Part one: Programme Specification

Course record information

Name and level of final award:	The BSc Honours Computer Systems Engineering, BSc Honours Computer Systems Engineering with Industrial Placement are *BSc* degrees that is Bologna FQ-EHEA first cycle degree or diploma compatible
Name and level of intermediate awards:	BSc Computer Systems Engineering Diploma of HE in Computer Systems Engineering Certificate of HE *in Computer Systems Engineering*
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 George Charalambous
Course URL:	http://www.westminster.ac.uk/courses/subjects/computer-and-network-engineering/undergraduate-courses
Mode and length of study:	Full time(3 years) /Sandwich(4 years)
University of Westminster course code:	U09FUCYE
JACS code:	H65
UCAS code:	H657 H656 with foundation
QAA subject benchmarking group:	Engineering
Professional body accreditation:	IET Incorporated Engineer (IEng)
Date of course validation/review:	2009
Date of programme specification:	2012/13

Admissions requirements

Students who had their secondary education in the UK should have at least 5 GCSE passes at Grade C or equivalent including English Language and Mathematics. The University normally requires all undergraduate applicants who have not had their secondary education through the medium of English to attain the equivalent of IELTS 6.0, Cambridge Proficiency, or TOEFL 550 (paper)/80 (internet).

As well as these, applicants should meet one of the requirements listed below:

- **A-Level Entry**
  At least two subjects passed in the General Certificate of Education at Advanced Level, one of which must be a technological subject (e.g. Mathematics, Technology, Physics, Engineering, Engineering Science, Electronics or Electronic Systems). Usually, A-level grades of at least CCD (or AB) will be required.
- **Advanced Diploma Entry**
  The award of an Advanced Diploma in Engineering. Usually, a Grade C plus relevant Additional Specialist Learning (ASL) at Grade C would be required.
- **National Diploma/Certificate Entry**
  The award of a BTEC National Diploma or Certificate in Engineering. Usually, diploma grades of MMM or certificate grades of AA will be required.
- **Foundation Course Entry**
  The award of a Certificate or Diploma upon completion of an approved foundation or access course.
- **Other Entry**
  Candidates holding qualifications differing in detail but not in standard from the above (e.g. an approved Secondary Leaving Certificate such as the International Baccalaureate with acceptable grades in relevant subjects) may be considered eligible for admission to the courses.

Direct Entry to Level 5 (Year 2): Candidates who have successfully completed studies comparable in content and standard to the Level 4 of the Course, including a practical skills component, may be considered for direct entry to the second year of the Course.
Where possible, all applicants are interviewed and may be given an aptitude test.

Aims of the course

This course is designed to equip students with the knowledge and skills as well as embracing the structure, design and efficient operation of the modern day computer as well as that of embedded microprocessors, peripheral devices and associated operational and supervisory software. The course is underpinned with a sound knowledge of digital systems, network engineering and electronic circuit techniques.

The course aims to:

- Provide an enjoyable learning experience which will serve as a solid intellectual basis for a professional engineering career in the computer and embedded systems or related fields.
- Establish fundamental principles of electronics, mathematics and computing, and develop the connection between these and a broad range of engineering systems.
- Encourage initiative and confidence in approaching engineering problems and adoption of an investigative approach to their solution using a blend of analytical and practical skills.
- Develop skills in presentation of technical work, the interpersonal and organisational requirements associated with carrying out an engineering project, and an appreciation of the industrial and social context of the technology.
- Give an understanding of the role and responsibilities of the professional engineer to society and the environment.
- Engender the communication and interpersonal skills necessary for operation in a professional engineering environment and to provide an education that allows graduates to adapt the future changes in technology.

The supplementary aims of the **sandwich mode** of attendance are to provide students with relevant workplace experience and to launch their initial professional development with a view to becoming an Incorporated Engineer.

Employment and further study opportunities

Today's organisations need graduates with both good degrees and skills relevant to the workplace, i.e. 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.

Learning outcomes

Learning outcomes are statements on what successful students 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.

Knowledge and understanding

Students will be able to demonstrate their knowledge and understanding of essential facts, concepts, theories and principles pertaining to computer systems engineering, and its underpinning science and mathematics. They will have an appreciation of the wider multidisciplinary engineering context and its underlying principles. They will appreciate the social, environmental, ethical, economic and commercial considerations affecting the exercise of their engineering judgement.

Specific skills

Students be able to apply appropriate quantitative science and engineering tools to the analysis of problems. They will be able to demonstrate creative and innovative ability in the synthesis of solutions and in formulating designs. They will be able to comprehend the broad picture and thus work with an appropriate level of detail.

Students will possess practical engineering skills acquired through, for example, work carried out in laboratories and workshops; in industry through supervised work experience; in individual and group project work; in design work; and in the development and use of computer software in design, analysis and control.

And in summary students will have the following skills:

1. Underpinning Science and Mathematics

Graduates will be able to demonstrate:

- Knowledge and understanding of the scientific principles underpinning computer systems engineering, and their evolution;
- Knowledge and understanding of mathematics necessary to support application of the key engineering principles in computer systems engineering.

2. Engineering Analysis

Graduates will be able to demonstrate:

- Ability to monitor, interpret and apply the results of analysis and modelling in order to bring about continuous improvement;
- Ability to apply quantitative methods and computer software relevant to computer systems engineering, frequently within a multidisciplinary context;
- Ability to use the results of analysis to solve engineering problems, apply technology and implement engineering processes;

  Ability to apply a systems approach to engineering problems through know-how of the application of computer communication and network technologies.

3. Design

Graduates will have the knowledge, understanding and skills to:

- Investigate and define a problem and identify constraints including environmental and sustainability limitations, health and safety and risk assessment issues;
- Understand customer and user needs and the importance of considerations such as aesthetics;
- Identify and manage cost drivers;

- Use creativity to establish innovative solutions;
- Ensure fitness for purpose for all aspects of the problem including production, operation, maintenance and disposal;
- Manage the design process and evaluate outcomes.

4. Economic, Social, and Environmental Context

Graduates will be able to demonstrate:

- Knowledge and understanding of commercial and economic context of engineering processes;
- Knowledge of management techniques which may be used to achieve engineering objectives within that context;
- Understanding of the requirement for engineering activities to promote sustainable development;
- Awareness of the framework of relevant legal requirements governing engineering activities, including personnel, health, safety, and risk (including environmental risk) issues;
- Understanding of the need for a high level of professional and ethical conduct in engineering.

5. Engineering Practice

Graduates will be able to demonstrate practical application of engineering skills, combining theory and experience, and use of other relevant knowledge and skills.
This includes:

- Knowledge of characteristics of protocols, equipment, processes, and products in the electronic and communication industries;
- Workshop and laboratory skills;
- Understanding of contexts in which engineering knowledge can be applied including operations and management, technology development, etc;
- Understanding use of technical literature and other information sources;
- Awareness of nature of intellectual property and contractual issues;
- Understanding of appropriate codes of practice and industry standards;
- Awareness of quality issues;
- Ability to work with technical uncertainty.

Key transferable skills

Students will have developed transferable skills that will be of value in a wide range of situations. These skills include problem solving, communication, and working with others, as well as the effective use of general IT facilities and information retrieval skills. They also include planning self-learning and improving performance, as the foundation for lifelong learning/CPD

Learning

The fundamental principle underlying the teaching methods used on this course is "learning by doing". That is, in order to learn and understand the engineering skills and techniques required, students cannot just be told them or read about them - they need to practise them.

The intermediate student learning outcomes will be:

Level 4: students will be able to:

- demonstrate understanding of basic computer systems;
- demonstrate some knowledge of current technology, applications and techniques as taught.
- read, use and create simple descriptions in words, mathematics or diagrams of electronic, software and mathematical concepts, and use these in the description and analysis of simple systems;
- analyse simple real-world problems and synthesise appropriate solutions using given engineering techniques;
- given prescribed methods, design, implement, debug and test, simple programs in high-level and low-level languages;
- work on structured group tasks, given direction and guidance, collaborating in the production of practical products and documentation;
- communicate technical information correctly, by means of presentations, written reports, appropriate diagrams and discussion;
- gather and assimilate information as directed and apply it as instructed;
- manage their learning as directed, keeping to set deadlines.

level 5: students will be able to:

- demonstrate understanding of mathematical laws governing the operation of computer communication and networks systems;
- demonstrate an awareness of the industrial and social context of computer system engineering;
- demonstrate knowledge of current technology, applications and techniques.
- read, use and create descriptions in words, mathematics or diagrams of hardware and software, and use these in the description, analysis and interfacing of systems;
- analyse given real-world requirements and synthesise appropriate solutions from standard engineering techniques;
- selecting from well-defined methods, design, implement, debug and test digital circuits, computer networks and programs in high-level and low-level languages;
- approach an engineering problem in a disciplined fashion, making decisions with support and assistance.
- work on structured group tasks, collaborating in the production of complex practical products and documentation;
- communicate complex technical information succinctly and accurately, by means of presentations, written reports, appropriate diagrams and discussion;
- gather and assimilate information with some guidance and apply it appropriately; manage project work, sticking to given timetables and structure.

Teaching

The following teaching methods are used

- Lecture / seminar sessions
- Projects (group and individual)
- Laboratories and computer-aided engineering
- Problem sheets, investigations and design
- On-line learning

Lecturers provide written and verbal feedback on students' work throughout the course. This may be individual or for the whole class.

Most of the mathematics in this course is taught within the engineering modules which use it. This means that students learn the mathematical theory and how it is applied at the same time, so as to make it more obviously relevant.

Unlike some programmes with a wide choice of separate modules, this course builds on tightly interrelated themes. They have been designed to fit together, and it is vital that knowledge and skills feed across from one subject to another. Staff teaching the modules have experience across a range of engineering areas, and will expect students to develop the same without compartmentalising ideas.

Assessment

These modules share a common assessment strategy. As well as checking that students have met the learning outcomes of the module, assessment will, where possible and appropriate, be:

- formative (helping students to learn);
- rigorous (not easily copied, or otherwise passed without appropriate knowledge and skill);
- challenging (requiring understanding, not just memorising of facts or mathematical tricks);
- workplace relevant (the sort of tasks engineers might be judged on by an employer);
- interesting (relevant to the application of the subject).

Modules may have between one or two aspects of assessment making up the total mark. There are minimum marks for each aspect. This means, for example, that students cannot make up for a very poor exam mark by getting an excellent coursework mark nor can they depend on a good group mark, due to the efforts of other group members, to compensate for a very poor individual mark. A wide variety of assessment methods are used, including

- In-class tests (making up the majority of coursework marks)
- Group work
- Laboratories
- Viva-voce examinations
- Formal examinations
- Written reports
- Presentations and posters
- Computer-based quizzes and exercises
- Design and implementation of hardware and software
- Analysis, testing and modification of existing hardware or software
- Participation in class activities such as question-and-answer sessions

The average amount of KIS categorised assessment at different levels in the degree is:

Level	% Coursework	% Practical	% Written
4	16.1	17.1	66.8
5	28.1	28.1	43.8
6	42.8	14.8	42.5

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**
ECSC402	Programming Methodology with C/C++	Core	15	7.5
ECSC406	Software Development Principles	Core	15	7.5
EECT401	Computer Systems Project	Core	15	7.5
EECN401	Computer Networks and Communications	Core	15	7.5
EEEL445	Electronics & Circuits	Core	15	7.5
EECT406	Digital Principles	Core	15	7.5
EEEL440	Engineering Problem Solving Skills	Core	15	7.5
EBSY400 ECSC408 SACE400	Communications and Learning Skills OR Maths for Computing OR Academic English 4 (overseas only students)	Option	15	7.5
Award of Certificate of Higher Education in Computer Systems Engineering available				
Credit Level 5				
Module code	**Module title**	**Status**	**UK credit**	**ECTS**
EECN500	Network Engineering	Core	15	7.5
EECT500	Computer Systems Engineering	Core	15	7.5
EECN510	Network Software Engineering	Core	15	7.5
EECT510	Embedded Microprocessor Systems Project *	Core	15	7.5
EECT505	Microelectronic and FPGA System Design Project *	Core	15	7.5
EECT515	Operating Systems	Core	15	7.5
EECT520	Event Driven & GUI Programming	Core	15	7.5
EECT525	Professional Engineering Practice	Core	15	7.5
Award of Diploma of Higher Education in Computer Systems Engineering available				
Credit Level 6				
Module code	**Module title**	**Status**	**UK credit**	**ECTS**
EECT625	Industrial Management	Core	15	7.5
EECT615	Computer Architecture and Performance	Core	15	7.5
EBSY603	Information Technology Security	Core	15	7.5
EECT600	Real-Time Embedded Systems	Core	15	7.5
EECT635	Operating System's Structure	Core	15	7.5
EECN610	Distributed Systems and Network Software	Core	15	7.5
EECT699	Individual Project *	Core	30	15
Award of BSc available **Award of BSc Honours available.**				

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

Academic regulations

The **BSc Honours** Computer Systems 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. The following regulations should be read in conjunction with Section 17: Modular Framework for Undergraduate Courses and relevant sections of the current Handbook of Academic Regulations, which is available at westminster.ac.uk/academic-regulations

Award

To qualify for the award of BSc Honours Computer Systems Engineering, a student must have:

- obtained at least 360 credits including:
  - passed 75 credits at credit Level 4 or higher and achieved 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
- satisfied the requirements contained within any course specific regulations for the relevant course scheme.

Honours Classification: The class of degree will normally be determined as follows:
First Class: An average of 70% or higher in the best modules worth 120 credits at Level 6, with an average of at least 60% in the best modules worth 120 credits remaining at Levels 5 and 6.

Upper Second Class: An average of 60% or higher in the best modules worth 120 credits at Level 6, with an average of at least 50% in the best modules worth 120 credits remaining at Levels 5 and 6.

Lower Second Class: An average of 50% or higher in the best modules worth 120 credits at Level 6, with an average of at least 40% in the best modules worth 120 credits remaining at Levels 5 and 6.

Third Class: An average of 40% or above in the best 240 credits at Levels 5 and 6.

To achieve the award of **BSc Honours Computer Systems Engineering with Industrial Placement**, the conditions for the corresponding full-time degree must be fulfilled plus the industrial placement must have been successfully completed by passing the module, Industrial Placement and Professional Development.

The classification of the sandwich degree will be determined by the same criteria as for the corresponding full-time degree. The industrial placement will not contribute to the classification.

Intermediate Awards

For a full list of the Intermediate Awards and their classification Please go to http://www.westminster.ac.uk/__data/assets/pdf_file/0010/120205/Section_17_Undergraduate_Framework_for_Taught_Courses_2012.pdf

As well as the default regulations for the award of a non-Honours Degree http://www.westminster.ac.uk/__data/assets/pdf_file/0010/120205/Section_17_Undergraduate_Framework_for_Taught_Courses_2012.pdf for students to qualify for the award of BSc Computer Systems Engineering students need also to have achieved a minimum mark of 35% in the final year project module

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 Faculty 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 Faculty. 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 Faculty. 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.

Student Affairs 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 Student Affairs Hub is located at 101 New Cavendish Street, Cavendish House (1st Floor), with an additional office located at the Harrow Campus.

http://www.westminster.ac.uk/study/new-students/when-you-arrive

The University of Westminster Students' Union also provides a range of facilities to support all students during their time at the University. http://www.uwsu.com/

Reference points for the course

Internally

- University Quality Assurance Handbook and Modular Frameworks
- Staff research and development in Electronics and Communications
- Industrial advisory panel

Externally

Mainly:

- UK-SPEC (Engineering Council's UK Standard for Professional Engineering Competence) *The Accreditation of Higher Engineering Programmes*
- IET (Institution of Engineering and Technology) *Academic Accreditation Guidelines*
- QAA Subject Benchmark for Engineering

Also:

- QAA Guidelines for Preparing Programme Specifications
- SEEC Credit Level Descriptors for Further and Higher Education

Professional body accreditation

IET

Quality management and enhancement

Course management

This course is managed by staff from the Department of Engineering in the Faculty of Science and Technology. The Course Team consists of lecturers on individual modules, the Head of Department and technical support staff. The day-to-day running of each course is the responsibility of the Course Leader, while the strategic direction of the courses and the allocation of staff is the responsibility of the Head of the Department. The Dean of the Faculty of Science & Technology takes overall responsibility for all departments within this School.

Course approval, monitoring and review

The course was initially approved by a University Validation Panel in 2009. 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 Faculty 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 Faculty 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 Faculty's' quality assurance evidence base.

For more information about this course:

Admissions tutor: Dr Mohammed Al-Janabi
Course leader: Dr George Charalambous

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.