



# **BCS Higher Education Qualifications**

## **Professional Graduate Diploma in IT**

### **Software Engineering 2 Syllabus**

Version 3.2

July 2020

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	March 2014	Released
Version 2.0	June 2016	Re-formatted with syllabus numbering – no change to content
Version 3.0	Dec 2016	Regulation Statement Added
Version 3.1	Feb 2019	Minor amends to content and updated reading list.
Version 3.2	July 2020	Address changed

# 2. Rationale

To develop, maintain in operation, and evolve software systems that are of high quality it is imperative the Computing professionals understand software development and its evolution as an engineering discipline. This understanding must be based on the theoretical foundations of software engineering and demonstrated through a critical application of software engineering theory to real world problems in practical applications.

# 3. Aims

- To gain a thorough understanding of the relationship between the processes used in the engineering of software systems, the software products produced, and of the theory, laws, and models, that provide a rational basis for the practice of software engineering.

# 4. Objectives

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

- Demonstrate a critical understanding of software systems engineering theory in the form of laws and models, and of associated methods, tools, and techniques;
- Critically apply the above to practical situations found throughout the Software Life Cycle from software requirements engineering, system specification, design, implementation, validation and verification, through to maintenance and evolution; and to recognize the potential for software reuse throughout the life cycle;
- Appreciate the importance of software project management, software economics, estimation and planning as well as the management of software project teams and their productivity;
- Discuss critically recent advances in software engineering: component-based software engineering, model driven software development, the Agile paradigm including Extreme programming, software product lines engineering and community based software development such as Free and Open Source Software development;
- Appraise advanced software concepts and their applicability in practice: Design Patterns and Frameworks, Software Refactoring techniques, Software Architectural analysis, Software as a Service.

## 5. Prior Knowledge Expected

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 should be familiar with the material covered in the Certificate syllabus and the Software Engineering 1 Diploma syllabus and should have knowledge of Object Oriented software development, both design and implementation and practical experience of developing software systems.

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 three-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 ANALYSIS AND IMPROVEMENT OF SOFTWARE PROCESSES	1.1	Software Process Improvement (Such as: CMM, CMM-I, SPICE (ISO/IEC 330XX); ISO and IEEE Software Engineering standards e.g. ISO 9001, ISO/IEC 12207, ISO/IEC 90003, IEEE 1012)
	1.2	Various Software Life Cycle Models (Waterfall, V-model, Prototyping, Spiral Model, Incremental Development, Evolutionary Development, Agile models including Extreme programming)
	1.3	Software Requirements Engineering including requirements management
	1.4	Software Management: project management, cost estimation, planning, personnel management, team building
	1.5	Software Evolution: Lehman's Laws of Software Evolution and related models and studies
2 ANALYSIS AND IMPROVEMENT OF SOFTWARE PRODUCTS	2.1	Software Maintenance and the related types of maintenance, Impact Analysis, Reverse and Re-engineering of software
	2.2	Software Architecture and software re-factoring, Architectural styles, examples, and applications, Architectural models, Model-driven development
	2.3	Software metrics, software complexity measures, measures of software coupling and cohesion, models and associated measures of software quality
3 ADVANCED TOPICS IN SOFTWARE ENGINEERING	3.1	Software reuse, Component based software engineering, Software product lines, Design patterns
	3.2	Software as a service, platform as a service, infrastructure as a service, including web services, cloud computing and dynamic reconfiguration of software systems
	3.3	Open Source Software Engineering
	3.4	Advanced use of UML including Object-Constraint Language and use of Assertions, pre- and post-condition

## 8. Recommended Reading List

Software Engineering 2	ISBN 10	ISBN 13
<b>Primary Texts</b>		
• Sommerville, I., Software Engineering, Pearson, (10 <sup>th</sup> Ed), 2015	1292096131	978-1292096131
• Pressman, R. S., Maxim, B., Software Engineering: A Practitioner's Approach, McGraw-Hill Education, (8th Ed), 2014	1259253157	978-1259253157
<b>Other Texts</b>		
• Brooks, F. P., The Mythical Man-Month, Addison-Wesley, 1995	0201835959	978-0201835953
• Fenton, N., Pfleeger, S., Software metrics: a rigorous and practical approach, 3 <sup>rd</sup> Edition, CRC Press, 2015.	1439838228	978-1439838228
• Gamma, E., Helm R., Johnson, R., Vlissides, J., Design Patterns: Elements of Reusable Object-Oriented Software, 1994.	0201633612	978-0201633610
• Watts, H., Managing the Software Process (SEI), Addison- Wesley, 1989.	0201180952	978-0201180954
• Spinellis, D., Code Quality: the Open Source Perspective, Addison- Wesley, 2006.	0201546108 8131703800	978-0201546101 978-8131703809
• Beck, K., Extreme Programming Explained: Embrace Change, Addison-Wesley, 2nd Edition, 2004.	0321166078	978-0321166074
• Cockburn, A., Agile Software Development, Addison-Wesley, 2nd Edition, 2006.	0321482751	978-0321482754
• Bass, L., Clements, P., Kazman, R., Software Architecture in Practice (SEI), Addison-Wesley, 3rd Edition, 2012.	0321815734	978-0321815736
• Hull, E., Jackson, K. Dick J., Requirements Engineering, 3rd edition, Springer, 2010.	1849964041	978-1849964043
• Rumbaugh, J., Jacobson, I., Booch, G., The Unified Modeling Language Reference Manual, Addison-Wesley, 2nd Edition, 2004.	032171895X	978-0321718952
• Mens, T., Demeyer, S. (Eds.), Software Evolution, Springer- Verlag, 2008.	3540764399	978-3540764397

## 9. Contact Points

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Lines are open Monday to Friday, 08.15 a.m. to 5.15 p.m. UK time.

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