



Advanced Higher
Course
Specification



Advanced Higher Computing Science Course Specification (C716 77)

Valid from August 2015

This edition: April 2015, version 2.0

This specification may be reproduced in whole or in part for educational purposes provided that no profit is derived from reproduction and that, if reproduced in part, the source is acknowledged. Additional copies of this Course Specification can be downloaded from SQA's website: www.sqa.org.uk.

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

© Scottish Qualifications Authority 2015

Course outline

Course title: Advanced Higher Computing Science

SCQF: level 7 (32 SCQF credit points)

Course code: C716 77

Mandatory Units

H223 77 Software Design and Development (Advanced Higher)	12 SCQF credit points
H226 77 Information System Design and Development (Advanced Higher)	12 SCQF credit points

Course assessment **8 SCQF credit points**

This Course includes eight SCQF credit points to allow additional time for preparation for Course assessment. The Course assessment covers the added value of the Course. Further information on the Course assessment is provided in the Assessment section.

Recommended entry

Entry to this Course is at the discretion of the centre. However, learners would normally be expected to have attained the skills, knowledge and understanding required by the following or equivalent qualifications and/or experience:

- ◆ Higher Computing Science Course

Core Skills

Achievement of this Course gives automatic certification of the following:

- ◆ Complete Core Skill: Accessing Information at SCQF level 7
- ◆ Complete Core Skill: Providing/Creating Information at SCQF level 7

Progression

This Course or its Units may provide progression to:

- ◆ a range of computing-related Higher National Diplomas
- ◆ degrees in Computing Science or related disciplines
- ◆ careers in computing, IT and/or related areas

Further details are provided in the *Course Support Notes*.

Equality and inclusion

This Course Specification has been designed to ensure that there are no unnecessary barriers to learning or assessment. The individual needs of learners should be taken into account when planning learning experiences, selecting assessment methods or considering alternative evidence. For further information, please refer to the *Course/Unit Support Notes* and the *Course Assessment Specification*.

Rationale

All new and revised National Courses reflect Curriculum for Excellence values, purposes and principles. They offer flexibility, provide more time for learning, more focus on skills and applying learning, and scope for personalisation and choice.

In this Course, and its component Units, there will be an emphasis on skills development and the application of those skills. Assessment approaches will be proportionate, fit for purpose and will promote best practice, enabling learners to achieve the highest standards they can.

This Course provides learners with opportunities to continue to acquire and develop the attributes and capabilities of the four capacities, as well as skills for learning, skills for life and skills for work.

All Courses provide opportunities for learners to develop breadth, challenge and application, but the focus and balance of the assessment will be appropriate for the subject area.

Relationship between the Course and Curriculum for Excellence values, purposes and principles

The Course provides an understanding of the key technologies that underpin our modern digital world, and develops a wide range of transferable skills. It brings together elements of technology, computing science and creative digital media, and applies these to real-world contexts and challenges. It examines the economic, environmental and social impact of computing technologies, and provides opportunities for personalisation and choice.

The Course focuses on exploring advanced concepts, ideas and processes which inform the study of computing science and provide insight into the challenge, excitement and reward to be found in these areas. Learners will have the opportunity to integrate and apply existing skills and knowledge gained across their learning experiences, from numeracy and literacy in programming and project development, to understanding of social sciences in assessing environmental, social and economic issues, to using creative problem-solving strategies to address complex problems and develop real solutions. The Course provides opportunities for learners to engage in a broad range of activities and learning that draws on their own experience and personal interests in a proactive and progressive way.

The Course encourages learners to become successful, responsible and creative, and to continue to acquire and develop the attributes and capabilities of the four capacities, including: creativity, flexibility and adaptability; enthusiasm and a willingness to learn;

perseverance, independence and resilience; responsibility and reliability; and confidence and enterprise.

The Course provides progression from the Higher Computing Science Course.

Purpose and aims of the Course

Computing science is vital to everyday life — socially, technologically and economically; it shapes the world in which we live and its future. Computing is embedded in the world around us and plays an important part in many aspects of our lives at home, work and at leisure. Our society needs computing professionals with the imagination and ability to extend and design the computers, programs, applications and networks of the future in fields which include science, education, business and industry.

The Course provides a broad and challenging exploration of these areas, focusing on the development of advanced programming, development and research skills to gain an understanding of the role and impact of contemporary computing technologies. Because of its relevance and its focus on developing transferable skills it will be valuable to many learners, particularly those considering a career or further study in computing, IT and related disciplines.

The purpose of the Course is to build on the knowledge, understanding and practical skills developed by the learner in the Higher Computing Science Course, and to provide a useful bridge towards study of computing science and other disciplines in higher education. This is achieved by consolidating and extending learners' depth and breadth of learning, providing opportunity for independent and investigative work, while encouraging teamwork and requiring candidates to develop and present a proposal for a computing-based project.

The aims of the Course are to enable learners to:

- ◆ understand and apply computational thinking skills across a range of computing contexts
- ◆ extend and apply knowledge and understanding of advanced concepts and processes in computing science
- ◆ apply skills and knowledge in analysis, design, development, implementation and evaluation to a range of digital solutions with increasingly complex aspects
- ◆ apply creative problem-solving skills across a range of contexts
- ◆ develop autonomous learning, investigative and research skills
- ◆ communicate advanced computing concepts clearly and concisely, using appropriate terminology
- ◆ develop an informed understanding of the role and impact of computing technologies in transforming and influencing our environment and society

Related to these aims, and underlying the study of computing science, are a number of unifying themes, including technological progress and trends, the relationship between software, hardware and system performance, and information representation and transfer as a core component of any computation. These are used to explore a variety of specialist areas through practical and investigative tasks.

Information about typical learners who might do the Course

The Course is designed for all learners who can respond to a level of challenge, especially those considering further study or a career in computing science and related disciplines. It provides sufficient breadth, flexibility and choice to meet the needs of all learners, and is particularly suitable for those who have studied Higher Computing Science, Mathematics and/or Physics

Learners will develop a deeper understanding of the central role of computing professionals as creative problem-solvers and designers, able to conceive, design, implement and operate complex systems, and of the far-reaching impact of information technology on our society and the environment. They will also continue to develop a range of transferable skills for learning, skills for life and skills for work, opening up a wide range of career and study opportunities.

On completing the Course, learners will have developed strong skills and knowledge in analysis and problem-solving, and in the software and information system design and development process and lifecycle. They will have developed a deeper knowledge of computational thinking concepts, with the ability to apply these to a range of contexts.

Course activities also provide opportunities to enhance generic and transferable skills in planning and organising, working independently and in teams, critical thinking and decision-making, research, communication and self- and peer-evaluation, in a range of technological contexts.

Progression pathways from this Course are wide, from direct entry to further study in areas such as software programming/engineering, databases, robotics, artificial intelligence, e-commerce, social networking and web design and development, to technical roles in networking, security, systems analysis and testing, and a wealth of others. Critically, many business and industry employers value computing skills as vital to their growth and sustainability, while a growing number of individuals use computing technologies as a way to create entrepreneurial, social and enterprise-building opportunities.

Course structure and conditions of award

Course structure

The Course enables learners to develop and extend a range of skills related to the design and development of software and information systems, including skills in analysis and problem-solving, designing and modelling, developing, implementing and testing, and skills in evaluating systems and solutions across a range of contemporary contexts.

The Course also enables learners to develop and extend knowledge and understanding of advanced computing concepts and processes, and the ability to apply these to a variety of problems; and an awareness of the impact of computing and information technology on society and the environment.

Units are statements of standards for assessment and not programmes of learning and teaching. They can be delivered in a number of ways.

The Course consists of two mandatory Units and a Course assessment. The Course assessment will consist of a project and a question paper.

Software Design and Development (Advanced Higher)

This Unit explores a range of advanced concepts and processes relating to software design and development, including the use of standard algorithms, structured data types and a range of programming constructs. Learners will develop skills in, developing well-structured, complex modular programs through practical tasks, using appropriate programming languages. Through investigative and practical work, learners will gain an understanding of the similarities and differences in different contemporary programming paradigms.

Information System Design and Development (Advanced Higher)

This Unit explores a range of advanced concepts and processes relating to the design and development of complex information systems. Learners will develop skills in developing and implementing complex information systems through practical tasks using appropriate development tools. Learners will develop their independent learning skills by investigating a contemporary development, describing its purpose, features and applications, a related technical challenge or current area of development, examining its legal and/or ethical implications, and evaluating its environmental, economic and/or social impact.

Conditions of award

To gain the award of the Course, the learner must pass both of the Units as well as the Course assessment. The required Units are shown in the Course outline section. Course assessment will provide the basis for grading attainment in the Course award.

Skills, knowledge and understanding

Further information on the assessment of skills, knowledge and understanding for the Course is given in the *Course Assessment Specification*. A broad overview of the mandatory subject skills, knowledge and understanding that will be assessed in the Course is given in this section.

This covers:

- ◆ applying computational thinking to solve complex computing problems
- ◆ analysing complex problems within computing science across a range of contemporary contexts
- ◆ analysing, designing, developing, implementing, testing and evaluating digital solutions (including computer programs) to complex problems across a range of contexts
- ◆ developing advanced skills in computer programming and the ability to communicate how a program works
- ◆ communicating understanding of complex concepts related to software design and development and information system design, development and management clearly and concisely, using appropriate terminology
- ◆ knowledge and understanding of the wide role and impact of contemporary computing technologies on the environment and society
- ◆ investigating and reporting on contemporary computing technologies

Skills, knowledge and understanding to be included in the Course will be appropriate to the SCQF level of the Course. The SCQF level descriptors give further information on characteristics and expected performance at each SCQF level (www.sqa.org.uk/scqf).

Assessment

Information about assessment for the Course is included in the *Course Assessment Specification*, which provides full details including advice on how a learner's overall attainment for the Course will be determined.

Unit assessment

All Units are internally assessed against the requirements shown in the *Unit Specification*.

They can be assessed on a Unit-by-Unit basis or by combined assessment.

They will be assessed on a pass/fail basis within centres. SQA will provide rigorous external quality assurance, including external verification, to ensure assessment judgments are consistent and meet national standards.

The assessment of the Units in this Course will be as follows:

Software Design and Development (Advanced Higher)

For this Unit, learners will be required to provide evidence of:

- ◆ skills, knowledge and understanding of software design and development
- ◆ knowledge and understanding of different contemporary programming paradigms

Information System Design and Development (Advanced Higher)

For this Unit, learners will be required to provide evidence of:

- ◆ skills, knowledge and understanding of information system design and development
- ◆ knowledge and understanding of the implications of a contemporary development

Course assessment

Courses from National 4 to Advanced Higher include assessment of [added value](#)¹. At National 5, Higher and Advanced Higher, the added value will be assessed in the Course assessment. The added value for the Course must 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 the Advanced Higher Computing Science Course, added value will focus on:

- ◆ breadth
- ◆ challenge
- ◆ application

Learners will draw on, extend and apply the skills and knowledge they have developed during the Course. These will be assessed through a combination of a [project](#)² and a [question paper](#)³.

¹ Definitions can be found here: <http://www.sqa.org.uk/sqa/58409.html>

² Definitions can be found here: <http://www.sqa.org.uk/sqa/58409.html>

The Computing Science project adds value by requiring challenge and application. Learners will apply knowledge and skills from across the Course to specify, plan, develop, implement, test and evaluate a digital solution to a significant and appropriately challenging computing-based problem.

The question paper introduces breadth to the assessment. It required depth of understanding and application of knowledge from the Units.

³ See link above for definition.

Development of skills for learning, skills for life and skills for work

It is expected that learners will develop broad, generic skills through this Course. The skills that learners will be expected to improve on and develop through the Course are based on SQA's *Skills Framework: Skills for Learning, Skills for Life and Skills for Work* and drawn from the main skills areas listed below. These must be built into the Course where there are appropriate opportunities.

2 Numeracy

2.3 Information handling

3 Health and wellbeing

3.1 Personal learning

4 Employability, enterprise and citizenship

4.2 Information and communication technology (ICT)

5 Thinking skills

5.3 Applying

5.4 Analysing and evaluating

Amplification of these skills is given in SQA's *Skills Framework: Skills for Learning, Skills for Life and Skills for Work*. The level of these skills will be appropriate to the level of the Course. Further information on building in skills for learning, skills for life and skills for work for the Course is given in the *Course Support Notes*.

Administrative information

Published: April 2015 (version 2.0)

History of changes to National Course Specification

Version	Description of change	Authorised by	Date
2.0	Changes to the description of Units in 'Course structure' and 'Unit assessment' sections, to align with changes made to Unit Specifications.	Qualifications Development Manager	April 2015

This specification may be reproduced in whole or in part for educational purposes provided that no profit is derived from reproduction and that, if reproduced in part, the source is acknowledged. Additional copies of this specification can be downloaded from SQA's website at www.sqa.org.uk.

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

© Scottish Qualifications Authority 2015