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BCS Foundation Certificate in Data Centre Infrastructure Syllabus

Version 1.3
December 2016

This professional certification is not regulated by the following United Kingdom Regulators - Ofqual, Qualification in Wales, CCEA or SQA

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 1.3 December 2016	Strapline regarding regulated statement has been added
Version 1.2 March 2015	Updated language requirements for extra time and use of dictionaries. Standardised the trainer requirements
Version 1.1 October 2013	Updated trainer requirements to include minimum experience.
Version 1.0 November 2012	Syllabus created.

Contents

Aims and Objectives

This course will introduce the candidate to all of the main disciplines associated with the design and running of a data centre.

Target Group

The purpose of the Foundation Certificate in Data Centre Infrastructure is to certify that the candidate has gained knowledge of the various elements within a data centre, the various specialisms involved, and the associated best practices. It is best suited to any person involved directly/indirectly in the management/operation of an existing data centre/computer room or involved in the exploration, design or build phase of a new project OR any person using the services of a 3rd party data centre operator wishing to gain an insight into the nature of data centre infrastructure.

Data centre infrastructure/design is a systems level issue requiring a multi-disciplinary solution, therefore the Certificate is not intended to enable the holder of the Certificate to individually be able to manage, control or optimise all aspects of a data centre design or build but to provide them with the skills to work with assistance from experts in other disciplines to deliver an overall design and efficiency strategy.

Those likely to be interested in obtaining a qualification of this nature include:

Data Centre Management
IT Management
Network Management
Facility Management
M&E Consultants
Electrical Engineers
HVAC Engineers
Data Centre owners/operators
Architects
Project Managers
Building Contractors
Property Developers
Sales Engineers from OEM Vendors

Objectives

Candidates can expect to gain knowledge and understanding in the following areas upon successful completion of the education and examination components related to this certification.

- Why the design of a data centre is important *(Blooms Level 1 – Remembering)*
- Explain what best practice of design in the data centre involves *(Blooms Level 2 – Understanding)*
- Developing and demonstrating appropriate understanding of the options in the running of an efficient data centre *(Blooms Level 3 – Applying)*

Duration and Format of the Course

Candidates can study for this certificate in two ways: by attending training courses provided by Accredited Training Organisations or by self-study. An accredited training course will require a minimum of 19 hours of study run over a minimum of three days.

The course can be delivered a number of different ways from traditional class-room based training to online e-learning.

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 objective shown above.

Duration and Format of the Examination

The format for the examination is a one-hour multiple-choice examination. The examination is closed book i.e.no materials can be taken into the examination room. The pass rate is 26/40.

Additional time for candidates requiring Reasonable Adjustments due to a disability

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

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

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

If the examination is taken in a language that is not the candidate'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.

The candidate registration form asks for the candidate's business language, if this is not English then BCS will automatically allocate additional time.

Syllabus

The subject areas and topics covered by this syllabus by section:

Part 1

1. An introduction to the data centre

The purpose of this unit is to explain the basics of the history of the data centre, why businesses build them and how various designs are classified (e.g. Tier I – IV)

Specifically, candidates must be able to:

1.1. Understand the history of the data centre, from its humble beginnings as a computer room to the football field sized behemoths of today.
1.2. Understand the critical services data centres provide and how they are embedded across most things we do throughout a typical day without us knowing.
1.3. Understand the important role data centres play and how they enable the digital, and likely low carbon economy, of the future.
1.4. Identify the relevant industry bodies, and the associated standards and regulations.
1.5. Describe and explain the most used definitions in the data centre industry.
1.6. Understand how the efficiency metrics are calculated – explain how legacy data centres performed and current trends.
1.7. Explain the market forces that are shaping the industry and how they are impacting today's designs.
1.8. Understand the design process and how criticality, the importance/impact of downtime, and the needs of the business informs the design.
1.9. Understand resilience vs. business need.
1.10. Identify the options available to those seeking data centre designs including the types of data centres for the different computing architectures and business models.

The recommended study period for this unit is a minimum of **2 hours.**

2. Site selection and environmental considerations

The purpose of this unit is to help the candidate comprehend what should be taken into account when selecting the location for a data centre.

Specifically, candidates must be able to:

2.1. Understand the standards recommendations.
2.2. Explain how the availability of resources affects a design, including power, connectivity and water.
2.3. Understand how geography influences the location of a data centre, including air-quality and localised risks.
2.4. Understand how business needs can override other site selection criteria, e.g. communications latency.
2.5. Be aware of what future influences on design are likely to be.

The recommended study period for this unit is a minimum of **1 hour.**

3. Architecture Design and Standards Recommendations

Specifically, candidates must understand key elements of a data centre design:

3.1. Align design and architecture to business strategy today and into the future.
3.2. Business impact of decisions – looking at design from a TCO perspective over lifecycle.
3.3. External Shell design.
3.4. Space considerations.
3.5. Structural Specifications.
3.6. Applicable Standards – including fire resistance, fire suppression and security, etc.
3.7. Codes & Regulations – including legislative requirements across different countries and voluntary initiatives (e.g. EU CoC, building sustainability – LEED, BREEAM)
3.8. Other types of data centre design – covering modular data centres, scalable data centres, container based systems, fast provisioning, pre-fabricated data centres, Pods, etc.
3.9. Future thinking on data centre design.

The recommended study period for this unit is a minimum of **1 hour.**

4. Raised Access Floor and Design Best Practices, connecting the infrastructure with copper and fibre.

Specifically, candidates must be able to:

4.1. Understand the h**i**story of the access floor and debate whether a raised floor is still needed.
4.2. Define the relevant standards and regulations.
4.3. Understand floor loading.
4.4. Explain the design considerations with regard to flooring.
4.5. Explain where air grille tiles and ramps should be sited and the role played in airflow management and management of the data centre.
4.6. Be aware of the implications of cutting floor tiles and build up of zinc whiskers.
4.7. Understand current cabling standards and why they are important. Explain the technology behind copper cable and fibre cable technology.
4.8. Describe the various methods of cable containment and associated benefits.
4.9. Understand the design principles of communication cabling.
4.10. Be aware of recent/future developments in this area.

The recommended study period for this unit is a minimum of **2 hours** inclusive of revision.

Part 2

5. **IT Hardware**

The purpose of this unit is to help candidates understand the terminology and technology of the IT hardware to be housed in a data centre.

Specifically, candidates must be able to:

5.1. Identify the roles and terminologies of servers.
5.2. Understand the issues surrounding low server utilisation and the benefits of virtualisation.
5.3. Understand the various types of storage equipment.
5.4. Understand the various types of communications equipment.
5.5. Be aware of technology developments, today's challenges and the associated standards & regulations around IT hardware – think about what the next 4 – 5 next generations of equipment could look like in the interest of future proofing data centre design.
5.6. Understand the number of generations and versions that will be accommodated in the data centre throughout its lifecycle.
5.7. Understand container based systems and the benefits to IT hardware and data centre systems.
5.8. Understand provisioning guidelines associated with IT, and how they affect managing data centre capacity.
5.9. Be aware of innovative designs – Google, Facebook, Yahoo, Deutsche Bank, Kyoto cooling, eBay.
5.10. Be aware that future IT loads will be more variable than in the past. Consider how to manage this, in a dynamic consumption world, through workload management.

The recommended study period for this unit is a minimum of **1 hour.**

6. Cooling System Options and Environmental Control

The purpose of this unit is to help the candidate to comprehend cooling in the context of the data centre.

Specifically, candidates must be able to:

6.1. Demonstrate knowledge of the fundamentals of cooling.
6.2. Understand what cooling options are available and the advantages\disadvantages of each method, especially with respect to risk management.
6.3. Understand different monitoring and control strategies including associated benefits.
6.4. Be aware of the evolution of ASHRAE temperature, humidity and contamination recommendations around cooling and why they have changed. Be aware of how to implement the changes in an operational environment.
6.5. Understand how cooling is affected by design considerations across the world.
6.6. Understand how to make cooling systems more efficient – understand CoP/EER and operational efficiency across the whole lifecycle of the data centre including part load efficiency.
6.7. Be aware of codes and regulations covering cooling.
6.8. Be aware of likely future developments in this area.
6.9. Heat re-use use and possible applications.

The recommended study period for this unit is a minimum of **2 hours** inclusive of revision.

7. Electrical Power Systems

The purpose of this unit is to explain the various electrical elements in the context of the data centre.

Specifically, candidates must be able to:

7.1. Understand electrical basics.
7.2. Identify what is meant by power quality for the ICT load and understand the ITIC/CBEMA Power Quality Curve.
7.3. Explain the term 'grid power supply'.
7.4. Understand AC and DC power solutions.
7.5. Identify the various types of UPS including scalable & modular designs for energy efficiency and eco-mode operation.
7.6. Identify the various forms of energy storage, particularly battery and flywheel, and understand the limitations of each. Understand how power can be distributed in the data centre.
7.7. Explain standby/backup power and understand emerging technologies in this area – including fuel cell technologies.
7.8. Be aware of the codes and regulations covering electrical installation.
7.9. Managing UPS capacity throughout the lifecycle of the data centre.
7.10. Maintenance considerations.
7.11. Renewable power – low carbon generation and its applicability to the modern data centre.

The recommended study period for this unit is a minimum of **2 hours** inclusive of revision.

8. Room Layout

The purpose of this unit is to explain the importance of a room layout in the context of the data centre.

Specifically, candidates must be able to:

8.1. Understand equipment considerations.
8.2. Identify IT cabinet types and their installation – including rack mount and blade configurations.
8.3. Explain what is a hot aisle/cold aisle configuration and understand the benefits of air management.
8.4. Understand how to incorporate non-standard equipment.
8.5. Be aware of applicable standards.
8.6. Future considerations aligned to IT roadmap, including liquid cooled servers.

The recommended study period for this unit is a minimum of **2 hours** inclusive of revision

9. Fire Protection and Security Systems

The purpose of this unit is to explain the various methods of fire protection and security protection used in the data centre.

Specifically, candidates must be able to:

9.1. Explain the importance of fire regulations, how to prevent fire and identify the prime reasons for a fire suppression strategy.
9.2. Understand the various systems for fire detection, warning and fire suppression; including water, water-mist & gaseous suppressants.
9.3. Identify how any system design needs to consider fire.
9.4. Understand the elements of a security plan.
9.5. Understand the difference between physical security and electronic security.
9.6. Be aware of surveillance policy and procedures along with associated regulations and standards.

The recommended study period for this unit is a minimum of **2 hours** inclusive of revision

10. Building Automation and Energy Management Systems

The purpose of this unit is to provide an overview of the various data centre management software and hardware available.

Specifically, candidates must be able to:

10.1. Define BMS & EMS.
10.2. Understand what is involved in building automation protocols.
10.3. Understand integrated systems and interfaces.
10.4. Be aware of measuring and monitoring, and reporting systems and the minimum requirements for a high energy-efficiency strategy.
10.5. Identify applicable standards and likely future thinking.
10.6. Understand the drivers in infrastructure management and why it is important.
10.7. DCIM technology and future (IT and Facilities Management converging).

The recommended study period for this unit is a minimum of **2 hours** inclusive of revision.

11. Commissioning and Handover

The purpose of this unit is to familiarise the candidate with the timeline of a data centre build from drawing up a business case to handing over the facility to a manager.

Specifically, candidates must be able to:

11.1. Understand what the minimum commissioning scope of works is.
11.2. Identify project phases and the involvement of a training element for the future operational staff.
11.3. Understand the elements of a commissioning plan.
11.4. Be aware of the likely documentation needed.
11.5. Understand the elements of maintenance plans, both planned and emergency including OEM & third-party contracts and SLAs.
11.6. Understand how to deal with equipment moves, adds and changes.

The recommended study period for this unit is a minimum of **2 hours** inclusive of revision.

Levels of Knowledge / SFIA Levels

This course will provide candidates 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 at www.bcs.org/levels

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

Format of the Examination

Type	Multiple choice, 40 Questions
Duration	1 Hour. Candidates are entitled to an additional 15 minutes if they are sitting an examination in a language that is not their native/official language
Pre-requisites	None, although accredited training is strongly recommended
Supervised / Invigilated	Yes
Open Book	Yes
Pass Mark	50%
Distinction Mark	None
Calculators	Calculators cannot be used during the examination
Delivery	Paper based examination

Trainer Criteria

Criteria:	• Hold the BCS Foundation Certificate in Data Centre Infrastructure • Have 10 days training experience or hold a train the trainer qualifcation • Have a minimum of 3 years practical experience in data centre infrastructure

Classroom Size

Trainer to candidate ratio	1:16