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BCS Level 4 Diploma in Software Languages Syllabus
QAN 603/0545/9

Version 2.0
March 2018

This is a United Kingdom government regulated qualification which is administered and approved by one or more of the following: Ofqual, Qualification in Wales, CCEA or SQA

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Change History

Any changes made to the syllabus shall be clearly documented with a change history log. This shall include the latest version number, date of the amendment and changes made. The purpose is to identify quickly what changes have been made.

Version Number	Changes Made
Version 1.0 July 2016	Syllabus Created
Version 1.1 September 2016	Syllabus updated to reflect changes to Knowledge Module feedback
Version 1.2	Syllabus updated to include QAN
Version 2.0	Syllabus amended. Section 1.3 split into 2 learning outcomes, additional bullet in 2.1, final bullet in 2.2 specified.

Introduction

This Diploma is the second module of the two knowledge modules required for the Level 4 Software Developer Apprenticeship. It covers the range of concepts, approaches and techniques that are applicable to Software Languages, for which Apprentices are required to demonstrate their knowledge and understanding.

Objectives

Apprentices should be able to demonstrate knowledge and understanding of Software Languages, its theory and techniques. Key areas are:

1. Understand and apply software design approaches and patterns; can interpret and implement a given design, compliant with security and maintainability requirements.
2. Understand and apply the math required to be a software developer (for example but not limited to algorithms, logic and data structures).

Evidence of lessons learnt in these key areas should be collected and reflected upon when the Apprentice is compiling the Summative Portfolio, as the Apprentice could identify how the task may be improved upon or carried out differently with knowledge subsequently gained.

Target Audience

The Diploma is relevant to anyone enrolled on the Level 4 Software Developer Apprenticeship Programme.

Course Format and Duration

Candidates can study for this Diploma by attending a training course provided by a BCS accredited Training Provider. The estimated total qualification time for this Diploma is 508 hours.

Eligibility for the Examination

There are no specific pre-requisites for entry to the examination; however, candidates should possess the appropriate level of knowledge to fulfil the objectives shown above.

Format and Duration of the Examination

The format for the examination is a one-hour multiple-choice examination consisting of 40 questions. The examination is closed book (no materials can be taken into the examination room). The pass mark is 26/40 (65%).

Additional time for Apprentices requiring Reasonable Adjustments due to a disability

Apprentices may request additional time if they require reasonable adjustments. Please refer to the reasonable adjustments policy for detailed information on how and when to apply.

Additional time for Apprentices whose language is not the language of the examination

If the examination is taken in a language that is not the Apprentice's native/official language, then they are entitled to 25% extra time.

If the examination is taken in a language that is not the Apprentice's native/official language, then they are entitled to use their own **paper** language dictionary (whose purpose is translation between the examination language and another national language) during the examination. Electronic versions of dictionaries will **not** be allowed into the examination room.

Guidelines for Training Providers

Each major subject heading in this syllabus is assigned an allocated time. The purpose of this is two-fold: first, to give both guidance on the relative proportion of time to be allocated to each section of an accredited course and an approximate minimum time for the teaching of each section; second, to guide the proportion of questions in the exam. Training Providers may spend more time than is indicated and Apprentices may spend more time again in reading and research. Courses do not have to follow the same order as the syllabus. Courses may be run as a single module or broken down into two or three smaller modules.

This syllabus is structured into sections relating to major subject headings and numbered with a single digit section number. Each section is allocated a minimum contact time for presentation. Apprentices should be encouraged to consider their Summative Portfolio throughout the modules.

Excerpts from BCS Books

Accredited Training Organisations may include excerpts from BCS books in the course materials. If you wish to use excerpts from the books you will need a license from BCS to do this. If you are interested in taking out a licence to use BCS published material, you should contact the Head of Publishing at BCS outlining the material you wish to copy and the use to which it will be put.

Syllabus

For each top-level area of the syllabus a percentage and K level is identified. The percentage is the exam coverage of that area, and the K level identifies the maximum level of knowledge that may be examined for that area.

1. Software Design (50%, K3)

1.1 Demonstrate an understanding of the purpose of software design:
- To aid Communication between 'actors'.
- As a basis for rigorous development.
- To provide a standard approach.
- To ensure consistency across the development.
- To assist in the identification of re-use.
- To compare the current situation with the required.

1.2 Understand and apply the use of software design approaches and software patterns in the software design process.

1.3 Explain the rationale for separating functional and non-functional requirements.

1.4 Show how software designs can be documented including how the design documents will be used to support software implementation.

1.5 Demonstrate the need for secure development and give examples of how this can be included within the software implementation process.

1.6 Discover the need for software maintainability and how software can be implemented in a manner that enables re-use and maintainability.

2. Computational Theory and Mathematics (50%, K3)

2.1 Explain and demonstrate the following key techniques of maths required for software development:
- decomposition;
- pattern recognition;
- abstraction;
- algorithms;
- mathematical logic.

2.2 Demonstrate how algorithms are used to create a logical solution to a computable problem:
- The use of semi-formal specification of algorithms, based on a simplified computer model.
- Development of code from an algorithm.
- The use of operators in algorithms, including arithmetic (+; -; *; /; %); assignment (=); relational (==; >; <; !=; >=; <=); logical (&&; ||, !); bitwise; incremental.'

2.3 Apply the primary elements of programming logic.

Levels of Knowledge / SFIA Levels

This syllabus will provide Apprentices with the levels of difficulty / knowledge skill highlighted within the following table, enabling them to develop the skills to operate at the levels of responsibility indicated. The levels of knowledge and SFIA levels are explained on the website www.bcs.org/levels. The levels of knowledge above will enable Apprentices to develop the following levels of skill to be able to operate at the following levels of responsibility (as defined within the SFIA framework) within their workplace:

Level	Levels of Knowledge	Levels of Skill and Responsibility (SFIA)
K7		Set strategy, inspire and mobilise
K6	Evaluate	Initiate and influence
K5	Synthesise	Ensure and advise
K4	Analyse	Enable
K3	Apply	Apply
K2	Understand	Assist
K1	Remember	Follow

Question Weighting

Syllabus Area	Target number of questions
1. Software Design	20
2. Computational Theory and Mathematics	20
Total	**40 Questions**

Format of Examination

Type	40 Question Multiple Choice.
Duration	1 Hour. An additional 15 minutes will be allowed for Apprentices sitting the examination in a language that is not their native /mother tongue.
Pre-requisites	Training from a BCS accredited Training Provider is strongly recommended but is not a pre-requisite.
Supervised	Yes.
Open Book	No.
Pass Mark	26/40 (65%).
Calculators	Calculators cannot be used during this examination.
Total Qualification Time (TQT)	508 Hours.
Delivery	Online.

Trainer Criteria

Criteria	▪ Have 10 days training experience or have a 'Train the Trainer' qualification ▪ Have a minimum of 3 years practical experience in the subject area

Classroom Size

Trainer to Apprentice ratio	1:16

Recommended Reading List

Primary Text:

Title Developing Information Systems: Practical guidance for IT professionals
Authors Cadle J. (Editor)
Publisher BCS Learning & Development
Publication Date 2014
ISBN 9781780172453

Supporting Text:

Title Software Engineering for Students: A Programming Approach
Authors Bell, D.
Publisher Addison Wesley (4th Edition)
Publication Date 2005
ISBN 978-0321261274

Indicative Programming Texts:

Title	Data Structures and Algorithms in Java
Authors	Goodrich, Michael, and Tamassia, R.
Publisher	John Wiley and Sons, 6th Edition
Publication Date	2014
ISBN	978-1118771334

Title	Java Concepts 6/E for Java 7 and 8 International Student Version
Authors	Horstmann, C.S.
Publisher	Wiley
Publication Date	2010
ASIN	B012J0WFRO

Title	Java How to Program
Authors	Deitel, P. and Deitel H.
Publisher	Pearson (8th Edition)
Publication Date	2010
ISBN	978-0131836617

Title	Problem solving with C++
Authors	Savitch, W.
Publisher	Pearson (7th Edition)
Publication Date	2009
ISBN	978-1292018249

Title	C How to Program
Authors	Deitel, P. and Deitel H.
Publisher	Prentice Hall
Publication Date	2012
ISBN	978-0273776840

Title	Data Structure and Algorithms Using Visual Basic.NET
Authors	McMillan, M.
Publisher	Cambridge University Press
Publication Date	2005
ISBN	978-0521547659

Title	Introduction to Programming Using Visual Basic 2008
Authors	Schneider, D. I.
Publisher	Pearson (7th Edition)
Publication Date	2009
ISBN	978-0138149437