# BCS LEVEL 6 PROFESSIONAL GRADUATE DIPLOMA IN IT

# IT AND THE ENVIRONMENT

SYLLABUS

bcs
The Chartered Institute for IT

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# Introduction

## Level 6 Professional Graduate Diploma in IT

The final stage within the BCS three-stage Higher Education Qualification program, the Level 6 Professional Graduate Diploma (PGD) enables candidates who have already achieved the Level 5 Diploma in IT to gain depth of knowledge and expertise in their field.

Our modules have been created in-line with the SFIAPlus framework and latest developments in the industry, giving you a competitive edge in the IT job market and showing your dedication to the industry. You will have the opportunity to learn about topics such as advanced database management, network information systems, web engineering and programming paradigms, as well as to build upon knowledge and skills developed during the Level 5 Diploma.

To successfully achieve the qualification, candidates need to complete:

* One core module (Professional Project in IT)
* Four optional modules

Depending on entrance conditions, completing the Level 6 PGD in IT may support entry onto a Master's degree course at selected global universities.

## IT and the Environment Optional Module

The IT and the Environment module is an optional module that forms part of the Level 6 PGD in IT – the final stage within the BCS three-stage Higher Education Qualification program.

Candidates will develop their knowledge of both how information systems can contribute to environmental issues such as climate change and pollution, as well as how information technology can reduce environmental damage caused by many human activities. Candidates will explore topics such as teleconferencing, office automation and digital control systems as ways to mitigate against the environmental impact of information systems. The module will also give candidates the opportunity to deepen their understanding of legal and professional obligations regarding the environment, and how to incorporate environmental considerations into their own work.

# Qualification Suitability and Overview

Candidates must have achieved the Diploma in IT or have an appropriate exemption in order to be entered for the Professional Graduate Diploma (PGD). Candidates can study for this PGD 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 6 PGD is suitable for professionals wishing to gain an advanced formal IT qualification, and this module may be particularly relevant for candidates interested in career opportunities such as sustainability management or energy consultancy.

| Total Qualification Time | Guided Learning Hours | Assessment Time |
|---|---|---|
| 1414 hours | 250 hours | 3 hours |

# SFIA Levels

This module 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 6.

## DCMA4

Uses data centre management tools to produce management information on power, cooling and space and investigate issues where necessary. Carries out routine audit and checks to ensure adherence to policies and procedures. Facilitates the implementation of mandatory electrical safety testing.

## SUST4

Assesses and reports on how different tactical decisions affect sustainability. Evaluates factors and risks (political, legislative, technological, economic, social) that impact on operational processes and strategic direction. Evaluates and reports on implementation of sustainability measures in specific areas.

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

# Learning Outcomes

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

- Understand the main legislative provisions affecting the environmental impact of human activities.
- Understand the need for a holistic approach in assessing environmental impact and be able to incorporate environmental considerations into a cost/benefit analysis.
- Understand the environmental impact of information systems and be able to draw up realistic plans for reducing this impact.
- Be familiar with a range of applications of information technology that enable the environmental impact of human activity and natural changes to be monitored and possibly reduced.
- Be able to assess the potential for using information technology to reduce the environmental impact of specific activities.

# Syllabus

## 1. Legislative and regulatory provisions

### Learners will be able to:

**1.1** Discuss legislative and political issues relating to technology.

### Indicative content

a. Basic principles of climate science and climate modelling
b. International standards, e.g. ISO 14001 Environmental Management Systems and EU WEEE directive
c. National regulations, e.g. UK Environmental Protection Act (1990)
d. Voluntary codes, e.g. EU Code of Conduct for Data Centres
e. Professional and ethical compliance

### Guidance

Candidates will be expected to have a general knowledge of relevant legislative and political issues, both national and international; this is the type of knowledge they could gain by regularly reading a serious newspaper or news magazine. They should also have a general understanding of the basic principles of climate science and the limitations of climate modelling. The debate will also consider professional and ethical perspectives for companies in addressing environmental issues.

# 2. Remote sensing

## Learners will be able to:

**2.1** Discuss different types of remote sensing.

### Indicative content

a. Types of remote sensing (both platforms and type of radiation)
b. Quality of remote sensing data
c. Spatial, temporal, spectral and amplitude resolution
d. Visible light imaging
e. Infrared imaging (including traditional aerial photography and satellite imaging)
f. Lidar
g. Synthetic aperature RADAR
h. Multi- and hyper-spectral imaging systems
i. Ground-based sensor arrays

### Guidance

Remote sensing offers the possibility to monitor the environment using a range of technologies. The information helps scientists and organisations to build an understanding of different issues. Candidates will be able to discuss different types of remote sensing, and have an understanding of the general characteristics of the sensor types and what information can be gathered. They should also be able to appreciate how these sensors can be deployed.

**2.2** Discuss the uses of remote sensing.

### Indicative content

a. Gathering the data from remote locations
b. Building data sets over time and using historical data to track trends
c. Deploying remote sensing devices, including power for the devices
d. Communications systems for transferring data, e.g. satellite communications, mesh networks.
e. Using data with tools such as GIS and online mapping

### Guidance

Candidates should be able to discuss how remote sensing can be used in different scenarios, considering how the infomration gathered can help. Example scenarios could include initialising and validating global climate models, monitoring pollution and land usage changes, and monitoring changes to ice caps and glaciers, but this list is not exhaustive.

# 3. Environmental impact analysis

## Learners will be able to:

**3.1** Critically assess the environmental impact of an activity.

## Indicative content

a.  Environmental and quality audits
b.  Energy requirements, carbon emissions, pollution, use of non-renewable resources and other damage to the environment.
c.  Lifecycle from design and construction through operational life, to final decommissioning and disposal.
d.  Assessing the best option for the reuse, repurposing and recycling of equipment
e.  Disposal and recycling of IT equipment, including awareness of Waste Electrical and Electronic Equipment recycling (WEEE) and Regulations: restriction of hazardous substances (RoHS).

## Guidance

This section of the syllabus is concerned with how organisations can assess the environmental impact of activities to create products. This is a holistic approach, considering the full lifecycle of a product. Candidates should be able to consider the materials, ernergy and outputs from production. They will also be expected to have specific knowledge of the environmental issues surrounding the disposal and recycling of IT equipment; before disposal, for example, they should consider ways to extend the operational use of equipment, through reuse or repurposing it for another activity,  or ways to recycle the equipment.

# 4. Environmental impact of information systems

## Learners will be able to:

**4.1** Discuss the impact of raw material requirements.

### Indicative content

a. Impact of raw material requirements
b. Fabrication activities
c. Transportation in the production of hardware and consumables
d. Safe recycling and disposal of obsolete equipment and its regulatory control, e.g. WEEE and RoHS.

### Guidance

Candidates should be able to discuss the impact of using raw materials throughout the product lifecycle, from production to recycling and disposal. They should also have an awareness of how regulations (national or international) may apply to companies.

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**4.2** Discuss power management.

### Indicative content

a. Power management
b. Considering wake-up times, sleep, hibernation, etc.
c. Assessing energy profiles of IT equipment, including desktops, laptops, printers, servers and virtualisation.
d. Data centres and cloud computing
e. Estimating carbon footprint of different activities, including data centres.

### Guidance

Candidates should understand the use of power management for IT systems and ways that organisations can assess the power usage and establish policies to manage the power usage.

Candidates should also be able to discuss the environmental impact of data centres, which are either owned by a company or provided as a cloud computing service.

## 5. Environmental effects of communication systems

### Learners will be able to:

**5.1** Discuss the methods of balancing environmental costs and communication systems.

### Indicative content

a.  Evaluate the use of cloud systems for providing IT resources
b.  Communication systems to support remote working
c.  Strengths and weaknesses of remote working
d.  IoT systems and communication between devices
e.  Public engagement about the benefits of communication systems

### Guidance

This section of the syllabus is about balancing the environmental costs of communication systems against their environmental benefits. Candidates should consider different aspects of communication systems, including the growing use of cloud computing to support IT systems, as well as changes to working to include more remote working. They should also be able to discuss strengths and weaknesses for businesses and their employees. Furthermore, candidates should be able to discuss scenarios, such as how sensors could be deployed to gather information and how they could communicate using wireless and wired communication networks.

## 6. Information technology in the service of power generation and energy conservation

### Learners will be able to:

**6.1** Discuss  the role of IT in optimising energy generation and transmission.

### Indicative content

a.  Optimising the use of renewable resources
b.  Green energy, e.g. solar, tidal and wind
c.  Smart Grid technology to balance demand for power
d.  Smart meters
e.  Sensors for applications, e.g. temperature, wind, people counting, and IT hardware and software to manage systems

### Guidance

This is about the role of IT in optimising energy generation and transmission, particularly optimising use of renewable resources. This includes the Smart Grid and the use of Smart Meters.  As well as considering what the technology can do, candidates should also consider the impact on consumers. They should be able to discuss issues related to scenarios about power systems, and how sensors and data monitoring can be used to help manage the system. The emphasis of this part of the syllabus is on the capabilities and impact of currently available products, rather than the internal details of their operation.

# Examination Format

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

| | |
|---|---|
| **Type** | Three written questions from a choice of five, each with equal marks |
| **Duration** | Three 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 three questions from a choice of five. All questions are equally weighted and worth 25 marks.

# Recommended Reading

## Primary texts

|  |  |
|---|---|
| **Title:** | Green IT |
| **Author:** | BCS |
| **Date:** | 2019 |
| **Available at:** | https://bcs.vitalsource.com/books/9781780171357 |

## Additional texts

|  |  |
|---|---|
| **Title:** | What's up in Green IT? |
| **Author:** | BCS |
| **Date:** | 2018 |
| **Available at:** | https://www.bcs.org/media/3065/whats-up-in-green-it-2018.pdf |

|  |  |
|---|---|
| **Title:** | The Case for Energy-Proportional Computing |
| **Author:** | Barroso, L.A. and Holzle, U. |
| **Date:** | 2007 |
| **Available at:** | https://www.barroso.org/publications/ieee_computer07.pdf |

|  |  |
|---|---|
| **Title:** | Computer Models, Climate Data and the Politics of Global Warming |
| **Author:** | Edwards, P. |
| **Date:** | 2010 |
| **ISBN:** | 0262013924 |

**Title:** Computing for the Future of the Planet

**Author:** Hopper, A and Rice, A.

**Date:** 2008

**Available at:** https://www.cl.cam.ac.uk/research/dtg/www/publications/public/acr31/hopper-rs.pdf


**Title:** Green Information Technology: A Sustainable Approach

**Author:** Datsbaz, M., Pattinson, C., Akhgar, B.

**Date:** 2015

**ISBN:** 9780128013793


**Title:** Dealing with Electronic Waste

**Author:** Macauley, M., Palmer, K., and Shih, J-S

**Date:** 2003

**Available at:** https://www.journals.elsevier.com/journal-of-environmental-management


**Title:** Remote Sensing of the Environment: An Earth Resource Perspective

**Author:** Jensen, J.R.

**Date:** 2006

**ISBN:** 0131889508


**Title:** The Sustainable Network

**Author:** Sorensen, S.

**Date:** 2009

**ISBN:** 0596157037

**Title:** A review of research on the environmental impact of e-business and ICT

**Author:** Yi, L and Thomas, H. R.

**Date:** 2007

**Available at:** https://www.sciencedirect.com/science/article/pii/S0160412007000736

**Title:** The Environmental Impact of Getting the News

**Author:** Reichart, I., Hischier, R.

**Date:** 2002

**Available at:** https://onlinelibrary.wiley.com/doi/10.1162/108819802766269593

**Title:** Greening IEEE

**Author:** Meyer, P.

**Date:** 2009

**Available at:** https://ieeexplore.ieee.org/document/5247004

# News and government sources

**The Guardian** has a section of its web site dedicated to environmental affairs, available at http://www.guardian.co.uk/environment.

**The Economist**'s online coverage can be found on its science and technology pages at http://www.economist.com/science-technology.

The **International Standards Organisation** (ISO) has an issue of its Focus publication that discussed Green IT (2019), available at https://www.iso.org/isofocus_134.html.

Information about **Waste from Electrical and Electronic Equipment** (WEEE) can be found on the **European Union** website (https://ec.europa.eu/environment/topics/waste-and-recycling/waste-electrical-and-electronic-equipment-weee_en) and the **UK Health and Safety Executive** (HSE) website (https://www.hse.gov.uk/waste/waste-electrical.htm).

Information about **Restriction of Hazardous Substances in Electrical and Electronic Equipment** (RoHS) can be found on the **European Union** website (https://ec.europa.eu/environment/topics/waste-and-recycling/rohs-directive_en) and the **UK Health and Safety Executive** (HSE) website (https://www.gov.uk/guidance/rohs-compliance-and-guidance).

# Using 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 request a license, please contact the Head of Publishing at BCS outlining the material you wish to copy and its intended use.

# 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 August 2021 | Document created |

# CONTACT

For further information please contact:

**BCS**
The Chartered Institute for IT
3 Newbridge Square
Swindon
SN1 1BY

**T** +44 (0)1793 417 445

www.bcs.org