

## **PROGRAMME SPECIFICATION**

### **Course record information**

Name and level of final award:	BEng (Hons) Software Engineering/ MEng Software Engineering is a Honours degree that is Bologna FQ-EHEA first cycle degree or diploma compatible.
Name and level of intermediate awards:	BEng Software Engineering Diploma of HE Certificate of HE
Awarding body/institution:	University of Westminster
Status of awarding body/institution:	Recognised Body
Location of delivery:	Central London (Cavendish)
Language of delivery and assessment:	English
Course/programme leader:	Dr Alexander Bolotov
Course URL:	<a href="http://www.westminster.ac.uk/courses/subjects/computer-science-and-software-engineering/undergraduate-courses/full-time/u09fusen-beng-honours-software-engineering">http://www.westminster.ac.uk/courses/subjects/computer-science-and-software-engineering/undergraduate-courses/full-time/u09fusen-beng-honours-software-engineering</a>
Mode and length of study:	3 years full-time 4 year full-time sandwich
University of Westminster course code:	BEng: U09FUSEN MEng: U09FUSFM
JACS code:	G600
UCAS code:	BEng: G600 MEng: G603
QAA subject benchmarking group:	Computing
Professional body accreditation:	British Computer Society (BCS)
Date of course review:	November 2013
Date of programme specification:	November 2013

### **Admissions requirements**

Level 4 entry: 240 UCAS points (A2 - CCC)

## **Aims of the course**

A software engineer is responsible for creating and maintaining secure and robust software applications. This involves applying a wide range of technologies and skills to formally design, develop and test software to ensure that it satisfies the client's requirements.

Students completing the course will have sufficient expertise to enter employment productively at any stage of the software lifecycle with a minimum of training. They will be able to operate effectively in a professional environment; they will learn and use new technologies quickly.

BEng Software Engineering course aims:

- A1 To provide students with knowledge and understanding of the fundamental principles and technologies of software engineering.
- A2 To give students practical skills in the application of current tools and techniques for the design and development of software.
- A3 To give students substantial experience of applying a systematic approach to software development and evaluation.
- A4 To make students aware of professional, ethical and legal issues that might arise in a software development environment.
- A5 To enable students to develop as independent and self-critical problem solvers.
- A6 To prepare students for continued study at an advanced level, either in formal postgraduate study or as continued professional development.

## **Employment and further study opportunities**

Today's organisations need graduates with both good degrees and skills relevant to the workplace, ie employability skills. The University of Westminster is committed to developing employable graduates by ensuring that:

- Career development skills are embedded in all courses
- Opportunities for part-time work, placements and work-related learning activities are widely available to students
- Staff continue to widen and strengthen the University's links with employers in all sectors, involving them in curriculum design and encouraging their participation in other aspects of the University's career education and guidance provision
- Staff are provided with up-to-date data on labour market trends and employers' requirements which will inform the service delivered to students.
- Students can choose to do a year-long industrial placement within a sandwich mode as a formal part of the BEng Software Engineering course.

Most students will graduate to jobs with professional roles in the software development industry. Students wishing to continue with further study and/or research will have adequate knowledge and study skills to make this a feasible alternative. Typical career opportunities include: Software Engineer, Web Application Programmer, Software Designer/Analyst, Web Site Designer/Programmer, Team Leader.

Study opportunities within the University of Westminster: MSc Software Engineering, MSc Computer Forensics, MSc Computer Science, other related MSc courses, PhD study.

## **Learning outcomes**

Learning outcomes are statements on what successful students will have achieved as the result of learning. These threshold statements of achievement are linked to the knowledge, understanding and skills that a student will have gained on successfully completing a course.

## **Learning outcomes for Level 4**

### **Knowledge and Understanding (Level 4)**

By the end of level 4 students will be able to:

- K1. confidently plan, design and implement algorithms using fundamental procedural programming constructs;
- K2. design and represent the flow of simple computer programs in a standard design language;
- K3. describe and use the basic concepts of classes and objects in computer programs;
- K4. create and manipulate simple databases;
- K5. describe the structure of a computing system, the design of its basic components and explain the interactions of hardware and software components;
- K6. manipulate data and data representation through logical and numerical techniques; apply appropriate mathematical techniques as used in computer science and are required for programming;
- K7. understand fundamental concepts of network tools;
- K8. describe the file architecture and the organization of a web site;
- K9. describe the main ethical, social, legal and professional issues in Computer Science and Software Engineering;
- K10. apply appropriate mathematical techniques as used in computer science.

### **Specific skills (Level 4)**

By the end of level 4 students will be able to:

- S1. implement and test software solutions using a software development environment;
- S2. create and format a web site with basic interactive elements using a mark-up language.

### **Key Transferable skills (Level 4)**

By the end of level 4 students will be able to:

- T1. take responsibility for individual study with appropriate guidance;
- T2. evaluate and reflect on their own learning and personal planning processes, with guidance;
- T3. work effectively as part of a team, with guidance;
- T4. carry out a literature research on a given topic, with guidance, using a range of resources;
- T5. demonstrate the origins of their ideas by referencing sources used in their work;
- T6. prepare and present the findings from literature and personal tutorial activities in an appropriate academic form of communication;
- T7. express themselves in writing for different professional and academic audiences;
- T8. prepare their CV.

## **Learning outcomes for Level 5**

### **Knowledge and Understanding (Level 5)**

By the end of level 5 students will be able to:

- K11. demonstrate competency in object oriented programming;
- K12. employ a standard design language for the design, representation and formal specification of software;
- K13. apply the principles of algorithm and data structure design in the implementation of algorithms;
- K14. use, compare and contrast software frameworks and architectures;
- K15. explain and demonstrate how data is persistently stored, manipulated, and retrieved in object-oriented software development;
- K16. employ knowledge of software engineering principles to successfully plan and execute a software project;
- K17. apply software lifecycle models and software projects methodology;
- K18. discuss ethical, social, legal and professional issues in software engineering and interactive media;
- K19. identify the main roles and responsibilities of a professional software engineer;
- K20. apply the main HCI principles for software systems;
- K21. compare, contrast and reflect upon the computational costs and complexity of algorithmic solutions;
- K22. plan, design and implement novel algorithms and data structures for the problem at hand.

### **Specific Skills (Level 5)**

By the end of level 5 students will be able to:

- S3. define and implement a range of typical linear and non-linear advanced data in a variety of programming languages;
- S4. analyse, define and implement or re-use a range of typical algorithms such as searching, sorting, merging, path traversal algorithms;
- S5. manage a dedicated role within a software project team.

### **Key Transferable skills (Level 5)**

By the end of level 5 students will be able to:

- T9. interact effectively within a team or group, planning, collaborating and exchanging information and ideas;
- T10. carry out literature searches on a given subject to locate relevant academic books, electronic resources or journal articles, evaluating their relevance;
- T11. present ideas and arguments in a clear and structured manner in written or oral form with reference to sources;
- T12. demonstrate competence in interview, and presentation techniques.

### **Learning outcomes for Level 6**

The third year of studies builds upon specific skills that have been developed in Level 5 to more advanced and professional level.

#### **Knowledge and Understanding (Level 6)**

By the end of level 6 students will be able to:

- K23. identify and use appropriate software engineering principles to successfully design and develop a software project;
- K24. apply requirements engineering techniques in the design of projects;
- K25. identify and appraise the main threats to computer systems security and integrity;
- K26. assess how software quality issues impact on software design;
- K27. carry out a piece of independent research and produce a report on it;
- K28. apply formal methods in system specifications.

#### **Specific Skills (Level 6)**

By the end of level 6 students will be able to:

- S6. elicit and document the requirements for a medium software project;
- S7. choose and justify an appropriate software lifecycle model;
- S8. design and implement software, to meet a designated set of requirements using appropriate languages and tools and software methodology;
- S9. critically review and evaluate the theory and products available with respect to their chosen topic for the major project;
- S10. evaluate a range of commercial computing software and hardware applications and identify implications with their use;
- S11. appraise advanced software quality methods and their impact on software design;
- S12. perform rigorous analysis and reasoning about simple specifications and design a well structured medium sized specification.

#### **Key Transferable skills (Level 6)**

By the end of level 6 students will be able to:

- T13. autonomously manage a project with respect to time and task management;
- T14. make decisions independently with respect to the needs and limitations of a task or project;
- T15. plan and manage a major project, including, time-management and task allocation;
- T16. work professionally in a group in a variety of situations and on a range of tasks and deal independently with a range of situations within group work;
- T17. produce coherent reports showing evidence of critical thinking.

On completion of the MEng course, the students will have (including the above):

### **Knowledge and Understanding (Level 7)**

K23 A thorough understanding of the principles of software frameworks and design patterns as well as ability to evaluate them for re-usability in problem solving.

K24 Detailed understanding of the mathematical science and practical issues of advanced algorithms for solving complex problems.

### **Specific Skills (Level 7)**

S12 Demonstrate a critical understanding of existing software frameworks and system architectures as well as competence in the design of large scale software systems.

S13 Critically evaluate the efficiencies and complexity of advanced algorithms in order to implement them correctly for a software system.

### **Key Transferable skills (Level 7)**

T18 Show professional competence in developing a work programme to accommodate ongoing software system developments and to exercise leadership in unfamiliar situations.

### **Learning, teaching and assessment methods**

#### **Learning**

Students exercise their critical evaluation and reflection skills in tutorials, which promote the review of taught material and the analysis of new material such as journals, articles and technology white papers.

#### **Teaching**

Lectures are used to set the context of material and to impart fundamental knowledge. Practical skills are primarily developed through task and problem-oriented activities in laboratories. Most programming and development modules are entirely lab based giving the students maximum opportunity to develop practical skills and hands-on experience.

#### **Assessment**

A variety of assessment methods are adopted based around traditional academic techniques such as practical and essay-based coursework and exams. Assessment shall include opportunity for self-reflection and contain an element of performance monitoring to ensure student's perform to their abilities and will make full use of the University virtual learning environment.

Assessment will adhere to the standard practice in the Framework for Undergraduate Courses (360 credits) and the Handbook of Academic Regulations.

### **Course structure**

This section shows the core and option modules available as part of the course and their credit value. Full-time Undergraduate students study 120 credits per year.

Credit Level 4					
Module code	Module title	Status	UK credit	ECTS	Course Learning Outcomes
ECSC400	Communication and Career Management for Computer Scientists and Software Engineers	Core	15	7.5	K9
ECSC404	Computer Systems Fundamentals	Core	15	7.5	K5,K6,K7
ECSC405	Software Development Principles II	Core	15	7.5	K1,K3
ECSC407	Web Technology	Core	15	7.5	K1,K8
ECSC408	Mathematics for Computing	Core	15	7.5	K6.K10
ECSC410	Software Development Principles I	Core	30	15	K1,K2
ECSC411	Information Systems	Core	15	7.5	K4, K5
<b>Award of Certificate of Higher Education available</b>					
Credit Level 5					
Module code	Module title	Status	UK credit	ECTS	Course Learning Outcomes
ECSC500	Professional Practice in Computer Science	Core	15	7.5	K18, K19
ECSC501	Object Oriented Programming I	Core	15	7.5	K11,K13
ECSC502	Object Oriented Programming II	Core	15	7.5	K11,K13,K15,K16
ECSC503	Software Development Group Project	Core	30	15	K12, K14, K16, K17, K19, K20
ECSC504	Algorithms and Complexity	Core	15	7.5	K13, K21,K22
<i>Any two from:</i>					
ECWM502	Advanced Client -side Web Development	Option	15	7.5	
EICG501	3D Graphics programming	Option	15	7.5	
EICG502	Physics for Games Programming	Option	15	7.5	
ECWM512	Web Server-Side Programming	Option	15	7.5	
ECWM511	Mobile Application Development	Option	15	7.5	
ECWM506	Mobile Computing Principles	Option	15	7.5	
EBSY505	Database Design and Practice I	Option	15	7.5	
EBSY506	Database Design and Practice II	Option	15	7.5	
<b>Award of Diploma of Higher Education available</b>					
Credit Level 6					
Module code	Module title	Status	UK credit	ECTS	Course Learning Outcomes
ECSC697	Computer Science and Software Engineering Project	Core	45	22.5	K23,K24,K26,K27
ECSE609	Security and Forensics	Core	15	7.5	K25
ECSE610	Formal Specification	Core	15	7.5	K28
<i>Any three from:</i>					
ECWM603	Mobile User Experience	Option	15	7.5	
EICG601	Advanced Maths for Games Development	Option	15	7.5	
ECWM604	Advanced Web Technology	Option	15	7.5	
ECWM601	Native Programming	Option	15	7.5	
ECWM618	Web Intelligence	Option	15	7.5	
ECSE615	Computer Systems Administration	Option	15	7.5	

ECWM606	Web Analytics and Marketing	Option	15	7.5	
ECWM611	Real-time and Embedded Systems	Option	15	7.5	
<b>Award of BSc available</b>					
<b>Award of BSc Honours available.</b>					

Credit Level 7 (MEng)					
Module code	Module title	Status	UK credit	ECTS	Course Learning Outcomes
Code	Title	Status	Value		
ECSE703	Software Engineering Context	Core	20	10	K23, K24, S12, S13
ECSC799	Computer Science Project	Core	40	20	K23, S12, T18
ECSC798	Research Methods and Professional Practice	Core	20	10	T18
ECSE706	Enterprise Development	Option	20	10	
ECSF701	Computer Forensics Fundamentals	Option	20	10	
EBSY706	Data Mining	Option	20	10	
ECSC701	iPhone Application Development	Option	20	10	

Award of MEng in Software Engineering available

Please note: Not all option modules will necessarily be offered in any one year.

### Academic regulations

The BEng Honours Software Engineering and its intermediate awards operate in accordance with the University's Academic Regulations and the *Framework for Higher Education Qualifications in England, Wales and Northern Ireland* published by the Quality Assurance Agency for Higher Education (QAA) in 2008.

All students should make sure that they access a copy of the current edition of the general University handbook called *Essential Westminster*, which is available at [westminster.ac.uk/essential-westminster](http://westminster.ac.uk/essential-westminster). The following regulations should be read in conjunction with the *Modular Framework for Undergraduate Courses* and relevant sections of the current *Handbook of Academic Regulations*, which is available at [westminster.ac.uk/academic-regulations](http://westminster.ac.uk/academic-regulations).

### Award

**To qualify for the award of BEng Software Engineering, a student must have:**

- obtained at least 360 credits including:
  - passed 75 credits at credit Level 4 or higher and achieve at least a condoned credit in each of the remaining modules worth 45 credits at Level 4; and
  - passed a minimum of 120 Credits at credit Level 5 or higher; and
  - passed a minimum of 120 credits at credit Level 6 or higher.
- attempted modules with a maximum value of 330 credits at credit Levels 5 and 6; and
- satisfy the requirements contained within any course specific regulations for the relevant course scheme.

### Course Specific Regulation

In addition to the standard University progression regulations, in order to progress from level 4 to level 5 a student must pass ECSC410 Software Development Principles.

The class of the Honours degree awarded is decided by two criteria, the average of the best 105 credits passed at credit Level 6 being in the range of the class to be awarded, and the



average of the next best 105 credits passed at credit Levels 5 and 6 provided the next best 105 credits passed are no more than one classification below this.

In order to progress from Level 6 to Level 7 of the MEng course, a student must obtain a minimum of 120 credits at Level 6.

### MEng Award

In respect of the modules described in this course scheme, to qualify for the award of MEng Software Engineering a student must:

(a) have obtained at least 480 credits including:

- i) a minimum of 120 credits at Level 4 or higher, of which no more than 15 shall be condoned; and
- ii) a minimum of 120 credits at Level 5 or higher, and
- iii) a minimum of 120 credits at Level 6 or higher, including the Individual Project, and
- iv) a minimum of 120 credits at Level 7 or higher, including the Project

(b) have attempted modules worth no more than 470 credits at Levels 5, 6 and 7. (An attempt includes a first attempt and any subsequent retake of any module but does not include reassessment without attendance)

An overall average mark for Levels 6 and 7 is calculated with a weighting of 40% for the best 15 modules worth 120 credits at Level 6 and a weighting of 60% for the best modules worth 120 credits at Level 7. The MEng may be awarded with **Distinction** if this overall mark is at least 70% *else* with **Merit** if this overall mark is at least 60% *else* an MEng degree if this overall mark is at least 50%

A student enrolled on the MEng course who fails to fulfil the requirements to be awarded an MEng degree (or who wishes) may instead be considered for the award of BEng (Honours) degree or BEng degree in accordance with the regulations for those courses. In such cases, credits and marks awarded for Level 6 MEng modules may substitute for Level-6 BEng modules. Other substitutions of Level 7 modules for Level-6 BEng modules may be made at the discretion of the Conferment Board

### Support for students

Upon arrival, an induction programme will introduce students to the staff responsible for the course, the campus on which they will be studying, the Library and IT facilities and to the School Registry. Students will be provided with the Course Handbook, which provides detailed information about the course. Students are allocated a personal tutor who can provide advice and guidance on academic matters.

Learning support includes four libraries, each holding a collection of resources related to the subjects taught at their School. Students can search the entire library collection online through the Library Search service to find and reserve printed books, and access electronic resources (databases, e-journals, e-books).

Students can choose to study in the libraries, which have areas for silent and group study, desktop computers, laptops for loan, photocopying and printing services. They can also

choose from several computer rooms at each campus where desktop computers are available with the general and specialist software that supports the courses taught at their School. Students can also securely connect their own laptops and mobile devices to the University wireless network.

The University uses a Virtual Learning Environment called Blackboard where students access their course materials, and can communicate and collaborate with staff and other students.

At University level, Services for Students provide advice and guidance on accommodation, financial and legal matters, personal counselling, health and disability issues, careers and the chaplaincy providing multi-faith guidance. The International Office provides particular support for international students. The University of Westminster Students' Union also provides a range of facilities to support all students during their time at the University.

## **Reference points for the course**

### **Internally**

University Teaching and Learning policy statements,  
University Quality Assurance Handbook and Modular Frameworks,  
staff research.

### **Externally**

QAA Subject Benchmark statements,  
Professional, Statutory, Regulatory Body requirements/guidance,  
University and SEEC (credit consortium) level descriptors.

### **Professional body accreditation**

British Computer Society (BCS) Criteria

## **Quality management and enhancement**

### **Course management**

The BEng Software Engineering course is under the Computer Science and Software Engineering Department (CSSE) and the management structure supporting the course is as follows:

- Dr Alexander Bolotov, Course Leader is responsible for day to day running and overall management of the course and development of the curriculum
- Dr Alexandra Psarrou, Head of Department, holds academic responsibility for the course and other courses within the Department
- Professor Jane Lewis, Dean of Faculty, holds overall responsibility for the course, and for the other courses run by the Faculty

### **Course approval, monitoring and review**

The course was initially approved by a University Validation Panel in 2009 and reviewed in 2013. The panel included internal peers from the University and external subject specialists from academia and industry to ensure the comparability of the course to those offered in

other universities and the relevance to employers. Periodic course review helps to ensure that the curriculum is up-to-date and that the skills gained on the course continue to be relevant to employers.

The course is monitored each year by the School to ensure it is running effectively and that issues which might affect the student experience have been appropriately addressed. Staff will consider evidence about the course, including the outcomes from each Course Committee, evidence of student progression and achievement and the reports from external examiners, to evaluate the effectiveness of the course. The Annual Monitoring Sub-Committee considers the School action plans resulting from this process and the outcomes are reported to the Academic Council, which has overall responsibility for the maintenance of quality and standards in the University.

### **Student involvement in Quality Assurance and Enhancement**

Student feedback is important to the University and student views are taken seriously. Student feedback is gathered in a variety of ways. The most formal mechanism for feedback on the course is the Course Committee. Student representatives will be elected to sit on the Committee to represent the views of their peer group in various discussions. The University and the Students' Union work together to provide a full induction to the role of the Course Committee.

All students are invited to complete a Module Feedback Questionnaire before the end of each module. The feedback from this will inform the module leader on the effectiveness of the module and highlight areas that could be enhanced. The University also has an annual Student Experience Survey which elicits feedback from students about their course and University experience.

Students meet with review panels when the periodic review of the course is conducted to provide oral feedback on their experience on the course. Student feedback from course committees is part of the Schools' quality assurance evidence base.

For more information about this course:

<http://www.westminster.ac.uk/courses/subjects/computer-science-and-software-engineering/undergraduate-courses/full-time/u09fusen-beng-honours-software-engineering>

For further information and advice contact the Course Enquiries Team on +44 (0)20 7915 5511 or [course-enquiries@westminster.ac.uk](mailto:course-enquiries@westminster.ac.uk)

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**Please note:** This programme specification provides a concise summary of the main features of the course and the learning outcomes that a student might reasonably be expected to achieve and demonstrate if s/he takes full advantage of the learning opportunities that are provided. This specification should be read in conjunction with the Course Handbook provided to students and Module Handbooks, which provide more detailed information on the specific learning outcomes, content, teaching, learning and assessment methods for each module.

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