CCEA Draft GCE Specification in Software and Systems Development

For first teaching from September 2013
For first award of AS Level in Summer 2014
For first award of A Level in Summer 2015

Subject Code: [ ]

Foreword

This booklet contains CCEA's Advanced Subsidiary (AS) and Advanced GCE [subject] for first teaching from September 2013.

The AS is the first part of the full Advanced GCE course. It is possible to take the AS as a stand-alone qualification. The AS units are assessed at a standard appropriate for students who have completed half of the full course.

The A2 is the second part of the full Advanced GCE course. Assessed at a standard appropriate for students who have completed the full course, the A2 units include both synoptic assessment (to assess students' overall learning throughout the course) and an element of stretch and challenge.

The full Advanced GCE award is based on students' marks from the AS (50 percent) and the A2 (50 percent). We award an A* to students who achieve a grade A in the full A level qualification and an A* on the aggregate of the A2 units.

We will notify centres in writing of any major changes to this specification. We will also publish changes on our website at www.ccea.org.uk

The version on our website is the most up-to-date version. Please note that the web version may be different from printed versions.

Subject Code	????
QAN	???/????/?

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1 Introduction

This specification sets out the content and assessment details for our Advanced Subsidiary (AS) and Advanced Level (A Level) courses in [subject]. First teaching begins from September 2013. You can view and download the latest version of this specification on our website at www.ccea.org.uk

Students can take the AS course as a final qualification or as the first half of the A Level course. They must also complete the A2 course (the second half of the A Level) if they wish to obtain a full A Level qualification. We will make the first AS awards for this specification in 2014 and the first A Level awards in 2015.

The specification builds on the broad objectives of the Northern Ireland Curriculum. It is also relevant to key curriculum concerns in England and Wales.

1.1 Aims

This specification aims to encourage students to:

- [insert a maximum of six bullet points and begin each bullet point with a verb if possible (or change the stem that introduces the list); examples below];
- apply their skills to relevant work-related scenarios;
- work with others in group settings;
- research, develop and present their findings in a variety of formats;
- develop advanced study skills in preparation for third level education; and
- demonstrate their understanding and application of key concepts through challenging internal and external assessments.

1.2 Key features

The key features of the specification appear below. [Examples below. Insert a maximum of five additional short bullet points to summarise key features of the specification. Make each bullet a complete sentence.]

- It includes four assessment units: two externally assessed and two internally assessed [amend as appropriate].
- It gives students the opportunity to develop subject knowledge, understanding and skills in relation to a work context.
- Assessment at A2 includes stretch and challenge, reflected in the use of a wider range of question types, higher demand evaluative tasks, synoptic assessment and extended writing.
- A course of study based on this specification provides a sound basis for progression to higher education.
- Exemplar schemes of work, a resource list and specimen assessment materials are available to accompany this specification.

1.3 Prior attainment

[Insert statement detailing any prior attainment or experience recommended for students taking the course. If no prior attainment or experience is required, state this. For example, 'There is no particular level of attainment required to study this specification. However, it builds on knowledge, understanding and skills developed ...']

1.4 Classification codes and subject combinations

Every specification is assigned a national classification code that indicates the subject area to which it belongs. The classification code for this qualification is [code].

Progression to another school/college

Should a student take two qualifications with the same classification code, schools and colleges that they apply to may take the view that they have achieved only one of the two GCEs. The same view may be taken if students take two GCE qualifications that have different classification codes but have content that overlaps significantly. Students who have any doubts about their subject combinations should check with the universities and colleges that they wish to attend before embarking on their planned study.

Centres in England

Centres in England should also be aware that, for the purpose of the School and College Achievement and Attainment Tables, if a student enters for more than one GCE qualification with the same classification code, only one grade (the highest) will count.

2 Specification at a Glance

The table below summarises the structure of the AS and A Level courses:

[Add/Delete rows as necessary for your subject]

Content	Assessment	Weightings	Availability
AS 1: Introduction to Object Oriented Development	**External Assessment** 2 hour exam paper (brief description of exam)	50% of AS and 25% of A-Level	Summer only
AS 2: Event Driven Programming	**Internal Assessment** (brief description of assessment)	50% of AS and 25% of A-Level	Summer only
A2 1: Systems Approaches and Database Concepts	**External Assessment** (brief description of exam)	50% of AS and 25% of A-Level	Summer only
A2 2: Implementing Solutions	**Internal Assessment** (brief description of assessment)	50% of AS and 25% of A-Level	Summer only

3 Subject Content

We have divided the course into four units: two units at AS level and two units at A2. The content of each unit, as well as the respective learning outcomes, appears below.

3.1 Unit AS 1: Introduction to Object Oriented

This unit will provide students with a thorough understanding of Object Oriented systems based on a console environment. Students will adopt an object oriented approach to problem solving. Object concepts will be defined and implemented. The unit will enable students to develop object oriented skills and appreciate the benefits of developing applications in this type of environment.

Content	Learning outcomes
What is Software	Students should be able to: Understand concepts associated with • Systems software • Application software; Be aware of the types of software that support systems.
How to define data	Students should be able to: Understand • Objects • Classes • Attributes • Simple type • Reference (Object) Types; Identify and name objects and classes; Understand that an object is an occurrence of a class and that its behaviour relates to what it actually does; Understand the function of classes in an object oriented environment; Understand and name attributes and types; Understand that attributes represent the properties of a class.
What are Program Control Structures	Students should be able to: Understand the basic principles of control structures in terms of • Sequence • Repetition • Selection

	Apply • Decision making loops • Selection
What are Objects	Students should be able to: Understand the principles underpinning • Encapsulation • Inheritance • Interface • Polymorphism • Methods public/static
What are Data Structures	Students should be able to: Understand the need to store and organise data efficiently within specific structures; Design and use: • Arrays (static) - of simple type - of objects • Array list (dynamic) • Add, remove and apply;
What is Exception Handling	Students should be able to: Understand the need to be able to trap errors in program code; Understand the ways that errors can be trapped in an object oriented environment; Understand concepts of: • Error trapping techniques from an object perspective • Try/Catch (Blocks)
How to manage Input /Output	Students should be able to: Understand the role of different file types in an object oriented environment; Understand and use • Text Files • Binary Files • Object files (Serialisation); Input data from the command line prompt.

How to test an object oriented application	Students should be able to: Understand the need to apply testing techniques to object oriented applications; Analyse and interpret test results; Develop and use suitable testing strategies; Evaluate test strategies.

3.2 Unit AS 2: Event Driven Programming

This unit will provide students with an opportunity to implement and develop Object Oriented Technologies in an event driven environment. Students will be able to design, implement, test and evaluate event driven applications.

Content	Learning outcomes
How to define windows objects	Students should be able to: Demonstrate their understanding of windows objects in the implementation of an event driven application; Understand and apply the features of: • GUI • FORM – properties such as labels, text boxes.
What are events	Students should be able to: Demonstrate their understanding of events in the implementation of an event driven application; Use • Triggers – such as Button, Key presses, Mouse clicks.
What are Multiple Forms	Students should be able to: Demonstrate their understanding of multiple forms in an event driven application; Design and implement: • Multiple Form applications Menus, toolbars
How to design and implement an event driven application	Students should be able to: Understand the concept of a storyboard and its use to an event driven application; Develop storyboards for event driven applications; Design and implement an event driven application using Storyboarding.

How to link an object application to simple files	Students should be able to: Understand and use • Text files • Binary files • Object files (Object serialisation)
How to test an event driven application	Students should be able to: Understand the concepts of • Error trapping techniques from an object perspective • Try/Catch (Blocks); Demonstrate these concepts in an event driven application; Demonstrate the application of a testing strategy in an event driven application; Apply a suitable test strategy to an event driven application; Interpret and evaluate test results.
How to evaluate an event driven application	Students should be able to: Develop and evaluate an event driven application in terms of • Initial requirements • Features • Functionality.

3.3 Unit A2 1: Systems Approaches and Database Concepts

This unit will provide students with a thorough understanding of the reasons for systems development, as well as an understanding of fundamental systems analysis and design concepts. It will provide a detailed study of design methodologies. The unit will introduce students to project management concepts and testing strategies that assist the systems development process. The unit will enable students to understand the need for quality assurance and professional practice.

The unit will introduce important database concepts enabling an understanding of relational database systems.

Content	Learning outcomes
Why systems are developed	Students should be able to: • Understand and evaluate the reasons for project initiation and systems development within organisations; • Understand and apply analysis and design principles to business solutions; • Appreciate the roles inherent in the systems development process and the particular role of the User in the development process.
How systems are developed	Students should be able to: • Appreciate the purpose of applying a methodology to the solution of systems problems; • Understand how methodologies have evolved in line with changing technologies and appreciate the roles of participants in their application; • Understand a range of methodologies including: traditional, iterative and Agile methods; - Waterfall - SSADM - SPIRAL

	- RAD - DSDM - SCRUM - XP; • Understand the application of methodologies in specific situations; • Understand stages, rules, tools and techniques associated with methodologies; • Understand the role of CASE tools in the development process; • Understand the role of Prototyping in the development process; • Appreciate the basic concepts of UML and apply some modeling techniques; • Evaluate the suitability and application of a range of methodologies in a range of business situations.
How projects are managed	Students should be able to: • Understand the purpose of project management; • Understand project management concepts and the roles and responsibilities of those associated with project management; • Appreciate how projects are controlled; • Understand the resources involved in developing a project; • Apply project planning techniques including use of GANTT, PERT, MILESTONES, FLOAT and CRITICAL PATH; • Appreciate performance measurement.
How systems are tested	Students should be able to: • Appreciate the significance of testing throughout the development cycle particularly at the design stage; • Understand the different types of testing that can be applied throughout the development cycle including program, system, white box, black box, integration and user acceptance; • Understand the role of the personnel involved in testing procedures; • Understand the concept of a test plan and its likely content;

	• Develop test plans for specific scenarios.
Why Quality Assurance is necessary	Students should be able to: • Understand the concepts and application of Quality Assurance in the software development process including the use of documentation; • Appreciate the role of professional bodies in maintaining quality standards; • Appreciate the available range of quality standards.
What is a Relational database system	Students should be able to: • Understand the concept of a database and associated terminology; • Understand - The nature of databases; - Relational models; - Data models.
What is a database structure	Understand and apply ER models and normalisation including: - First Normal Form; - Second Normal Form; - Third Normal Form.
What are relationships	Understand different types of relationships; Apply a range of relationships including: - One to One - One to Many - Many to Many;
What is SQL	Understand how to work with data using SQL commands and statements.

	Understand and apply • Principles of SQL • SQL commands • SQL statements.

3.4 Unit A2 2: Implementing Solutions

This unit will provide students with an opportunity to design and implement a solution to a given problem using the knowledge and skills acquired in the preceding units. The unit will provide students with the opportunity to implement an agreed design using an appropriate software tool. The unit will integrate the knowledge and skills acquired in the other units and will allow students to experience the elements of the systems development process.

Content	Learning outcomes
How to apply project management techniques to the development process	Students should be able to: • Create a detailed project plan for the development process that is capable of reflecting change as the project progresses; • Document the plan using relevant tools and techniques.
How to select a systems approach to the solution of a business problem	Students should be able to: • Evaluate different approaches to a given problem; • Select and justify a specific approach to a given problem.
How to define and document user requirements	Students should be able to: • Present and explain a detailed User Requirements specification for a given problem giving consideration to - Functional requirements - Non functional requirements - Software - Hardware - Technical and operational aspects.

How to document the design of the solution and test the design	Students should be able to: • Provide a detailed design of their solution; • Test the design of their solution to ensure that the desired User outcomes can be achieved.
How to develop a desktop solution using RDMS	Students should be able: • Apply techniques of relational database management systems to solutions to the given problem.
How to implement a solution	Students should be able to: • Select an appropriate software tool to implement their design; • Develop a solution to the problem; • Implement the solution; • Document the solution; • Present their solution using appropriate media.
How to test the solution	Students should be able to: • Apply suitable testing procedures to their software solution; • Document test outcomes; • Evaluate their test procedures.
How to evaluate the solution	Students should be able to: • Conduct a comprehensive critical evaluation of their solution; • Provide an evaluation of their personal performance.

4.1 Assessment opportunities

Assessment can take place in stages during the AS and A Level courses. Alternatively, candidates can take all the assessment at the end of each course. For the availability of assessment units, see Section 2 of this specification.

It is possible to resit individual AS and A2 assessment units. The best result for each assessment unit counts towards the AS and A Level qualifications. Results for individual assessment units remain available to count towards an AS or A Level qualification until we withdraw the specification.

4.2 Assessment objectives

Below are the assessment objectives for this specification. Candidates must:

[Insert assessment objectives in bulleted text followed by AO1, AO2, etc in brackets. For example:

- demonstrate knowledge and understanding of concepts (AO1);]
-
-

4.3 Assessment objective weightings

The table below sets out the assessment objective weightings for each assessment unit and the overall AS and A Level qualifications:

Assessment Objective	Assessment Unit Weighting				Overall Weighting	
	AS 1	AS 2	A2 1	A2 2	AS	A Level
AO1	**8%**	**8%**	**6%**	**6%**	**16%**	**28%**
AO2	**8%**	**10%**	**7%**	**10%**	**18%**	**35%**
AO3	**9%**	**7%**	**12%**	**9%**	**16%**	**37%**
Total	**25%**	**25%**	**25%**	**25%**	**50%**	**100%**

4.4 Quality of written communication

In AS and A Level [insert subject area], candidates must demonstrate their quality of written communication. In particular, they must:

- ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear;
- select and use a form and style of writing appropriate to their purpose and to complex subject matter; and
- organise information clearly and coherently, using specialist vocabulary where appropriate.

Examiners and teachers assess the quality of candidates' written communication in their responses to questions and tasks that require extended writing.

4.5 Synoptic assessment at A2

The A2 assessment units include [or, for example, 'One of the A2 assessment units includes'] an element of synoptic assessment, which encourages the development of the understanding of the subject as a whole. In [subject], synoptic assessment requires candidates to demonstrate that they can:

[the text below is an example only; please amend or rewrite for your subject, making sure each point follows on from the stem 'they can';

- build on material first encountered in the AS units;
- draw together the knowledge, understanding and skills learned in different parts of the A Level course;
- select and present work for examination that demonstrates their strengths across the areas of knowledge and the range of skills described;
- sustain their own lines of enquiry and record and observe from primary sources;
- bring together and make connections between the areas of knowledge and the range of skills described and learned throughout the course; and
- respond to one or more of the following:
  - a stimulus or issue;
  - a design brief or problem; and
  - a task that specifies an image, object or other outcome to be achieved.]

4.6 Stretch and challenge at A2

The A2 assessment units provide opportunities for stretch and challenge by incorporating [for example]:

- a wider range of question types to address different skills, for example case studies and open-ended questions;
- a greater number of higher demand evaluative tasks;
- questions that require learners to show more connections between sections of the specification; and
- extended writing where appropriate.

4.7 Reporting and grading

We report the results of individual assessment units on a uniform mark scale that reflects the assessment weighting of each unit.

We award AS qualifications on a five grade scale from A to E, with A being the highest. We award A Level qualifications on a six grade scale from A* to E, with A* being the highest. We determine the AS and A Level grades awarded by aggregating the uniform marks obtained on individual assessment units. To be awarded an A*, candidates need to achieve a grade A on their full A Level qualification and an A* on the aggregate of their A2 units. If candidates fail to attain a grade E, we report their results as unclassified (U).

The grades we award match the performance descriptions in Section 5 of this specification.

5 Performance Descriptions

These performance descriptions give a general indication of the standards of achievement likely to have been shown by candidates awarded particular grades. The descriptions must be interpreted in relation to the content in the specification; they are not designed to define that content.

The grade awarded depends in practice upon the extent to which the candidate has met the assessment objectives overall. Shortcomings in some aspects of candidates' performance in the assessment may be balanced by better performances in others.

Grade	Description
A	
C	
F	

6 Guidance on Internal Assessment

There are [add number and amend as appropriate] internal assessments in this specification, [one] at AS level and [one] at A2:

- Internal Assessment Unit 1 [title and description]; and
- Internal Assessment Unit 2 [title and description].

The internal assessment will have a specific focus on candidates' ability to apply their knowledge and skills within a work-related context.

6.1 Setting of tasks

[Please amend for your subject.] We will provide centres with details of the assessment tasks and guidance on how to complete and submit them. Teachers must ensure that the completed tasks conform to the unit requirements.

6.2 Supervision of candidates

[Please amend for your subject.] Candidates should work independently when completing their coursework. Teachers should, however, provide advice and guidance on any problems they encounter and supervise candidates' work to monitor their progress.

6.3 Assessment conditions

[Please amend for your subject.] Candidates will complete their coursework in conditions that combine classroom and independent study activities. These conditions must ensure that the internal assessment remains reliable and fair.

6.4 Marking and internal standardisation

Teachers should use their professional judgement to select and apply the criteria in each mark band appropriately and fairly to candidates' work. They should award the appropriate mark within any range on a 'best fit' basis, making allowance for balancing strengths and weaknesses within each response.

Centres with more than one teaching group must carry out internal standardisation of the internal assessment tasks before submitting them to us. This is to ensure, as far as possible, that each teacher has applied the assessment criteria consistently when marking assessments.

As a result of internal standardisation, it may be necessary to adjust an individual teacher's marking. This is to bring assessments into line with those of other teachers in the centre and to match the standards established at the agreement trial. Where adjustment is necessary, the total/final mark recorded on the Candidate Record Sheet should be amended.

6.5 Moderation

Centres must submit their marks and samples to us by [month] in any year. We may adjust centres' marking. This is to bring the assessment of the candidates' work into line with our agreed standards.

We issue full instructions well in advance of submission on:

- the details of moderation procedures;
- the nature of sampling; and
- the dates by which marks and samples must be submitted to us.

Teachers and centre staff may contact us at any stage if they require advice, assistance or support regarding any aspect of internal assessment. We provide moderators who can support groups of centres or contact individual centres to discuss issues arising from the internal assessments.

7 Links

7.1 Support

[Delete/amend/add to the list below as appropriate to your subject]
We provide the following resources to support this specification:

- a subject microsite within our website;
- guidance notes for teachers; and
- specimen assessment materials.

We intend to expand our range of support to include the following:

- past papers;
- Chief Examiner's reports;
- Principal Moderator's reports;
- schemes of work;
- centre support visits;
- support days for teachers;
- portfolio clinics;
- agreement trials;
- a resource list; and
- exemplification of standards.

You can find our annual support programme of events and materials for [subject] on our website at www.ccea.org.uk

7.2 Curriculum objectives

This specification addresses and builds upon the broad curriculum objectives for Northern Ireland, England and Wales. In particular, it enables students to understand, relate to and explore:

- [amend and/or expand on this text as appropriate: spiritual, moral, ethical, social, economic, cultural and legislative (including equality and disability discrimination) issues;
- sustainable development, health and safety considerations and European developments; and
- the 'skills agenda' and employability.]

7.3 Skills development

This specification provides students with opportunities to develop skills in the areas of communication, application of number and ICT.

[Add levels and links to particular sections of content where appropriate. Do not include detailed exemplification here, but include reference to any other materials that provide it under 'Support' above.]

7.4 Examination entries

Entry codes for this subject and details on how to make entries are available on our Qualifications Administration Handbook microsite, which you can access at www.ccea.org.uk

Alternatively, you can telephone our Examination Entries, Results and Certification team using the contact details provided in this section.

7.5 Equality and inclusion

We have considered the requirements of equalities legislation in developing this specification.

GCE qualifications often require the assessment of a broad range of competences. This is because they are general qualifications and, as such, prepare students for a wide range of occupations and higher level courses.

The qualification criteria were reviewed to identify whether any of the competences required by the subject presented a potential barrier to any students with disabilities. If this was the case, the situation was reviewed again to ensure that such competences were included only where essential to the subject. The findings of this process were discussed with disability and equality groups and with people with disabilities.

During the development process, an external equality panel reviewed the specification to identify any potential barriers to equality and inclusion. Where appropriate, we have considered measures to support access and mitigate against barriers.

Reasonable adjustments are made for students with disabilities in order to reduce barriers to accessing assessments. For this reason, very few students will have a complete barrier to any part of the assessment.

Students who, even after exploring all possibilities through reasonable adjustments, are still unable to access a significant part of the assessment may still be able to receive an award. They would be given a grade on the parts of the assessment they have taken, and there would be an indication on their certificate that not all of the competences have been addressed. This will be kept under review and may be amended in the future.

[Review inclusion sheets for similar subjects and insert any specific barriers in your subject]

It is important to note that where access arrangements are permitted, they must not be used in any way that undermines the integrity of the assessment. **You can find information on reasonable adjustments in the Joint Council for Qualifications' document *Access Arrangements and Special Consideration: Regulations and Guidance Relating to Candidates Who Are Eligible for Adjustments in Examinations.***

7.6 Contact details

The following list provides contact details for relevant staff members and departments:

- Specification Support Officer:
  (telephone: (028) 9026 1200, extension XXXX, email: xxxx@ccea.org.uk)

- Officer with Subject Responsibility:
  (telephone: (028) 9026 1200, email: xxxxx@ccea.org.uk)

- Examination Entries, Results and Certification
  (telephone: (028) 9026 1262, email: entriesandresults@ccea.org.uk)

- Examiner Recruitment
  (telephone: (028) 9026 1243, email: appointments@ccea.org.uk)

- Distribution (past papers and support materials)
  (telephone: (028) 9026 1242, email: cceadistribution@ccea.org.uk)

- Support Events Administration
  (telephone: (028) 9026 1401, email: events@ccea.org.uk)

- Information Section (including Freedom of Information requests)
  (telephone: (028) 9026 1200, email: info@ccea.org.uk)

- Business Assurance (appeals)
  (telephone: (028) 9026 1244, email: appealsmanager@ccea.org.uk).