



BCS Higher Education Qualifications

Diploma in IT

Object Oriented Programming Syllabus

Version 3.1

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This qualification is regulated by one or more of the following: Ofqual, Qualifications Wales, CCEA Regulation 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
Version 3.1	Feb 2019	Updates to section 2 and reading list updated

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	Abstraction. Encapsulation. Data Hiding/Information Hiding. Abstract Data Types (ADTs). Classes and Objects (Instances).
	2.2	Inheritance (Single, Multilevel, Multiple, Hierarchical, Hybrid). Super-classes (base classes) and sub-classes (derived classes). Specialisation vs. Generalisation. Abstract and Concrete Classes and Methods. Inheritance for Specialisation vs. Specification. Inter-class Relationships (is-a, has-a, part-of, association, aggregation, composition).
	2.3	Class members: fields (data members, variables, attributes), and methods (member functions, procedures). Messages. Object State. Constructors (parameterised, copy, conversion, default) and destructors. Accessors (getters) and Mutators (setters). Object and member scope.
	2.4	Ad-hoc and Parametric Polymorphism. Substitutability principle.
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

8. Recommended Reading List

Object Oriented Programing	ISBN 10	ISBN 13
Primary Texts		
• Fowler M., UML Distilled, Addison-Wesley (3rd Ed), 2003	0321193687	978-0321193681
• Shalloway A., Trott J., Design Patterns Explained: A New Perspective on Object-oriented Design, Addison-Wesley (2nd Ed), 2004	0321247140	978-0321247148
• Freeman S., Pryce N., Growing Object-Oriented Software Guided by Tests, Addison-Wesley (1 st . Edition) 2009	0321503627	978-0321503626
• Weisfeld M., The Object-Oriented Thought Process, Addison-Wesley Professional (4 th Ed.), 2013	0321861276	978-0321861276
Other Texts		
• Gamma et al, Design Patterns, Addison-Wesley, 1995	0201633612	978-0201633610
• Booch G., Rumbaugh J., Jacobson I., The Unified Modeling Language User Guide, Addison-Wesley (2 nd Ed), 2017	013485215X	978-0134852157
• Barnes D., Kolling M., Objects First with Java: A Practical Introduction Using BlueJ, Pearson (6 th Ed), 2016	0134477367	978-0134477367
• Balagurusamy E., Object-Oriented Programming with C++. McGraw Hill India (7 th Ed), 2017	9352607996	978-9352607990
• Philips D., Python 3 Object-oriented Programming, Pakt Publishing (3 rd Ed), 2018	1789615852	978-1789615852
• Antani V., Stefanov S., Object-Oriented JavaScript, Pakt Publishing (3rd Ed), 2017	178588056X	978-1785880568
• Clark D., Beginning C# Object-Oriented Programming, Apress (2 nd Ed), 2013	1430249358	978-1430249351
• Hamilton J. P., Object-Oriented Programming with Visual Basic .NET, O'Reilly Media, 2002	0596001469	978-0596001469

9. Contact Points

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