BCS Higher Education Qualifications

Level 6
IT and the Environment

Version 3.0

December 2016

This qualification is regulated by one or more of the following: Ofqual, Qualifications Wales, CCEA Regulation or SQA.

Contents

1. 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 the changes made. The purpose is to identify quickly what changes have been made.

Version Number	Date	Changes Made
Version 1.0	Feb 2014	Previous Release
Version 2.0	May 2016	Updated to new format. Reading list added. Removed reference in 'Other Reading' to the Connected Urban Development programme.
Version 3.0	Dec 2016	Regulation statement added.

2. Rationale

Environmental issues – climate change, pollution, the finite nature of many of the natural resources we are consuming – are now widely recognised as amongst the most important challenges facing the world. Information systems contribute significantly to these issues and information systems engineers need to be aware of the environmental effects of their systems and conscious of the way that their harmful effects can be alleviated.

Information technology can also, however, help to reduce environmental damage caused by many human activities – teleconferencing, for example, can reduce the amount of business travel undertaken and office automation can reduce substantially the demand for paper, while digital control systems can reduce the carbon footprint of many industrial processes and remote sensing can make us rapidly aware of environmental changes.

3. Aims

Candidates who complete this module successfully will understand: their legal and professional obligations regarding the environment; how to incorporate environmental considerations into their own work; and how information technology can contribute to reducing the environmental damage arising from human activities.

4. Objectives

On successful completion of the module, candidates will:

- be familiar with 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.

5. Prior Knowledge Expected

Certificate in IT

Candidates are expected to be familiar with the material covered in the Certificate syllabuses.

Diploma in IT

Candidates are expected to be familiar with the material covered in the Diploma syllabus for Professional Issues in Information Systems Practice.

Professional Graduate Diploma in IT

The learner must have achieved the Diploma in IT or have an appropriate exemption to be entered for the Professional Graduate Diploma in IT.

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.

Candidates should also be familiar with relevant basic concepts in Biology, Chemistry and Physics.

6. Format and Duration of the Examination

The examination is a three-hour closed book examination (no materials can be taken into the examination room) based on the syllabus in this document.

Examinations are held once a year and are undertaken in normal examination conditions with one or more duly appointed invigilators.

The pass mark is 40%.

7. Syllabus Detail

Category	Ref	Content
1 LEGISLATIVE AND REGULATORY PROVISIONS	1.1	Candidates will be expected to have a general knowledge of relevant legislative and political issues, both national and international, at the level that might be gained by the regular reading of a serious newspaper or news magazine. They will also be expected to have a general understanding of the basic principles of climate science and the limitations of climate modelling.
2 REMOTE SENSING	2.1	Different types of remote sensing (both platforms and type of radiation) and the situations for which they are appropriate. Quality of remote sensing data; spatial, temporal, spectral and amplitude resolution.
	2.2	Uses of remote sensing for initialising and validating global climate models and for monitoring pollution, land usage changes, changes to icecaps and glaciers, etc.
3 ENVIRONMENTAL IMPACT ANALYSIS	3.1	Assessing the environmental impact of an activity; the need for a holistic approach, taking into account energy requirements, carbon emissions, pollution, use of non-renewable resources and other damage to the environment; the need also to take into account all phases from design and construction, through operational life, to final decommissioning and disposal. Candidates will be expected to have specific knowledge of the environmental issues surrounding the disposal and recycling of IT equipment.
4 THE ENVIRONMENTAL IMPACT OF INFORMATION SYSTEMS	4.1	The impact of raw material requirements, fabrication activities and transport in the production of the hardware; consumables; recycling and disposal of obsolete equipment and its regulatory control.
	4.2	Power management. Power consumption of various storage technologies. The environmental impact of data centres; tools for estimating and reducing the carbon footprint of data centres.
5 THE ENVIRONMENTAL EFFECTS OF COMMUNICATION SYSTEMS	5.1	Balancing the environmental costs of communication systems against their environmental benefits.
6 INFORMATION TECHNOLOGY IN THE SERVICE OF POWER GENERATION AND ENERGY CONSERVATION	6.1	The role of IT in optimising energy generation and transmission and, in particular, optimising the use of renewable resources. 'Smart Grid' technology. The emphasis will be on the capabilities and impact of currently available products rather than the internal details of their operation.

8. Recommended Reading List

IT and the Environment	ISBN 10	ISBN 13
Primary Texts		

There are, as yet, no texts that cover the syllabus of this module in its entirety. However, the following book, published by the BCS, addresses concisely and comprehensively the environmental effects of IT systems, the way these can be alleviated and the IT professional's responsibilities in this direction. It does not, however, address the complementary topic of IT's role in monitoring and alleviating the environmental effects of other activities.

	ISBN 10	ISBN 13
• O'Neill, M. Green IT for Sustainable Business Practice. British Computer Society, 2010	1906124620	978-1906124625
Other Texts		

Candidates are likely to find that regular reading of a serious news magazine or newspaper will provide suitable coverage of the legislative and political issues mentioned in section 1 of the syllabus. The Economist or The Guardian (see below for web sites) have good coverage but so do many others.

The following is a list of research papers, reports and books that address a broad range of topics relevant to this module. Many of them are readily available on-line, at least in part, and most of them have extensive bibliographies that will allow students to pursue the topics in greater depth should they so wish.

Candidates are NOT expected to have read all the items in the list.

	ISBN 10	ISBN 13
• Barroso, L. A. & Hölzle, U. The Case for Energy-Proportional Computing. IEEE Computer 40, pp 33–37. (2007)		
• Edwards, P. A Vast Machine: Computer Models, Climate Data, and the Politics of Global Warming. MIT Press, 2010. This is a well written book in a fairly popular style that covers the material in section 1 and parts of section 2 of the syllabus. At 528 pages, the book contains far more material than candidates for this module need to know but a couple of afternoons spent browsing through the book in a library will be afternoons well spent.	0262013924	978-0262013925
• Hopper, A. and Rice, A. 'Computing for the Future of the Planet'. Philosophical Transactions of the Royal Society, A 366(1881):3685–3697, 2008. This paper was an important influence in drawing up this syllabus. Its text can be found on Andy Hopper's web site: http://www.cl.cam.ac.uk/research/dtg/~ah12/		

IT and the Environment	ISBN 10	ISBN 13
• Kuehr, R. and Williams, E. (eds). Computers and the Environment: Understanding and Managing Their Impacts. Kluwer Academic Publishers, 2009. This is a softcover reprint of the original 2003 text. Despite its title, the coverage of this book is limited. The manufacture of personal computers, their energy usage and their disposal is covered by a number of the contributors but wider issues are ignored. Covers section 4 of the syllabus and much of section 3.	1402016808	978-1402016806
• Larsson, M. Global Energy Transformation: four necessary steps to make clean energy the next success story. Palgrave Macmillan, 2009. This is a book about change management that treats the 'energy crisis' as creating the need for change, but tries to explain why change is necessary and uses a lot of IT-based ideas as potential solutions.	0230229190	978-0230229198
• Macauley, M., Palmer, K., and Shih, J-S. 'Dealing with electronic waste: modelling the costs and environmental benefits of computer monitor disposal'. Journal of Environmental Management 68, pp 13–22, 2003		
• Meyer, P. 'Greening IEEE'. IEEE Technology and Society Magazine, Fall 2009 issue, pp. 64-72. An overview of the work of IEEE in the sustainability field, with a good collection of references.		
• Reichart, I., Hischier, R. The Environmental Impact of Getting the News: A Comparison of On-Line, Television, and Newspaper Information Delivery. Journal of Industrial Ecology 6, pp185–200. (2002)		
• Jensen, J. R. Remote Sensing of the Environment: An Earth Resource Perspective. Second edition. Prentice Hall, 2006 This book is written at an appropriate level but the coverage is very much wider than is required for this module. Covers section 2 of the syllabus.	0131889508	978-0131889507
• Sorensen, S. The Sustainable Network. O'Reilly Media. pp 368. (2009). A mix of sustainability via technology (the net), energy measurement / carbon foot printing, social networking and security. The first 150 pages are particularly relevant to section 5 of the syllabus but also to sections 3 and 4.		

- Yi, L and Thomas, H. R. 'A review of research on the environmental impact of e-business and ICT'. Environment International, 33(6), pp 841-849, 2007

Other Reading

While web sites have to be treated with caution – material found on them may be biased, ephemeral, or plain wrong – they are also a source of much valuable information. The sites discussed below are, however, of a high standard and likely to remain relevant for some time.

The Guardian has a section of its web site dedicated to environmental affairs; its address is http://www.guardian.co.uk/environment . The Economist's on-line coverage can be found on its science and technology pages at http://www.economist.com/science-technology.

The site http://www.susteit.org.uk/ is a legacy site containing material produced as part of a strategic review of 'green IT' in higher and further education in the UK during 2008/9. While it is specific to this environment, it contains reports and detailed case studies, the conclusions of which are more generally applicable and, in any case, the environment will be familiar to many candidates for this module. It is also worth noting that constraints of commercial confidentiality are less inhibiting in this environment than in many others.

The Natural Edge Project (TNEP) is a collaborative partnership for research, education, and policy development on innovation for sustainable development, supported by HP. Its web site http://www.naturaledgeproject.net/ contains much valuable material and, in particular, the page http://www.naturaledgeproject.net/SustainableIT.aspx contains the text of a series of lectures on sustainable IT, particularly relevant to section 4 of the syllabus.

9. Contact Points

Email:
Customer Service team via www.bcs.org/contact

Phone:
UK: 01793 417424 or 0845 300 4417 (lo-call rate)
Overseas: +44 (0)1793 417424
Lines are open Monday to Friday, 08.15 a.m. to 5.45 p.m. UK time.

Website:
www.bcs.org/heq

Post:
BCS, The Chartered Institute for IT
First Floor, Block D, North Star House, North Star Avenue,
Swindon SN2 1FA, United Kingdom