BCS LEVEL 5 DIPLOMA IN IT

DATABASE SYSTEMS

SYLLABUS

THIS QUALIFICATION WILL BE RETIRING IN 2026

September 2023 v3.1

CONTENTS

Introduction

The second stage within the BCS three-stage Higher Education Qualification programme, the Level 5 Diploma enables candidates who have already achieved the Level 4 Certificate in IT to progress to higher levels of knowledge and competency.

This internationally-recognised qualification introduces you to the business-related aspects of the IT industry, developing your technological expertise while also considering the potential challenges of the day-to-day running of an organisation, such as legal obligations and intellectual property.

Our modules have been created in-line with the latest developments in the industry, giving you a competitive edge in the IT job market. You will have the opportunity to learn about object-oriented programming, user experience, systems analysis and design, as well as to build upon knowledge and skills developed during the Level 4 Certificate.

To successfully achieve the qualification, candidates need to complete:

- One core module
- Three optional modules
- One Professional Project in IT

Candidates who wish to progress onto the next stage will need to complete the Project at end of the Level 6 Professional Graduate Diploma in IT.

Database Systems Diploma in IT

The Database Systems module is an optional module that forms part of the Level 5 Diploma in IT – the second stage within the BCS three-stage Higher Education Qualification programme.

Candidates will develop an understanding of theoretical concepts relating to database design, configuration and development, consider the mechanisms used within databases to protect and recover data, and learn about the standard SQL language.

Qualification Suitability and Overview

Candidates must have achieved the Certificate in IT or have an appropriate exemption to be entered for the Diploma in IT. Candidates can study for this diploma by attending a training course provided by a BCS accredited Training Provider or through self-study, although it is strongly recommended that all candidates register with an approved centre. Studying with an approved centre will deliver significant benefits.

Candidates are required to become a member of BCS, The Chartered Institute for IT, to sit and be awarded the qualifications. Candidates may apply for a four-year student membership that will support them throughout their studies.

The Level 5 Diploma is suitable for professionals wishing to gain a formal IT qualification, and this module may be particularly relevant for candidates interested in career opportunities such as database analysis, administration or engineering.

Total Qualification Time (Certificate)	Guided Learning Hours (Module)	Assessment Time (Exam)
1086 hours	**225 hours**	**Two hours**

SFIA Levels

This award provides candidates with the level of knowledge highlighted within the table, enabling candidates to develop the skills to operate successfully at the levels of responsibility indicated.

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**

SFIA Plus

This syllabus has been linked to the SFIA knowledge skills and behaviours required at Level 5.

DBAD3:

Uses database management system software and tools to collect agreed performance statistics. Carries out agreed database maintenance and administration tasks.

DTAN3

Applies data analysis, design, modelling, and quality assurance techniques, based upon a detailed understanding of business processes, to establish, modify or maintain data structures and associated components (entity descriptions, relationship descriptions, attribute definitions). Advises database designers and other application development team members on the details of data structures and associated components.

DBDS3

Develops appropriate physical database or data warehouse design elements, within set policies, to meet business change or development project data requirements. Interprets installation standards to meet project needs and produces database or data warehouse component specifications.

Further detail around the SFIA Levels can be found at www.bcs.org/levels.

Learning Outcomes

Upon completion of this module, candidates will be able to:

- Draw and interpret data models.
- Write simple and effective SQL statements.
- Design appropriate user interfaces.
- Produce working schemas.

Syllabus

1. Underlying Theory of Relational Systems

Learners will be able to:

1.1 Describe theoretical concepts.

Indicative content	Guidance
a. Database design b. Configuration c. Development techniques	Candidates should demonstrate familiarity with design techniques, diagramming conventions and basic relational terminology, such as tables, tuples, attributes and entities.

2. The Database as a Shared Storage of Secure and Protected Data

Learners will be able to:

2.1 Explain relational approaches.

Indicative content	Guidance
a. Data-centred approach b. File-centred approach c. Post-relational approaches	Candidates should be able to analyse the relational approach to data design and its origins. they will also need to evaluate post-relational approaches such as NoSQL, key-value pair, document and non-structured data along with techniques for handling Big Data.

2.2 Describe logical and physical independence.

Indicative content	Guidance
a. How logical data independence is achieved. b. How physical data independence is achieved.	A database is all about the sharing of data in a controlled fashion. The mechanisms used within databases to protect and recover data should be well known. Candidates will need to establish the value of data independence and compare and contrast logical and physical independence along with their practical implications.

3. Data Structures and Database Design

Learners will be able to:

3.1 Explain and interpret entity relationship diagrams.

Indicative content	Guidance
a. Conceptual modelling	Candidates should be able to depict relationships between entities, including mandatory and optional relationships and cardinality.

3.2 Explain relationship constraints.

Indicative content	Guidance
a. Translation to relational model	There is a requirement to discuss technology that ensures data integrity and security via various basic constraints on the data such as primary, foreign key and check constraints - and in particular NOT NULL constraints.

4. Logical Design as a basis for Query Optimisation

Learners will be able to:

4.1 Describe functional dependency theory.

Indicative content	Guidance
a. Normalisation	Candidates will be expected to demonstrate skills in applying the normalisation process in data design from scenarios and examples. The stages of normalisation should be well understood.

4.2 Describe relational modelling.

Indicative content	Guidance
a. Translation of conceptual models to physical design b. Translation of entity models to physical design	The Relational Model needs to be seen as a collection of relations containing data. A relation can be regarded as a table of values. The data in rows in the table denote a real-world entity. In the relational model, data are stored as tables. However, it should be appreciated that the physical storage of the data is independent of the way the data are logically organised.

4.3 Demonstrate simple relational algebra programs.

Indicative content	Guidance
a. Features of relational algebra in SQL	The role of the relational algebra as a basis for data operations in languages such as SQL will need to be appreciated. Sequences of relational algebra operations to obtain the results from queries will need to be demonstrated.

5. The Standard SQL Language

Learners will be able to:

5.1 Explain standards and basic structure for SQL.

Indicative content	Guidance
a. Data definition b. Views c. Updates d. Insertion e. Referential integrity constraints	Skills and techniques will need to be demonstrated in the standard SQL language. The ability to query and manipulate data via high level language statements will be examined along with the implementation of constraints on the data. Attention needs to be paid to the handling of joins, subqueries and null values.

6. Database access and integrity

Learners will be able to:

6.1 Explain concurrency, recovery and database integrity.

Indicative content	Guidance
a. Locking techniques b. Back-up c. Recovery strategies	Candidates will need to assess locking strategies - in particular two-phase locking, and methods for backing up and recovering database data from a range of faults.

6.2 Demonstrate how to use Access Controls.

Indicative content	Guidance
a. Granting authorisation b. Auditing databases	Details of access controls such as passwords and privileges will also need to be addressed. Auditing systems are included in this section as part of building fault tolerance into systems.

Examination Format

This module is assessed through completion of an invigilated written exam.

Type	Four written questions from a choice of six, each with equal marks
Duration	Two hours
Supervised	Yes
Open Book	No (no materials can be taken into the examination room)
Passmark	10/25 (40%)
Delivery	Paper format only

Adjustments and/or additional time can be requested in line with the BCS reasonable adjustments policy for candidates with a disability or other special considerations.

Question Weighting

Candidates will choose four questions from a choice of six. All questions are equally weighted and worth 25 marks.

Recommended Reading

Primary texts

Title: Beginning Database Design: From Novice to Professional
Author: C. Churcher
Publisher: Apress
Date: 2013
ISBN: 978-1292061184

Title: Database Systems: practical approach to design, implementation, and management (6th edition)
Author: T. M. Connolly and C. Begg
Publisher: Pearson Education
Date: 2015
ISBN: 978-1292061184

Title: Modern Database Management (11th edition)
Author: J. A. McFadden and F. R. Hoffer
Publisher: Benjamin Cummins
Date: 2012
ISBN: 978-0273779285

Title: Database System Concepts (sixth edition)
Author: A. Silberschatz, H. Korth, and S. Sudarshan
Publisher: McGraw-Hill
Date: 2010
ISBN: 978-0073523323

Additional texts

Title: SQL Queries for Mere Mortals: A Hands-On Guide to Data Manipulation in SQL
Author: J. L. Viescas
Publisher: Addison Wesley
Date: 2018
ISBN: 978-0134858333

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Document 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 2021	Document Creation

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