GCE Subject Level Conditions and Requirements for Computer Science

April 2014

Contents

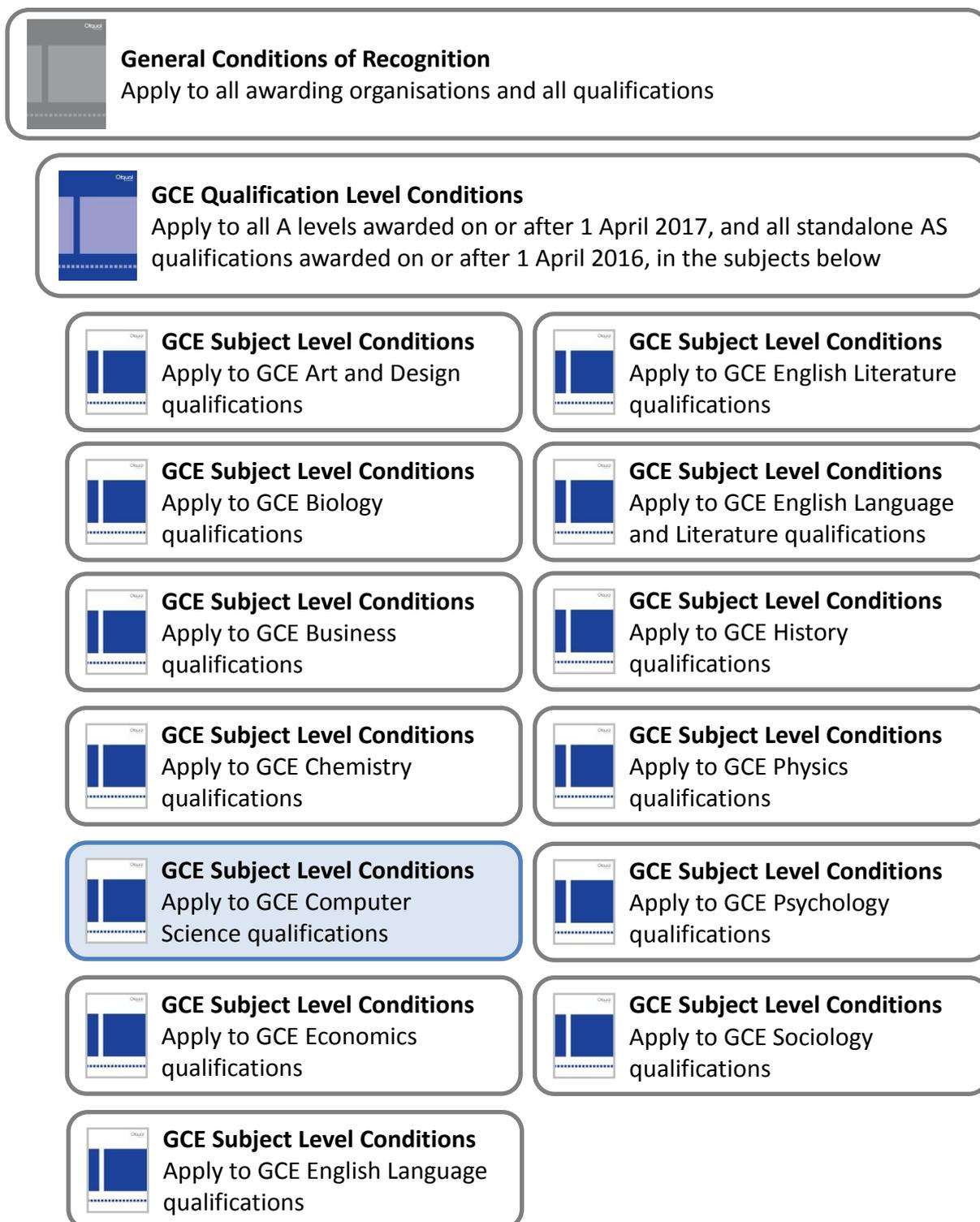# Introduction

About this document

1. This document (highlighted in the figure below) is part of a suite of documents which sets out the regulatory requirements for awarding organisations offering GCE qualifications.

General Conditions of Recognition
Apply to all awarding organisations and all qualifications

GCE Qualification Level Conditions
Apply to all A levels awarded on or after 1 April 2017, and all standalone AS qualifications awarded on or after 1 April 2016, in the subjects below

GCE Subject Level Conditions
Apply to GCE Art and Design qualifications

GCE Subject Level Conditions
Apply to GCE English Literature qualifications

GCE Subject Level Conditions
Apply to GCE Biology qualifications

GCE Subject Level Conditions
Apply to GCE English Language and Literature qualifications

GCE Subject Level Conditions
Apply to GCE Business qualifications

GCE Subject Level Conditions
Apply to GCE History qualifications

GCE Subject Level Conditions
Apply to GCE Chemistry qualifications

GCE Subject Level Conditions
Apply to GCE Physics qualifications

GCE Subject Level Conditions
Apply to GCE Computer Science qualifications

GCE Subject Level Conditions
Apply to GCE Psychology qualifications

GCE Subject Level Conditions
Apply to GCE Economics qualifications

GCE Subject Level Conditions
Apply to GCE Sociology qualifications

GCE Subject Level Conditions
Apply to GCE English Language qualifications

2. We have developed all our requirements for GCE qualifications with the intention that AS and A level qualifications should fulfil the purposes set out in the table below:

A levels	AS qualifications
□ define and assess achievement of the knowledge, skills and understanding which will be needed by students planning to progress to undergraduate study at a UK higher education establishment, particularly (although not only) in the same subject area; □ set out a robust and internationally comparable post-16 academic course of study to develop that knowledge, skills and understanding; □ permit UK universities to accurately identify the level of attainment of students; □ provide a basis for school and college accountability measures at age 18; and □ provide a benchmark of academic ability for employers.	□ provide evidence of students' achievements in a robust and internationally comparable post-16 course of study that is a sub-set of A level content; □ enable students to broaden the range of subjects they study.

Requirements set out in this document

3. This document sets out the GCE Subject Level Conditions for Computer Science. These conditions will come into effect at 12.01am on Wednesday 9 April 2014 for the following qualifications:

    □   all GCE A levels in Computer Science awarded on or after 1 April 2017; and

    □   all standalone GCE AS qualifications in Computer Science awarded on or after 1 April 2016.

4. It also sets out the assessment objectives for GCE Computer Science. Awarding organisations must comply with these assessment objectives under Condition GCE(Computer Science)1.2.

5. Appendix 1 reproduces the subject content requirements for Computer Science, as published by the Department for Education. Awarding organisations must comply with these requirements under Condition GCE(Computer Science)1.1.

6. With respect to the qualifications listed in paragraph 3, awarding organisations must also comply with:

   □ our *General Conditions of Recognition*,[1] which apply to all awarding organisations and qualifications; and

   □ our *GCE Qualification Level Conditions*;[2] and

   □ all relevant Regulatory Documents.

7. With respect to all other GCE qualifications in Computer Science, awarding organisations must continue to comply with the General Conditions of Recognition, the *General Conditions of Recognition in respect of GCE Qualifications*,[3] and the relevant Regulatory Documents.[4]

Summary of requirements

Subject Level Conditions	
GCE(Computer Science)1	[Compliance with content requirements](#)
GCE(Computer Science)2	[Assessment](#)

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[1] www.ofqual.gov.uk/documents/general-conditions-of-recognition

[2] www.ofqual.gov.uk/documents/gce-qualification-level-conditions

[3] www.ofqual.gov.uk/documents/general-conditions-of-recognition-in-respect-of-gce-qualifications

[4] www.ofqual.gov.uk/documents/list-of-additional-regulatory-documents

Assessment objectives
[Assessment objectives – GCE AS and A level qualifications in Computer Science](#)

Appendix 1 – Subject content (published by Department for Education)
[GCE AS and A level Subject Content for Computer Science](#)

Subject Level Conditions

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GCE Subject Level Conditions for Computer Science

Condition GCE(Computer Science)1   Compliance with content requirements

GCE(Computer Science)1.1   In respect of each GCE Qualification in Computer Science which it makes available, or proposes to make available, an awarding organisation must –

(a) comply with the requirements relating to that qualification set out in the document published by the Secretary of State entitled 'GCE AS and A level subject content for computer science', DFE-00359-2014,

(b) have regard to any recommendations or guidelines relating to that qualification set out in that document, and

(c) interpret that document in accordance with any requirements, and having regard to any guidance, which may be published by Ofqual and revised from time to time.

GCE(Computer Science)1.2   In respect of each GCE Qualification in Computer Science which it makes available, or proposes to make available, an awarding organisation must comply with any requirements, and have regard to any guidance, relating to the objectives to be met by any assessment for that qualification which may be published by Ofqual and revised from time to time.

Condition GCE(Computer Science)2   Assessment

GCE(Computer Science)2.1	Condition GCE4.1 does not apply to any GCE A level Computer Science qualification which an awarding organisation makes available or proposes to make available.

GCE(Computer Science)2.2   In respect of the total marks available for a GCE A level Computer Science qualification which it makes available, an awarding organisation must ensure that –

(a) 80 per cent of those marks are made available through Assessments by Examination, and

(b) 20 per cent of those marks are made available through assessments that are not Assessments by Examination.

GCE(Computer Science)2.3   An awarding organisation must ensure that each assessment for a GCE A level Computer Science qualification which it makes available which is not an Assessment by Examination complies with any requirements, and has regard to any guidance, which may be published by Ofqual and revised from time to time.

Assessment objectives

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Assessment objectives – GCE AS and A level qualifications in Computer Science

Condition GCE(Computer Science)1.2 allows us to specify requirements relating to the objectives to be met by any assessment for GCE qualifications in Computer Science.

The assessment objectives set out below constitute requirements for the purposes of Condition GCE(Computer Science)1.2. Awarding organisations must comply with these requirements in relation to all GCE AS and A level qualifications in Computer Science they make available.

		A level	*AS*
AO1	Demonstrate knowledge and understanding of the principles and concepts of computer science, including abstraction, logic, algorithms and data representation	*30-40%*	*35-45%*
AO2	Apply knowledge and understanding of the principles and concepts of computer science, including to analyse problems in computational terms	*30-40%*	*35-45%*
AO3	Design, program and evaluate computer systems that solve problems, making reasoned judgements about these and presenting conclusions	*30-40%*	*20-30%*

The ability to use mathematical skills at a level appropriate for GCE A level Computer Science must be tested across the assessment objectives. The weighting of mathematical skills within this subject must be at least 10 per cent for both AS and A level qualifications.

Subject content (published by Department for Education)

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GCE AS and A level subject content for computer science

Introduction

1. AS and A level subject content sets out the knowledge, understanding and skills common to all AS and A level specifications in computer science.

Aims and objectives

2. All specifications in computer science must build on the knowledge, understanding and skills established at key stage 4 and encourage students to develop a broad range of the knowledge, understanding and skills of computing, as a basis for progression into further learning and/or employment.

3. AS and A level specifications in computer science must encourage students to develop:

- an understanding of, and the ability to apply, the fundamental principles and concepts of computer science, including abstraction, decomposition, logic, algorithms and data representation

- the ability to analyse problems in computational terms through practical experience of solving such problems, including writing programs to do so

- the capacity for thinking creatively, innovatively, analytically, logically and critically

- the capacity to see relationships between different aspects of computer science

- mathematical skills (as set out in the attached annex)

- the ability to articulate the individual (moral), social (ethical), legal and cultural opportunities and risks of digital technology

Subject content

Knowledge and understanding

4. AS and A level specifications must require students to develop a knowledge and understanding of the fundamentals of computer science and programming including:

- fundamentals of programming

- the concept of data type, including primitive data types and complex data structures

- data representation

- following and writing algorithms

- methods of capturing, selecting, exchanging and managing data to produce information for a particular purpose

- the need for and functions of systems software

- characteristics of contemporary systems architectures, including processors, storage, input, output and their connectivity

- characteristics of networks and the importance of networking protocols and standards

- the individual (moral), social (ethical), legal and cultural opportunities and risks of digital technology

5.   In addition, A level specifications must require students to develop a knowledge and understanding of:

- the importance of the efficiency of an algorithm; that this can be measured in terms of execution time and space requirements, and that the efficiency of algorithms that perform the same task can be compared

- standard algorithms

- the use of databases to store, retrieve and manipulate data, including database programming and producing a data model

- the need for and characteristics of a variety of programming paradigms

Skills

6.   AS and A level specifications must require students to develop the following skills:

- take a systematic approach to problem solving

- design, write and test programs to either a specification or to solve a problem

- articulate how a program works, arguing for its correctness and efficiency using logical reasoning, test data, and user feedback

- use abstraction effectively:

     - to appropriately structure programs into modular parts with clear, well-documented interfaces

     - to model selected aspects of the external world in a program

- apply computing-related mathematics

7.   In addition, A level specifications must require students to:

- know and understand how to write specifications for a programming solution

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Annex: mathematical skills

Computer science uses mathematics to express its computational laws and processes.

Any accredited specification in computer science must contain a minimum of 10% mathematics. Awarding organisations are free to include and assess a greater percentage of mathematics. Students may be asked to demonstrate their knowledge and understanding and skills of computational processes and problem-solving in both theoretical and practical ways. The following list shows the key topics that will be common to all specifications in computer science.

For each topic below, while the concepts are Level 2 (though not all appear in GCSE mathematics specifications), students will, however, be expected to apply the skills they acquire in a Level 3 context.

Topics:

- Boolean algebra

- Comparison of complexity of algorithms*

- Number representations and bases

*applicable to A level only due to its advanced nature.

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