and standards to convergence networking practices, identify appropriate LAN and WAN infrastructures, plan an IP network, describe wireless networks, troubleshoot convergent networks, identify elements and benefits of a virtual LAN (VLAN) and define Quality of Service (QoS).

In the second Outcome candidates will learn how to define codecs and Pulse Code Modulation (PCM), define Integrated Services Digital Network (ISDN) elements and concepts, identify common voice services and feature sets and identify and troubleshoot problems with voice calls in digital and analogue environments.

In the third Outcome candidates will learn how to identify essential elements of a convergent network, identify requirements for transporting text, data, voice and video through a converged network, identify methods for providing video services through a converged network, explain how protocols are used to carry and control convergent network traffic, identify common convergence devices, troubleshoot common convergence technology and identify security issues for converged networks.

All Outcomes will be assessed at the end of the Unit by means of 60 multiple-choice/multiple-response questions with appropriate sampling of the complete Unit content. Candidates must score at least 60% in order to pass the Unit.

This Unit may assist in preparing for vendor certifications like CompTIA CTP+.

Networking Technology — FR24 35

The purpose of this 2-credit Unit is to enable candidates to work effectively in a Local Area Network installation or support role using networking computers. It is intended for candidates undertaking an HND in Computing, Computer Networking or a related area who require a broad understanding of Local Area Networks.

On completion of the Unit the candidate should be able to:

- 1 Describe the components of Local Area Networks and media.
- 2 Describe the OSI and TCP/IP models, and their layers.
- 3 Describe and use common addressing schemes and routing in a networked environment.
- 4 Describe connectivity and transmission features, and operation of local and wide area networks.
- 5 Configure, build and test a simple Local Area Network.

This Unit has five Outcomes:

In Outcome 1 the candidate will learn about common networking hardware used to connect a network including but not restricted to routers, switches, hubs, bridges, repeaters and NIC's. Networking terminology for example common topologies, LAN, WAN, MAN, SAN, PAN, WLAN, Virtual Private Networks and Intranets.

Outcome 2 deals with of the levels of the OSI model and its relationship to the TCP/IP protocol stack, the protocols at each level, the function of each level and the hardware used at the lower layers.

In Outcome 3 the candidate will learn about the IP v4 32bit addressing scheme including public and private address schemes, the IP v6 128 bit addressing scheme, how to configure subnets, how to convert decimal to binary and binary to decimal for use in IP addressing, how to convert hexadecimal to decimal and decimal to hex for use in IP addressing and learn how configure routing in a networked environment.

In Outcome 4 the candidate will learn about network cabling which will include signals and noise, signalling over copper and fibre, attenuation, loss, noise, crosstalk, LAN cabling, Ethernet media, UTP (Categories 5, 5e, 6, and 7), fibre-optics, wireless, LAN devices, MDI and MDIX, and WAN cabling.

Outcome 5 covers building a LAN and is intended to allow the candidate to apply the knowledge gained during the earlier Outcomes in a practical environment. The candidate will make and test different types of network cables, and will learn how to build and configure a peer to peer network, how to build and configure a workgroup network and how build and configure a client server network using routing technologies.

There will be a closed-book multiple-choice/multiple-response assessment covering all Outcomes. The candidate will be presented with 50 questions and expected to answer 60% of these correctly. The candidate will also be expected to keep a suitable record recording the practical tasks they have carried out during the Unit. The candidate must satisfy the requirements for these assessments in order to achieve the Unit.

In preparing for assessments for this Unit centres may find useful course materials and assessments on the Cisco NetSpace Academy. This Unit (in conjunction with the related Units: FR22 35 *Routing Technology*, FR23 35 *Switching Technology* and FR25 35 *Internetworking Technology*) may assist the candidate in preparing for Cisco examination 640-802: Cisco Certified Network Associate. In addition candidates may find this Unit helpful in preparation for Cisco examination 640-811: Interconnecting Cisco Networking Devices and Cisco examination 640-821 Introduction to Cisco Networking Technologies. The candidate should check the latest information at www.cisco.com to ensure that all objectives have been covered.

Routing Technology — FR22 35

This purpose of this 2-credit Unit is to provide candidates with an understanding of the basic theory of common contemporary interior gateway routing protocols and to implement these on routers designed to support small to medium sized enterprises. It is intended for those undertaking an HNC or HND in a Computer Networking or related area who require a basic understanding of routing technology.

On completion of the Unit the candidate should be able to:

- 1 Describe router fundamentals.
- 2 Describe contemporary IP addressing schemes.
- 3 Describe the operation of common contemporary interior gateway routing protocols.
- 4 Implement a routed network topology.

This Unit has four Outcomes:

The first Outcome puts the Unit into context by describing the role of a router in a network. Primary functions such as packet forwarding and best path determination are introduced. Contemporary router LAN and WAN interfaces are described together with their respective media characteristics.

In Outcome 2 legacy IP addressing schemes such as IPv4 classful and classless are described. In particular the limitations of classful addressing and the requirement for VLSM and CIDR techniques are outlined. IPv6 addressing scheme is described together with features such as address space, address assignment and simplified processing by routers.

In Outcome 3 the requirement for static routing is described. In addition the classification of legacy and contemporary routing protocols is defined, for example, distance vector and link state, vendor-specific (EIGRP) and vendor-neutral (OSPF).

Outcome 4 deals with be the implementation of a routed network from a given scenario.

There will be two forms of assessment within this Unit.

Outcomes 1 to 3 knowledge and understanding component of the Unit will be assessed as a single end-of-Unit test. This format of this test will be decided by your centre and will be timed, supervised and conducted under closed-book conditions. Candidates must answer at least 60% of the questions correctly in order to obtain a pass.

Outcome 4 will assess the skills component of the Unit and will take the form of a practical activity where candidates will be required to design and implement a routed network for a given scenario. The format of the evidence produced will be decided by your centre but is likely to take the form of a logbook or observation checklist.

In preparing for assessments for this Unit centres may find useful course materials and assessments on the Cisco NetSpace Academy. This Unit (in conjunction with the related Units: FR24 35 Networking Technology, FR23 35 Switching Technology and FR25 35 Internetworking Technology) may assist the candidate in preparing for Cisco examination 640-802: Cisco Certified Network Associate. In addition candidates may find this Unit helpful in preparation for Cisco examination 640-811: Interconnecting Cisco Networking Devices and Cisco examination 640-821 Introduction to Cisco Networking Technologies. The candidate should check the latest information at www.cisco.com to ensure that all objectives have been covered.

Switching Technology — FR23 35

The purpose of this 2-credit Unit is to provide candidates with an understanding of how a switch communicates on a network, how switches are interconnected and configured with other networking devices in a small or medium sized business network, which includes implementing VLAN segmentation integrating wireless devices into a LAN. It is intended for candidates undertaking an HNC or HND in Computing, Computer Networking or a related area who require a detailed understanding of switching technology.

On completion of the Unit the candidate should be able to:

- 1 Describe LAN architecture.
- 2 Describe and configure basic switching technology.
- 3 Describe and configure advanced switching technologies.
- 4 Describe and configure basic wireless LANs.

In the first part of the Course, candidates will study the principles of LAN architecture and design methods for switched networks.

In the second part of the Course, candidates will learn about basic switching techniques and the practical skills they need to configure them. This includes such areas as switch forwarding methods such as fast forward, cut through and store and forward, symmetric and asymmetric switching, memory buffering, layer 2 and layer 3 switching.

There will be a closed-book multiple-choice/multiple-response assessment covering all Outcomes. Candidates must answer at least 60% of the questions correctly in order to achieve a pass.

In preparing for assessments for this Unit centres may find useful course materials and assessments on the Cisco NetSpace Academy. This Unit (in conjunction with the related Units: FR24 35 *Networking Technology*, FR22 35 *Routing Technology* and FR25 35 *Internetworking Technology*) may assist the candidate in preparing for Cisco examination 640-802: Cisco Certified Network Associate. In addition candidates may find this Unit helpful in preparation for Cisco examination 640-811: Interconnecting Cisco Networking Devices and Cisco examination 640-821 Introduction to Cisco Networking Technologies. The candidate should check the latest information at www.cisco.com to ensure that all objectives have been covered.

Internetworking Technology — FR25 35

The purpose of this 2-credit Unit is to provide candidates with an understanding of WAN technologies and network services required by converged applications in enterprise networks. It will introduce integrated network services and explains how to select the appropriate devices and technologies to meet network requirements. Candidates will learn how to implement and configure common data link protocols and how to apply WAN security concepts, principles of traffic, access control, and addressing services and how to detect, troubleshoot, and correct common enterprise network implementation issues.

On completion of the Unit the candidate should be able to:

- 1 Describe WAN and remote access concepts.
- 2 Describe and configure common WAN protocols.
- 3 Describe and configure network security.
- 4 Describe and perform network troubleshooting.

In the first part of the Course, candidates will study the principles of WAN architecture and design methods for Wide Area Networks. They will learn about introductory WAN concepts such as Providing Integrated Services to the Enterprise, WAN Technology Concepts and WAN Connection Options.

In the second part of the Course, candidates will learn about common WAN protocols and the practical skills you need to configure them. This includes such areas as PPP and frame relay how to use them, configure them and test them.

In the third part of the Course candidates will learn about network security and how you can implement security in a number of ways from password security to the use of basic, advanced and complex access control lists.

In the fourth part of the Course candidates will learn about network Troubleshooting in particular the importance of establishing a network performance baseline, troubleshooting methodologies and tools as well as common WAN implementation issues. They will also perform the following practical tasks — carry out network troubleshooting using standard methodologies.

There will be a closed-book multiple-choice/multiple-response assessment covering all Outcomes. Candidates must answer at least 60% of the questions correctly in order to achieve a pass.

In preparing for assessments for this Unit centres may find useful course materials and assessments on the Cisco NetSpace Academy. This Unit (in conjunction with the related Units: FR24 35 *Networking Technology*, FR22 35 *Routing Technology* and FR23 35 *Switching Technology*) may assist the candidate in preparing for Cisco examination 640-802: Cisco Certified Network Associate. In addition candidates may find this Unit helpful in preparation for Cisco examination 640-811: Interconnecting Cisco Networking Devices and Cisco examination 640-821 Introduction to Cisco Networking Technologies. The candidate should check the latest information at www.cisco.com to ensure that all objectives have been covered.

Server Administration — H16X 35

This 2-credit Unit is designed to give candidates the skills required to function as a server administrator, responsible for the operations and day-to-day management of an infrastructure of network servers within an organisation. Server administrators manage the infrastructure, Web, and IT application servers, using scripts and batch files written by themselves or others to accomplish tasks on a regular basis. They conduct most server management tasks remotely by using Remote Desktop Server or administration tools installed on their local workstation.

On completion of the Unit the candidate should be able to:

- 1 Plan for server deployment.
- 2 Plan for server management.
- 3 Monitor and maintain servers.
- 4 Plan application and data provisioning.
- 5 Plan for business continuity and high availability.

This Unit has five Outcomes. Outcome 1 will cover how to plan for server deployment. This includes planning server installations and upgrades, planning for automated server deployment, planning infrastructure services server roles, planning application servers and services and planning file and print server roles.

Outcome 2 deals with how to plan for server management. This includes planning server management strategies, planning for delegated administration and planning and implementing group policy strategy.

Outcome 3 deals with how to monitor and maintain servers. This includes implementing patch management strategy, monitoring servers for performance evaluation and optimisation and monitoring and maintaining security and policies.

Outcome 4 deals with how to plan application and data provisioning.

Outcome 5 deals with how to plan for business continuity and high availability. This includes planning storage, planning high availability and planning for backup and recovery.

Assessment for all Outcomes will be undertaken at the end of the Unit by means of a multiple-choice test consisting of 60 questions. Candidates must score at least 60% in order to pass the Unit.

This Unit may assist in preparing for vendor certifications like the MCITP: Server Administrator on Windows Server 2008.

HND Computing: Technical Support Graded Unit 2 (Project) — H40G 35

This 2-credit Graded Unit is designed to provide evidence that the candidate has achieved the following principal aims of HND Computing Networking:

- 1 To prepare candidates for employment in a network-related post at technician or professional level in a computer networking support or administrative role.
- 2 To develop a range of specialist technical knowledge and skills in networking technologies and operating systems.

It is recommended that the candidate should have completed or be in the process of completing the following Units relating to the above specific aims prior to undertaking this Graded Unit:

FR22 35 *Networking Technology*
FR22 35 *Routing Technology*
H16X 35 *Server Administration*

This Graded Unit is designed to provide evidence of the candidate's ability to plan, develop, implement and evaluate technical skills gained throughout the course. It does not ask the candidate to prove new skills. During the Unit they will be expected to:

- 1 Interpret the needs of the project from the brief.
- 2 Gather information to plan and develop the project.
- 3 Decide upon and develop a design approach.
- 4 Carry out the development.
- 5 Evaluate the product and process.
- 6 Evaluate their own performance.

The assessment task is a project. The project will be a complex task which involves:

- 1 Variables which are complex or unfamiliar.
- 2 Relationships which need to be clarified.
- 3 A context which may be familiar or unfamiliar to you.

The project will be marked out of 100. The mark at each stage of the project takes into account the criteria outlined. Candidates can only progress to the next stage if they have met the minimum Evidence Requirements of the previous stage. At the end of each stage, there will be opportunities for remediation/reassessment on that particular stage. All allocated marks will be aggregated to arrive at an overall mark for the project. Assessors will assign an overall grade to the candidate for this Graded Unit based on the following grade boundaries.

A = 70%–100%

B = 60%–69%

C = 50%–59%

Candidates must achieve a minimum of:

- ◆ 20 marks for the Planning stage
- ◆ 20 marks for the Developing stage
- ◆ 10 marks for the Evaluating stage.

6.3 Opportunities for integration of Units

It is envisaged that where possible centres will deliver this award in an integrative manner to help the candidates appreciate the interconnections between the various subjects.

Integration means identifying opportunities either within a Unit or across Units to deliver and/or assess topics which meet the criteria for either two Outcomes within the same Unit, or two Outcomes — one Outcome from one Unit and one Outcome from another Unit.

For example, in Year 1 there may be opportunities to integrate into a single case study the teamwork task in *Team Working in Computing* (H178 34) with the project management work required for *Computing: Introduction to Project Management* (H17D 34).

In Year 2 the Unit *Computer Networking: Practical* (H17B 34), Outcome 1 deals with the implementation of a client server Local Area Network. This is also covered by Outcome 5 of the Unit *Networking Technology* (FR24 35) so both Outcomes could be assessed by the learners completing a single practical task activity.

Based on the proposed delivery of Years 1 and 2 the following opportunities exist for integration of delivery and/or assessment:

Year 1

Unit code	Unit title	Integration opportunity
H17D 34	Computing: Introduction to Project Management	There may be opportunities to integrate into a single case study the teamwork task in H178 34 with the project management work required for H17D 34
H178 34	Team Working in Computing	

Year 2

Unit code	Unit title	Integration opportunity
H17B 34	Computer Networking: Practical	Outcome 1 of H17B 34 and Outcome 5 of FR24 35 both cover implementation of a Local Area Network and can be integrated into a single assessment activity
FR24 35	Networking Technology	

7 Assessment in an HND award

7.1 Assessment in learning and for certification

Assessment is the process of evaluating a learner's learning.

Assessment takes place throughout the learning and teaching processes as well as the final assessment for certification. It can take many forms (for example: practical exercises, case studies, extended response questions) and can be used for different purposes — including identifying prior knowledge, identifying gaps in learning, providing feedback to learners as well as measuring learner attainment.

Assessment as part of the learning process is called **formative** assessment. It provides developmental feedback to a learner and tutors so that they can adjust their plan for future learning. It is not recorded for external purposes. **Formative** assessment is often called 'assessment for learning'.

Summative assessment is carried out for the purpose of certification. Through **summative assessment**, learners provide evidence to demonstrate that they can achieve the Evidence Requirements detailed in the statement of standards of the relevant Unit specification. It is generally undertaken at the end of a learning activity or programme of learning and is used to make a judgement on the learner's overall attainment.

7.2 Assessment planning of an HND

All HND qualifications are **summatively assessed** using a mix of continuous Unit assessment and Graded Unit assessments. It is helpful for learners, the Course Team and the internal verifiers if the Course Team has an overview of when summative assessments are likely to occur. It is, therefore, common practice for a Course Team, prior to the start of course delivery to agree the overall learning, teaching and assessment plan for the course. Part of this process requires tutors to agree when each Unit in the course will be **summatively assessed**.

In situations where Units of a course are being delivered in parallel, it is important that Course Teams make sure that the assessment load placed on learners is manageable, although it is recognised that by its very nature summative assessments will occur towards the end of learning.

7.3 Planning the Unit summative assessment

For each Unit, it is helpful for tutors/assessors to draw up a Unit assessment plan which:

- ◆ describes what is to be assessed.
- ◆ says what assessment methods will be used.
- ◆ describes how the assessments are to be administered, eg practical, online, etc.
- ◆ defines opportunities for integrating assessment.
- ◆ provides a timetable for when the assessment will take place.
- ◆ notes arrangements that need to be made to take account of additional support needs or prior learning.
- ◆ describes the measures to be taken to ensure that the evidence produced is authentic and current.
- ◆ describes how and when requirements for record-keeping and quality assurance processes will be met.

7.4 Negotiating summative assessments with the learners

Ultimately, it is up to the tutor to determine when a learner is ready for summative assessment (within the agreed time constraints of the course timetable). A good way of gauging if a learner is ready for assessment is to use a **practice assessment** (a final formative assessment which mirrors the summative assessment in terms of assessment method and an aspect of the Evidence Requirement where appropriate but it must not contain the same task detail as the summative assessment).

The tutor can use this assessment to identify the level of an individual learner's competence and the outcome can help the tutor determine if the learner is ready to attempt the summative assessment or if the learner still has gaps in knowledge and understanding that need to be addressed through further work.

It is good practice to communicate assessment plans to learners as early as possible in the course so that they know what to expect. A copy of the **proposed Course Assessment Plan** may be given to learners at the start of the course, often during course induction. Thereafter, it is up to each tutor to make sure that learners receive early warning of when assessment is likely to take place.

7.5 Summative assessment exemplars

Assessment exemplars are produced by SQA and are made available to centres for a number of Units in this HND. Assessment exemplars are intended solely for the purpose of assessment of learners against the standards given in the Unit specifications. **They must not be released prior to the assessment or be distributed for any other purpose. It is the centre's responsibility to maintain the security of all assessment exemplars.**

A Unit assessment exemplar will contain:

- ◆ details of the conditions under which the assessment is to be carried out.
- ◆ assessment tasks for each Outcome.
- ◆ a marking scheme or model answer.
- ◆ checklists (where appropriate).

It is vital that tutors:

- ◆ adhere to the conditions for the assessment, ie open-book, closed-book, controlled conditions.
- ◆ mark assessments consistently in line with the marking scheme or model answer provided.
- ◆ keep all assessment exemplars secure so that they can be used for future learner assessments.

Once the learner has completed the summative assessment, it is good practice for tutors to mark their learner's work quickly and provide constructive feedback.

8 HND Computing: Networking assessment strategy and plan

8.1 HND Computing: Networking assessment strategy

A guide to the type and number of assessments in each Unit of the HND Computing: Networking is shown below.

Unit	Assessment — Year 1			
Developing Software: Introduction H173 34	Outcome 1		Outcome 2	
	Open-book Practical task undertaken in supervised conditions over an extended period of time			
Professionalism and Ethics in Computing H1F7 34	Outcome 1	Outcome 2	Outcome 3	Outcome 4
	Open-book Single assessment for Unit relating to a case study and questions covering content of Outcomes Undertaken supervised conditions over an extended period of time			

Unit	Assessment — Year 1			
Computer Systems Fundamentals	Outcome 1	Outcome 2	Outcome 3	
H175 34	Open-book Set of 25 short response questions covering each bullet point Supervised assessment lasting 2 hours		Open-book Practical task and detailed log Supervised conditions with no time limit	
Troubleshooting Computer Problems	Outcome 1	Outcome 2	Outcome 3	Outcome 4
H177 34	Open-book Investigation carried out and all stages presented in a 1,000 word report Undertaken supervised conditions over an extended period of time			
Computing: Introduction to Project Management	Outcome 1	Outcome 2	Outcome 3	
H17D 34	Closed-book 20 multiple-choice questions Supervised conditions lasting 1 hour	Open-book Practical task covering content of Outcomes 2 and 3 Supervised conditions over an extended period of time		
Mathematics for Computing 1	Outcome 1	Outcome 2	Outcome 3	Outcome 4
D76E 34	Open-book Set of questions Supervised conditions lasting 45 minutes	Open-book Set of questions Supervised conditions lasting 45 minutes	Open-book Set of questions Supervised conditions lasting 45 minutes	Open-book Set of questions Supervised conditions lasting 45 minutes
	OR			
	Open-book Set of questions for complete Unit. Candidates may be given questions one week in advance Supervised conditions with no specified time limit			
Team Working in Computing	Outcome 1	Outcome 2	Outcome 3	Outcome 4
H178 34	Open-book Group project over an extended period of time			
HND Computing: Graded Unit 1 (Exam)	Graded Unit			
H40F 34	Closed-book Examination paper lasting 3 hours Supervised conditions			

Unit	Assessment — Year 1						
Client Operating Systems	Out-come 1	Out-come 2	Out-come 3	Out-come 4	Out-come 5	Out-come 6	Out-come 7
H1EM 34	Open-book Log book three out of five practical tasks	Open-book Log book two out of four practical tasks	Open-book Log book two out of four practical tasks	Open-book Log book 2 out of 4 practical tasks	Open-book Log book two out of four practical tasks	Open-book Log book two out of three practical tasks	Open-book Log book two out of three practical tasks
	AND Closed-book 30 restricted-response questions covering all Outcomes Supervised						
Security Concepts	Outcome 1	Outcome 2	Outcome 3	Outcome 4			
H17V 34	Closed-book 50 questions restricted-response assessment covering all Outcomes. 60% pass mark. Supervised, 110 minutes time limit AND Open-book Log book or equivalent showing practical tasks covering content of Unit Supervised conditions over an extended period of time						
PC Hardware & Operating Systems Essentials	Outcome 1	Outcome 2	Outcome 3	Outcome 4	Outcome 5		
H17E 34	Closed-book 36 questions multiple-choice/multiple-response assessment covering all Outcomes. 60% pass mark. Supervised, 100 minutes time limit AND Closed-book Log book or equivalent showing practical tasks covering content of Unit Supervised conditions						
Computer Forensics Fundamentals	Outcome 1	Outcome 2	Outcome 3	Outcome 4			
H1EN 34	Open-book Case study leading to written report of approximately 1,000 words based on the findings of the practical tasks for all Outcomes. Supervised conditions over an extended period of time						
Cloud Computing	Outcome 1	Outcome 2	Outcome 3				
H179 34	Open-book Case study leading to written report of approximately 1,000 words based on the findings of the practical tasks for all Outcomes. Supervised conditions over an extended period of time						

Unit	Assessment — Year 2				
Computer Networking: Practical H17B 34	Outcome 1	Outcome 2	Outcome 3		
		Closed-book 20 questions multiple-choice/multiple-response assessment. 60% pass mark. Supervised			
	AND Open-book Log book or equivalent showing practical tasks covering content of all Outcomes Supervised conditions over an extended period of time				
Networking Technology FR24 35	Outcome 1	Outcome 2	Outcome 3	Outcome 4	Outcome 5
	Closed-book 50 questions multiple-choice/multiple-response assessment covering all Outcomes. 60% pass mark. Supervised, 100 minutes time limit AND Open-book Log book or equivalent showing practical tasks covering content of Unit Supervised conditions over an extended period of time				
Routing Technology FR22 35	Outcome 1	Outcome 2	Outcome 3	Outcome 4	
	Closed-book 50 questions multiple-choice/multiple-response assessment covering all Outcomes. 60% pass mark. Supervised, 100 minutes time limit AND Open-book Log book or checklist showing completion of a practical skills test covering content of Unit Supervised conditions				
Switching Technology FR23 35	Outcome 1	Outcome 2	Outcome 3	Outcome 4	
	Closed-book 50 questions multiple-choice/multiple-response assessment covering all Outcomes. 60% pass mark. Supervised, 100 minutes time limit AND Open-book Log book or checklist showing completion of a practical skills test covering content of Unit Supervised conditions				

Unit	Assessment — Year 2				
	Outcome 1	Outcome 2	Outcome 3	Outcome 4	
Internetworking Technology FR25 35	Closed-book 50 questions multiple-choice/multiple-response assessment covering all Outcomes. 60% pass mark. Supervised, 100 minutes time limit AND Open-book Log book or checklist showing completion of a practical skills test covering content of Unit Supervised conditions				
Server Administration H16X 35	Outcome 1	Outcome 2	Outcome 3	Outcome 4	Outcome 5
	Closed-book 50 questions multiple-choice/multiple-response assessment covering all Outcomes. 60% pass mark. Supervised, 120 minutes time limit				
Convergence Technologies H17G 35	Outcome 1		Outcome 2	Outcome 3	
	Closed-book 50 questions multiple-choice/multiple-response assessment covering all Outcomes. 60% pass mark. Supervised, 120 minutes time limit				
HND Computing: Networking Graded Unit 2 (Project) H40G 35	Graded Unit				
	Open-book Practical project covering entire content of the Unit Supervised conditions over an extended period of time				

8.2 HND Computing: Networking Course Assessment Plan

Suggested course assessment schedules for Year 1 and Year 2 are found in Appendices 2a and 2b.

They are based on two semesters of 17 weeks. If a centre has a different length of semester, or decide to deliver Units in a different order they should amend their schedules accordingly.

8.3 HND Computing: Networking Graded Unit assessments

HND Computing: Graded Unit 1 (H40F 34) Examination at SCQF level 7 — 1 SQA HN credit

HND Computing: Networking: Graded Unit 2 (H40G 35) Project (Investigation) at SCQF level 8 — 2 SQA HN credits

HND Computing: Graded Unit 1 is a closed-book examination lasting three hours, and comprising three sections. The examination assesses the candidate's critical knowledge and understanding of the topics relating to the specific aims which this Graded Unit is designed to cover. The questions and corresponding marks are designed in accordance with the ranges indicated in the table that follows. However, the overall total mark for the examination is 100.

The question paper consists of three sections, totalling 100 marks (100%).

Section 1 will be worth 15% of the total marks.

Section 2 will be worth 15% of the total marks.

Section 3 will be worth 70% of the total marks.

The sections will be differentiated by content and level of demand which will be reflected in the type of question used in each section.

Section	Type of question	No of questions	Marks per question	Total % marks
1	Selected response	15	1	15%
2	Constructed response	1 (mandatory)	15	15%
3	Constructed response	7 from 8	10	70%

A more detailed explanation of the content of the sections follows in the table below:

Section 1 — Selected response questions		
Key topics	Level of demand	Percentage weighting for each topic
Computer Systems Fundamentals	Ability to demonstrate fundamental knowledge and understanding introduced in the three Units.	Five questions each worth 1 mark (5% of total)
Developing Software: Introduction		Five questions each worth 1 mark (5% of total)
Professionalism and Ethics in Computing		Five questions each worth 1 mark (5% of total)

Section 2 — Constructed response questions		
Key topics	Level of demand	Percentage weighting for each topic
Integrated question incorporating at least two of the following Units: <ul style="list-style-type: none"> ◆ Computer Systems Fundamentals ◆ Developing Software: Introduction ◆ Professionalism and Ethics in Computing ◆ Troubleshooting Computing Problems 	Application, analysis, synthesis and evaluation	One question worth 15 marks (15% of total)

Section 3 — Constructed response questions		
Key topics	Level of demand	Percentage weighting for each topic
Computer Systems Fundamentals	Knowledge, comprehension, application and analysis	Two questions each worth 10 marks.
Developing Software: Introduction	Knowledge, comprehension, application, analysis, synthesis and evaluation	Two questions each worth 10 marks.
Professionalism and Ethics in Computing	Knowledge, comprehension, application, analysis, synthesis and evaluation	Two questions each worth 10 marks.
Troubleshooting Computing Problems	Knowledge, comprehension, application and analysis	Two questions each worth 10 marks

NOTE — The candidate will choose seven from eight questions in section 3, 70% of the total.

This assessment should take place towards the end of the programme to ensure that candidates have covered the topics which will be assessed within the Graded Unit.

Candidates must achieve at least 50% to be awarded a pass. The grading is carried out as follows:

A = 70%–100%

B = 60%–69%

C = 50%–59%

There is no minimum score in any section.

HND Computing: Networking Graded Unit 2 is a project investigation to be completed on an open-book basis over a period of time.

This Unit covers the integration of a range of knowledge and skills achieved throughout selected Units of the HND. It is recommended that the candidate should have completed or be in the process of completing the following Units related to the specific aims of the award prior to undertaking this Group Award Graded Unit:

FR22 35 *Routing Technology*

FR34 35 *Networking Technology*

H16X 35 *Server Administration*

The project brief should include a sample of topics and issues selected from the following list of Outcomes from mandatory Units. The assessor may want to consider some suggestions in the table below.

Unit code	Unit title	Topics/Issues
FR24 35	Networking Technology	<ul style="list-style-type: none">◆ Contemporary IP addressing schemes◆ Configure, build and test a simple Local Area Network
FR22 35	Routing Technology	<ul style="list-style-type: none">◆ Interior gateway routing protocols.◆ Implement a routed network topology.
H16X 35	Server Administration	<ul style="list-style-type: none">◆ Monitor and maintain servers.◆ Application and data provisioning.◆ Business continuity and high availability◆ Virtualisation

NOTE: The list of Topics/Issues in the above table is not exhaustive. Depending on the characteristics of the project brief, the assessor may draw Outcomes from other Units in the HN framework provided such Units were undertaken by the candidate.

In addition to the integration of knowledge and skills needed to complete the project investigation, candidates will develop their skills in planning, negotiation, research, analysis, time management and problem solving. The Core Skill of *Problem Solving* at SCQF level 6 is embedded and therefore automatically certificated on successful completion of the Unit.

8.4 What happens if a learner does not achieve an assessment?

If a learner fails to demonstrate competence in a summative assessment, it is good practice to communicate this to the learner quickly. Tutors should take time to individually feedback to learners where they went wrong. Having given feedback, tutors should then advise learners on what they need to do to prepare for re-assessment.

The learner then undertakes additional work as discussed with the tutor, this is called remediation. It is when the learner revises class work or practises skills covered in class **BEFORE** they attempt the re-assessment. It is important that learners do get time to consolidate their knowledge and understanding before being re-assessed.

Re-assessment may take a variety of forms.

- ◆ For some assessments, learners may be allowed to provide additional information, eg if a learner has submitted a report based on a piece of independent research, s/he would be allowed to add the missing evidence and resubmit the report. The new information should be highlighted in such a way to show that it had been added, eg underlined, coloured and dated in the margin.
- ◆ For practical tasks related to their use of information technology, candidates may be permitted to correct work and resubmit — the original submission and the re-submission should both be kept.
- ◆ For multiple-choice, short-response and Graded Units, candidates may be required to attempt a completely new assessment instrument.

Where specific action has to be taken for re-assessment details will be noted in the Unit specification and tutors must be familiar with the Unit specification requirements for re-assessment.

It is important to note that re-assessment does **NOT** always require that candidates complete a full new assessment. Re-assessment may (and often does) allow candidates to re-attempt the part of the Outcome that they have not completed to a standard which meets the Unit specification.

For Units other than Graded Units, SQA provides only **ONE** summative assessment and it is extremely important that centres produce their own **alternative** assessments. These assessments can be used for re-assessment purposes.

Once a draft assessment has been prepared by the centre it should first be quality checked by centre staff (internally verified) and submitted to SQA for prior-verification to ensure that it is fit for purpose.⁶

If a candidate fails to reach the pass mark in the Computing Graded Unit 1 — Examination, then he/she should be allowed to sit an alternative examination before the beginning of the next session to allow progression to Year 2. Candidates must complete all aspects of the new assessment instrument.

9 Quality Assurance

SQA is committed to providing qualifications and support to match the needs of individuals, society and the economy of Scotland and internationally. SQA believes that global interaction in education and training benefits our customers, clients, partners and SQA through the sharing of expertise and experience.

SQA has a balanced portfolio of qualifications that is inclusive, facilitates progression, reflects Scotland's educational, economic, social and cultural needs and changes, and supports education and training worldwide.

SQA works in partnership with our approved centres to achieve our shared goals of excellence and consistency. This ensures that SQA's qualifications continue to meet the requirements all users of our qualifications.

SQA's quality assurance models are designed to ensure that assessment decisions made to national standards are correct and consistent, and that national standards are maintained. We are committed to maintaining an assessment and quality system that is easy to understand, effectively administered, publicly accountable, and cost-effective to operate.

As well as working with centres to manage and enhance the quality of SQA qualifications, SQA routinely monitors its own performance. SQA establishes processes that need to be followed and submit these to regular auditing. This includes systematic evaluation and review of the effectiveness of our quality management processes. SQA also monitors standards across all our qualifications over time, to ensure consistency. Feedback from stakeholders is an integral part of SQA's review activities.

SQA is subject to external audit by a number of agencies, including the Scottish Government.

⁶ For centres wishing support in this process, an online course has been developed — Produce HN Unit assessments for successful prior moderation

For assessed qualifications, SQA regularly monitors centres to ensure that they have the resources and expertise to assess candidates against the qualification criteria. (Assessment is where centres use assessment instruments to make decisions about candidates' work. External assessment is where SQA takes on these duties, usually in the form of examinations or externally assessed coursework. Only assessments are subject to quality assurance by verification.)

10 Verification

10.1 Introduction

SQA's quality assurance processes have been developed to ensure that national standards are applied to internally assessed Units or course components.

To maintain the credibility of SQA qualifications, we rely on effective collaboration with centres to ensure national standards are maintained across all qualifications at all levels.

Verification is the procedure that SQA uses to make sure that centres' assessment decisions are valid and reliable and are in line with national standards.

10.2 Why do we need verification?

Verification is one of a range of Quality Assurance measures used by SQA to confirm that:

- ◆ centres' assessment decisions are sound (ie valid, reliable and practicable).
- ◆ national standards are being uniformly applied.
- ◆ assessments are accurately and consistently applied across all candidates and levels.

This ensures qualifications and certification is credible with all candidates being assessed to a common standard.

10.3 Internal verification

Centres are responsible for the internal verification of their assessments. This means that centres should have an internal verification system — a system of having quality checks in place — which can be operated throughout the centre. Each tutor who is responsible for the assessment of candidates and/or internal verification of candidate material should:

- ◆ be made aware of their centre's quality assurance procedures.
- ◆ comply with these procedures.

Centres will appoint staff members to be internal verifiers. Internal verifiers will ensure that assessors apply standards of assessment uniformly and consistently. They should keep records of internal verification activity for external verifiers to access. Examples of records include:

- ◆ evidence of planned verification for the semester which conforms to the centre's verification strategy.
- ◆ minutes of meetings where assessment work is examined and where discussion about acceptable standards is noted and decisions recorded.
- ◆ internal verification forms showing which candidates' work has been verified and the outcome. Note where an assessor carries out observations, internal verifiers should also observe the assessor.
- ◆ evidence of discussion and support of assessors, particularly where candidate work has not been accepted by the internal verifier.
- ◆ evidence of reporting back to the Course Team, any recommendations/actions required and evidence that these are acted upon.

10.4 External verification

To ensure national consistency in assessment decisions, SQA appoints experienced teachers/lecturers who have good, recent experience in the delivery and assessment of their subject to carry out external verification in centres. SQA will notify the SQA Co-ordinator if your centre has been selected for verification.

SQA wants to encourage centres and staff to see verification in a positive light, as a valuable Quality Improvement tool.

Appendix 1a: Core Skills Year 1⁷

Unit code	Unit title	Communication		Numeracy		ICT		Problem Solving			Working with Others	
		Written Communication	Oral Communication	Using Number	Using Graphical Information	Accessing Information	Providing/Creating Information	Critical Thinking	Planning and Organising	Reviewing and Evaluating	Working Co-operatively with Others	Reviewing Co-operative Contribution
H173 34	Developing Software: Introduction							SCQF 6 E				
H178 34	Team Working in Computing	SCQF 6 S	SCQF 6 S			SCQF 6 E	SCQF 6 E				SCQF 6 E	SCQF 6 E
H177 34	Troubleshooting Computing Problems							SCQF 6 E	SCQF 6 E	SCQF 6 E		
H175 34	Computer Systems Fundamentals			SCQF 5 E	SCQF 5 E							
H1F7 34	Professionalism and Ethics in Computing	SCQF 6 S	SCQF 6 S			SCQF 6 S	SCQF 6 S					
D76E 34	Mathematics for Computing 1			SCQF 6 E	SCQF 5 E							

⁷S = signposted, E = embedded (shade as S — yellow and E — green)

Appendix 1b: Core Skills Year 2⁸

Unit code	Unit title	Communication		Numeracy		ICT		Problem Solving			Working with Others	
		Written Communication	Oral Communication	Using Number	Using Graphical Information	Accessing Information	Providing/Creating Information	Critical Thinking	Planning and Organising	Reviewing and Evaluating	Working Co-operatively with Others	Reviewing Co-operative Contribution
FR22 35	Routing Technology			SCQF 6 S								
H16X 35	Server Administration	SCQF 6 S										
H40G 35	HND Computing: Networking Graded Unit 2: Project							SCQF 6 E	SCQF 6 E	SCQF 6 E		

⁸S = signposted, E = embedded (shade as S — yellow and E — green)

Appendix 2a: Year 1, Semester 1 — Assessment Plan (Option A)

Unit nameWeek	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Developing Software: Introduction (H173 34)															X* 1, 2		
Professionalism and Ethics in Computing (H1F7 34)														X* 1, 2, 3, 4			
Computer System Fundamentals (H175 34)										X* 1, 2					X 3		
Troubleshooting Computer Problems (H177 34)															X* 1, 2, 3, 4		
Teamworking in Computing (H178 34)														X* 1, 2, 3, 4			
Client Operating Systems (H1EM 34)				X 1				X 2				X 3				X 4	
Security Concepts (H17V 34)							X 1						X 2				
Computing: Introduction to Project Management (H17D 34)													X* 2, 3			X(CB) 1	

Submission date is shown by an X, X* indicates integrated assessment and Outcomes integrated, X(CB) indicates closed-book.

Appendix 2a: Year 1, Semester 2 — Assessment Plan (Option A)

Unit nameWeek	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
HND Computing: Graded Unit 1 (Exam) (H40F 34)												X(CB)					
PC Hardware & Operating Systems Essentials (H17E 34)													X*(CB) 1, 2, 3, 4, 5			X 1, 2, 3, 4, 5	
Cloud Computing (H179 34)															X* 1, 2, 3,		
Mathematics for Computing 1 (D76E 34)				X 1				X 2				X 3				X 4	
Computer Forensics Fundamentals (H1EN 34)																X* 1, 2, 3, 4	
Client Operating Systems (H1EM 34)			X 5				X 6				X 7				X*(CB) 1, 2, 3, 4, 5, 6, 7		
Security Concepts (H17V 34)				X 3					X 4					X*(CB) 1, 2, 3, 4			

Submission date is shown by an X, X* indicates integrated assessment and Outcomes integrated, X(CB) indicates closed-book.

Appendix 2b: Year 2, Semester 1 — Assessment Plan (Option A)

Unit nameWeek	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Networking Technology (FR24 35)							X* 1, 2, 3, 4, 5	X*(CB) 1, 2, 3, 4, 5									
Routing Technology (FR22 35)															X* 1, 2, 3, 4	X*(CB) 1, 2, 3, 4	
Computer Networking: Practical (H17B 34)												X(CB) 2		X* 1, 2, 3			
Server Administration (H16X 35)															X*(CB) 1, 2, 3, 4, 5		

Submission date is shown by an X, X* indicates integrated assessment and Outcomes integrated, X(CB) indicates closed-book.

Appendix 2b: Year 2, Semester 2 — Assessment Plan (Option A)

Unit nameWeek	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
Switching Technology (FR23 35)							X* 1, 2, 3, 4	X*(CB) 1, 2, 3, 4									
Internetworking Technology (FR25 35)															X* 1, 2, 3, 4	X*(CB) 1, 2, 3, 4	
HND Computing: Networking Graded Unit 2 (Project) (H40G 35)															X*		
Convergence Technologies (H17G 35)														X*(CB) 1, 2, 3			

Submission date is shown by an X, X* indicates integrated assessment and Outcomes integrated, X(CB) indicates closed-book.

History of changes

It is anticipated that changes will take place during the life of the qualification, and this section will record these changes. This document is the latest version and incorporates the changes summarised below.

Version number	Description	Date