

# **BCS Higher Education Qualifications**

## **Diploma in IT**

# **Object Oriented Programming Syllabus**

Version 3.0

December 2016

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

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## 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	May 2014	Released
Version 2.0	March 2015	Re-formatted with syllabus numbering – no change to content
Version 3.0	Dec 2016	Regulated statement added

## 2. Rationale

This module examines the application of the object-oriented paradigm to programming. Candidates should have practical experience of at least one object oriented programming language.

## 3. Aims

- To develop an understanding of the principles underpinning object oriented programming
- To apply object based approaches

## 4. Objectives

Upon successful completion of this module, candidates will be able to demonstrate their competence in, and their ability to:

- Explain the motivation for and development of object oriented programming languages
- Produce a set of use cases given a problem statement
- Produce class diagrams, object interaction diagrams and object state transition diagrams for a given problem
- Describe the essential features of an object-oriented programming language
- Produce and/or debug code fragments that illustrate principles of object oriented software development
- Describe the principles for testing object oriented software and derive sets of test data given a specification

## 5. Prior Knowledge Expected

Candidates must have achieved the Certificate in IT or have an appropriate exemption to be entered for the Diploma in IT. Candidates should have practical experience of at least one object oriented programming language.

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.

## 6. Format and Duration of the Examination

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

Examinations are held twice 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 FOUNDATIONS	1.1	Genealogy of object oriented languages: structured programming, procedural programming
	1.2	Abstract data types, encapsulation,
	1.3	Typed and untyped languages
	1.4	Coupling and cohesion
2 CONCEPTS	2.1	Encapsulation. Classes and objects. Class members: Data members (fields) and member functions (methods). Class member visibility (private, public, protected). Class variables and instance variables. Class methods and instance methods. Service methods and support methods. Scope
	2.2	Class hierarchies. Single and multiple inheritance. Inter-class relationships.
	2.3	Constructors and destructors. Object initialisation. Memory management. Garbage collection. Methods and messages. Method signatures. Method and operator overloading. Method overriding. Abstract classes. Dynamic (late) binding. Polymorphism. Software reuse. Subclasses (derived classes). Superclasses (base classes). Invocation of superclass methods and constructors.
	2.4	Objects vs. variables. Classes vs. types. Delegation. Collection classes. Class libraries.
3 DESIGN	3.1	Unified Modelling Language (UML). Use case diagrams: actors, system boundary, <<uses>> and <<extends>>.
	3.2	Scenarios. Class diagrams: associations, aggregation, dependency, and inheritance. Object interaction diagrams, object state transition diagrams.
	3.3	Object constraint language (OCL): invariants, preconditions, postconditions.
	3.4	Design patterns. Pattern documentation: motivation, prerequisites, structure, participants and consequences. Examples of patterns: Adapter, Decorator, Iterator, Observer, Singleton
4 PRACTICE	4.1	Iterative and incremental development styles.
	4.2	Design of class hierarchies, refactoring
	4.3	Implementation of designs in an object-oriented programming language
	4.4	Testing object oriented code. Class testing, constructing class tests from OCL or state transition diagrams, test driver construction. Testing interactions and class hierarchies

## 8. Recommended Reading List

Object Oriented Programing	ISBN 10	ISBN 13
<b>Primary Texts</b>		
• Budd T., An Introduction to Object-oriented Programming, Addison- Wesley (3rd Ed), 2001	0201760312	978-0201760316
• Fowler M., UML Distilled, Addison-Wesley (3rd Ed), 2003	0321193687	978-0321193681
• Link, J., Unit Testing in Java: How Tests drive the Code, Morgan Kaufmann 2003	1558608680	978-1558608689
• Shalloway A. and Trott J., Design Patterns Explained: A New Perspective on Object-oriented Design, Addison-Wesley (2nd Ed), 2004	0321247140	978-0321247148
<b>Other Texts</b>		
• Barclay K and Savage J, Object-Oriented Design with UML and Java, Elsevier, 2004	0750660988	978-0750660983
• Eckel B., Thinking in C++, Prentice Hall, 2004	0131225529	978-0139798092
• Flanagan D., Java in a Nutshell, O'Reilly & Associates (5th Ed), 2005	0596007736	978-0596007737
• Gamma et al, Design Patterns, Addison-Wesley, 1995	0201633612	978-0201633610
• Grand M., Patterns in Java, John Wiley and Sons (2nd Ed), 2002	0471227293	978-0471227298
• Priestley M., Practical Object-Oriented Design with UML, McGraw-Hill (2nd Ed), 2003	0077103939	978-0077103934

## 9. Contact Points

### Email:

Customer Service team via [www.bcs.org/contact](http://www.bcs.org/contact)

### Phone:

UK: 01793 417424 or 0845 300 4417 (lo-call rate)

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### Website:

[www.bcs.org/heq](http://www.bcs.org/heq)

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