



# Computing and Information Science

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## Draft National Course Assessment Specification

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Please refer to the note of changes at the end of this Course Assessment Specification for details of changes from previous version (where applicable).

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# Course outline

<b>Course title:</b>	Higher Computing and Information Science
<b>SCQF level:</b>	6 (24 SCQF credit points)
<b>Course code:</b>	to be advised
<b>Course assessment code:</b>	to be advised

The purpose of the Course Assessment Specification is to ensure consistent and transparent assessment year on year. It describes the structure of the Course assessment and the mandatory skills, knowledge and understanding that will be assessed.

## Course assessment structure

Component 1 — question paper	90 marks
Component 2 — assignment	60 marks
<b>Total marks</b>	<b>150 marks</b>

This Course includes six SCQF credit points for 40 additional programmed hours to allow preparation for Course assessment. The Course assessment covers the added value of the Course.

## Equality and inclusion

This Course Assessment Specification has been designed to ensure that there are no unnecessary barriers to assessment. Assessments have been designed to promote equal opportunities while maintaining the integrity of the qualification.

For guidance on assessment arrangements for disabled learners and/or those with additional support needs, please follow the link to the Assessment Arrangements web page: [www.sqa.org.uk/sqa/14977.html](http://www.sqa.org.uk/sqa/14977.html).

Guidance on inclusive approaches to delivery and assessment of this Course will be provided in the *Course Support Notes*.

# Assessment

To gain the award of the Course, the learner must pass all the Units as well as the Course assessment. Course assessment will provide the basis for grading attainment in the Course award.

## Course assessment

SQA will produce and give instructions for the production and conduct of Course assessments based on the information provided in this document.

## Added value

The purpose of the Course assessment is to assess added value of the Course as well as confirming attainment in the Course and providing a grade. The added value for the Course will address the key purposes and aims of the Course as defined in the Course Rationale. It will do this by addressing one or more of breadth, challenge, or application.

In this Course assessment, added value will focus on the following:

- ◆ breadth — drawing on knowledge and skills from across the Course
- ◆ challenge — requiring greater depth or extension of knowledge and/or skills
- ◆ application — requiring application of knowledge and/or skills in practical or theoretical contexts as appropriate

This added value consists of the following:

To achieve success in the Course, learners must show that they can **apply** knowledge and skills developed through the Units to solve problems, in both practical and theoretical contexts.

The assignment requires learners to demonstrate aspects of challenge and application in a practical context. Learners will **apply** knowledge and skills from the Units to solve an appropriately challenging, practical computing and information science problem.

The question paper requires learners to demonstrate aspects of breadth and application in theoretical contexts. Learners will **apply** breadth of knowledge from across the Units and depth of understanding to answer appropriately challenging questions in computing and information science contexts.

## Grading

Course assessment will provide the basis for grading attainment in the Course award.

The Course assessment is graded A–D. The grade is determined on the basis of the total mark for all Course assessments together.

A learner's overall grade will be determined by their performance across the Course assessment.

**Grade description for C**

For the award of Grade C, learners will have demonstrated successful performance in all of the Units of the Course. In the Course assessment, learners will typically have demonstrated successful performance in relation to the mandatory skills, knowledge and understanding for the Course.

**Grade description for A**

For the award of Grade A, learners will have demonstrated successful performance in all of the Units of the Course. In the Course assessment, learners will typically have demonstrated a consistently high level of performance in relation to the mandatory skills, knowledge and understanding for the Course.

**Credit**

To take account of the extended range of learning and teaching approaches, remediation, consolidation of learning and integration needed for preparation for external assessment, six SCQF credit points are available in Courses at National 5 and Higher, and eight SCQF credit points in Courses at Advanced Higher. These points will be awarded when a grade D or better is achieved.

## Structure and coverage of the Course assessment

The Course assessment will consist of two Components: a question paper, and an assignment titled 'Developing a Computing and Information Science Solution'. The question paper will have two Sections.

### Component 1 — question paper

The purpose of the question paper is to assess breadth of knowledge from across the Units, depth of understanding, and application of this knowledge and understanding to answer appropriately challenging questions.

This question paper will give learners an opportunity to demonstrate the following skills, knowledge and understanding:

- ◆ applying aspects of computational thinking across a range of contexts
- ◆ analysing problems within computing and information science across a range of contemporary contexts
- ◆ the ability to communicate how a program works in technical detail
- ◆ communicating understanding of advanced concepts related to software design and development, and information system design and development, clearly and concisely using appropriate terminology
- ◆ understanding of the role and impact of contemporary computing technologies on the environment and society
- ◆ applying computing and information concepts and techniques to create solutions across a range of contexts

The question paper will have 90 marks (60% of the total mark).

Approximately 50% of the marks will be awarded for questions related to software design and development.

Approximately 50% of the marks will be awarded for questions related to information systems design and development.

The question paper has two Sections.

**Section 1** will have 20 marks and will consist of short answers.

This Section will give learners an opportunity to demonstrate breadth of knowledge from across the areas specified in the table provided in the 'Further mandatory information on Course coverage' section at the end of this *Course Assessment Specification*.

**Section 2** will have 70 marks and will consist of extended response questions.

This Section will give learners an opportunity to demonstrate application of knowledge and understanding to answer appropriately challenging context-based questions by drawing on and applying knowledge from the table provided in the 'Further mandatory information on Course coverage' section at the end of this *Course Assessment Specification*.

## Component 2 — Assignment

The purpose of the assignment is to assess practical application of knowledge and skills from the Units to develop a solution to an appropriately challenging computing and information science problem. It will assess learners' skills in analysing a problem, designing a solution to the problem, implementing a solution, and testing and reporting on that solution.

The assignment will have 60 marks (40% of the total mark).

- ◆ The assignment will be a meaningful and appropriately challenging task, requiring challenge and application.
- ◆ Time will be required for:
  - preparation for the assignment, which could include considering exemplar assignments and practising required skills
  - carrying out the stages of the assignment, with teacher guidance and support
  - assessing the process and completed solution
- ◆ The assignment should clearly demonstrate application of knowledge and skills, at an appropriate level, drawing significantly from both the *Software Design and Development* and *Information Systems Design and Development* Units (as defined in the 'Further mandatory information on Course coverage' section of this document).
- ◆ The teacher/lecturer will provide overall guidelines for the assignment and a list of questions/tasks/prompts which will lead learners through the assignment in clear stages.
- ◆ Marks will be awarded for:

◆ Analysing the problem	10 marks
◆ Designing a solution	10 marks
◆ Implementing a solution	20 marks
◆ Testing the solution	10 marks
◆ Reporting on the solution	10 marks
- ◆ Evidence should include:
  - the completed solution
  - a record of progress through the assignment (such as an informal log or blog produced by the learner)
  - a short report on the testing of the solution (in written, electronic or oral form)

## **Setting, conducting and marking of assessment**

### **Question paper**

The question paper will be set and marked by SQA, and conducted in centres under conditions specified for external examinations by SQA. Learners will complete the question paper in 1 hour and 30 minutes.

### **Controlled assessment — assignment**

The assignment is:

- ◆ set by SQA
- ◆ conducted under some supervision and control

Evidence will be internally marked by centre staff in line with SQA marking instructions

All marking will be quality assured by SQA.

A bank of assignments will be provided, and there will be choice from this bank.

- ◆ The assignment will be carried out under open book conditions, but supervised to ensure that the work presented is the candidate's own work.
- ◆ The teacher/lecturer may give learners support and guidance to help them progress through each stage of the assignment; where any significant amount of support is provided, this should be reflected in the marks awarded.
- ◆ The assignment is designed to discriminate between candidates, and therefore would be expected to provide a wide range of marks. Stronger candidates should be able to complete the assignment successfully with minimal support and guidance. Weaker candidates may not be able to complete all aspects of the assignment within a reasonable time, or may require significant assistance, and so would achieve a lower total mark.
- ◆ Once the assignment has been completed and assessed, it should not be returned to the candidate for further work to improve their mark.

## Further mandatory information on Course coverage

The following gives details of mandatory skills, knowledge and understanding for the Higher Computing Science Course. Course assessment will involve sampling the skills, knowledge and understanding. This list of skills, knowledge and understanding also provides the basis for the assessment of the Units of the Course.

The Course assessment (question paper and assignment) will require learners to draw on and apply knowledge of any of the topics listed below. This table should be read in conjunction with the descriptions of the question paper and the assignment.

<b>Software Design and Development</b>	
<b>Languages and environments</b>	Language types: <ul style="list-style-type: none"> <li>◆ imperative</li> <li>◆ declarative</li> <li>◆ object-oriented</li> </ul>
<b>Computational constructs</b>	Exemplification and implementation of the following constructs: <ul style="list-style-type: none"> <li>◆ subprograms and user-defined functions</li> <li>◆ parameter passing (value and reference)</li> <li>◆ sequential files (open/create, read, write, close, delete)</li> <li>◆ scope, local and global variables</li> </ul>
<b>Data types and structures</b>	String Numeric (integer and real) variables Boolean variables 1D arrays
<b>Testing and documenting solutions</b>	<ul style="list-style-type: none"> <li>◆ Constructing a test plan (incorporating normal, extreme and exceptional testing)</li> <li>◆ Syntax, execution and logic errors</li> <li>◆ Dry runs, trace tables (tools), break points</li> </ul>
<b>Algorithm specification</b>	<ul style="list-style-type: none"> <li>◆ Input validation</li> <li>◆ Linear search</li> <li>◆ Find minimum and maximum</li> <li>◆ Count occurrences</li> </ul>
<b>Design notations</b>	<ul style="list-style-type: none"> <li>◆ Structure diagram</li> <li>◆ Pseudocode</li> <li>◆ Wire framing</li> <li>◆ other contemporary design notations</li> </ul>
<b>Development methodologies (for both software development and information system development)</b>	<i>Iterative phases of development:</i> analysis, design, implementation, testing, documentation, evaluation, maintenance. <i>Development methodologies:</i> <ul style="list-style-type: none"> <li>◆ RAD</li> <li>◆ top-down/step-wise refinement</li> <li>◆ Agile</li> </ul>
<b>Low level operations and structure</b>	Virtual machines Emulators Mobile devices Use of binary to represent and store

	<ul style="list-style-type: none"> <li>◆ Integers and real numbers</li> <li>◆ characters</li> <li>◆ instructions (machine code)</li> <li>◆ graphics (bit-mapped and vector)</li> <li>◆ sound</li> <li>◆ video</li> </ul> <p><i>Computer architecture:</i></p> <ul style="list-style-type: none"> <li>◆ processor/processes, memory, cache, buses, interfaces</li> </ul>
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<b>Information Systems Design and Development</b>	
The following mandatory generic concepts and vocabulary may be applicable to a range of information systems types.	
<b>Structures and links</b>	<ul style="list-style-type: none"> <li>◆ database structures: relational, web-based</li> <li>◆ stylesheets, CSS</li> <li>◆ page structure: head, title, body</li> <li>◆ metadata</li> <li>◆ dynamic web pages, database-driven website</li> <li>◆ interactive web page, multimedia application</li> <li>◆ multi-level navigation</li> </ul>
<b>User interface</b>	<ul style="list-style-type: none"> <li>◆ Usability: fit for purpose, efficient, robust, maintainable</li> <li>◆ Accessibility</li> <li>◆ Optimisation</li> </ul>
<b>Media types</b>	<p>Compression:</p> <ul style="list-style-type: none"> <li>◆ lossy and lossless compression techniques, applied to sound, graphic and video data files</li> </ul>
<b>Coding</b>	<ul style="list-style-type: none"> <li>◆ Client-side scripting</li> <li>◆ Server-side scripting</li> </ul>
<b>Testing</b>	<ul style="list-style-type: none"> <li>◆ Beta testing</li> <li>◆ Usability</li> <li>◆ Compatibility issues (including memory and storage requirements, OS compatibility)</li> </ul>
<b>Purpose, features, functionality, users</b>	<ul style="list-style-type: none"> <li>◆ Detailed descriptions of purpose</li> <li>◆ Users: expert, novice, age-range, human, machine</li> </ul>
<b>Technical Implementation (hardware and software requirements)</b>	<p>Hardware:</p> <ul style="list-style-type: none"> <li>◆ input and output devices</li> <li>◆ processor type and speed (Hz)</li> <li>◆ memory (RAM, ROM)</li> <li>◆ operating system</li> <li>◆ device type (including supercomputer, desktop, laptop, tablet, smartphone)</li> </ul> <p>Software considerations:</p> <ul style="list-style-type: none"> <li>◆ licensing</li> <li>◆ proprietary versus open source</li> <li>◆ transferability</li> </ul>
<b>Technical implementation (storage)</b>	<p>Storage devices:</p> <ul style="list-style-type: none"> <li>◆ built-in, external, portable</li> <li>◆ magnetic, optical</li> <li>◆ capacity, speed</li> <li>◆ rewritable, read-only</li> <li>◆ interface type and speed</li> <li>◆ distributed and off-line storage</li> <li>◆ backup systems and strategy</li> </ul>

<b>Technical implementation (networking/connectivity)</b>	Cloud systems and server provision: <ul style="list-style-type: none"><li>◆ public, private, hybrid</li><li>◆ SaaS, IaaS, PaaS</li><li>◆ web hosting</li></ul>
<b>Security precautions</b>	<ul style="list-style-type: none"><li>◆ Encryption</li><li>◆ Digital certificates and signatures</li><li>◆ Server-side validation of online form data</li><li>◆ Biometrics in industry</li></ul>
<b>Legal implications</b>	<ul style="list-style-type: none"><li>◆ Freedom of Information (Scotland) Act (2002)</li><li>◆ Regulation of Investigatory Powers Act (2000)</li></ul>
<b>Environmental implications</b>	<ul style="list-style-type: none"><li>◆ Lifetime carbon footprint (manufacture, use, disposal)</li><li>◆ Environmental benefits</li></ul>
<b>Economic and societal implications</b>	<ul style="list-style-type: none"><li>◆ Economic: competitive advantage, global marketplace, business costs, maintainability, scalability</li><li>◆ Societal: censorship and freedom of speech, privacy and encryption, global citizenship, online communities</li></ul>

# Administrative information

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**Superclass:** to be advised

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## History of changes

Course details	Version	Description of change	Authorised by	Date

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Note: You are advised to check SQA's website ([www.sqa.org.uk](http://www.sqa.org.uk)) to ensure you are using the most up-to-date version of the Course Specification.