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PROGRAMME SPECIFICATION

Course Record Information	
Name and level of final & intermediate Awards	**BSc Honours Computer Systems Engineering** **BSc Honours Computer Systems Engineering (Sandwich)** BSc Computer Systems Engineering Certificate of HE in Computer Systems Technology Diploma of HE in Computer Systems Technology/ersity of Westminster
Location of Delivery	Central London (Cavendish)
Mode of Study	Full time/Sandwich
UW Course Code	U09FUCYE
JACS Code	H65
UCAS Code	H657 H656 with foundation
QAA Subject Benchmarking Group	Engineering
Professional Body Accreditation	IET
Date of initial course approval/last review	1997
Date of Programme Specification	2009

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.

This BSc degree provides the ideal educational base for entry to a career in the exciting computer industry. With an industry-wide shortage of computer system engineers, graduates are enjoying a choice of job opportunities.

The programming both systems and network oriented, and the embedded systems engineering skills acquired by the graduates allows them to target the growing markets of embedded system devices and portable devices.

Graduates are suited to various destinations for higher study, such as taught and research based MSc programmes.

Learning Outcomes

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

Intermediate Learning Outcomes

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.

General Learning Outcomes

Graduates will satisfy the following criteria:

Knowledge and Understanding: they 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.

Intellectual Abilities: they will 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.

Practical skills: they 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.

General transferable skills: they 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, Teaching and Assessment Methods

Teaching and Learning Methods

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 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 Strategy

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

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 (1st Year)

Code	Title	Status	Value
ECSC402	Programming Methodology with C/C++	Core	15
ECSC406	Software Development Principles	Core	15
EECT401	Computer Systems Project	Core	15
EECN401	Computer Networks and Communications	Core	15
EEEL445	Electronics & Circuits	Core	15
EECT406	Digital Principles	Core	15

EEEL440	Engineering Problem Solving Skills	Core	15
EBSY400 ECSC408 1EAPP04	Communications and Learning Skills OR Maths for Computing OR English for Academic Purposes(overseas only students)	Option	15
	Total Level Four Credit Value		**120**

Award of Certificate of Higher Education in Computer Systems Technology available.
Credit Level 5 (2nd Year)

Code	Title	Status	Value
EECN500	Network Engineering	Core	15
EECT500	Computer Systems Engineering	Core	15
EECN510	Network Software Engineering	Core	15
EECT510	Embedded Microprocessor Systems Project *	Core	15
EECT505	Microelectronic and FPGA System Design Project *	Core	15
EECT515	Operating Systems	Core	15
EECT520	Event Driven & GUI Programming	Core	15
EECT525	Professional Engineering Practice	Core	15
	Total Level Five Credit Value		120

Award of Diploma of Higher Education in Computer Systems Technology available.
Credit Level 6 (3rd Year)

Code	Title	Status	Value
EECT625	Industrial Management	Core	15
EECT615	Computer Architecture and Performance	Core	15
EBSY603	Information Technology Security	Core	15
EECT600	Real-Time Embedded Systems	Core	15
EECT635	Operating System's Structure	Core	15
EECN610	Distributed Systems and Network Software	Core	15
EECT699	Individual Project *	Core	30
	Total Level Six Credit Value		**120**

Award of BSc available
Award of BSc Honours available.

. **Academic Regulations**
The BSc (Hons) 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 2011/12*** which is available at westminster.ac.uk/essential-westminster. The following regulations should be read in conjunction with the Modular Fr*amework for Undergraduate Courses* and relevant

sections of the current *Handbook of Academic Regulations*.

A *pass* in a module is achieved when the overall mark is greater than or equal to 40%; with at least 30% in the final assessment and any qualifying marks and/or sets achieved as detailed in the module handbook.

Condoned Credit at Level 3 and Level 4(for new level 4 students 2011 entry):

A student may be awarded condoned credit at Levels 3 and 4 only, where he/she has achieved:

a) an overall module mark of greater than or equal to 30% but less than 40%;
b) an overall mark of 40% or greater but not reached the required qualifying mark(s) and/or qualifying set(s) as detailed in the module handbook; and
c) attempted all referred assessment as offered by the Assessment Board.

Where a student, following a referral opportunity, is awarded condoned credit, the recorded module mark will be capped at 39%. Condoned credit will count towards any credit limits for specified awards. Where a student is awarded condoned credit in a module but subsequently achieves an overall pass within a retake module, credit may contribute only once to an award.

Condoned Credit(for level 6 students 2009 entry):
A student may be awarded condoned credit for no more than one module at each of levels 3, 4, 5 and 6 where he/she has achieved:

a) an overall module mark of greater than or equal to 30% but less than 40%;
b) an overall mark of 40% or greater but not reached the required qualifying mark(s) and/or qualifying set(s) as detailed in the module handbook; and
c) attempted all referred assessment as offered by the Assessment Board.

Where a student, following a referral opportunity, is awarded condoned credit, the recorded module mark will be capped at 39%. Condoned credit will count towards any credit limits for specified awards. Where a student is awarded condoned credit in a module but subsequently achieves an overall pass within a retake module, credit may contribute only once to an award.

Progression(for new level 4 students 2011 entry):

T*o progress from Level* 4 to Level 5 in full time study, a student must obtain a minimum of 90 credit passed(i.e. not condoned) at level 4. In addition, a student must normally have an average of at least 40% across 120 credits.

In order to progress to Level 6, a student must normally obtain a minimum of 195 credits at Level 4 or above, including a minimum of 75 credits at Level 5 or above.

A student cannot normally attempt any module at the next level until they have fulfilled the above progression requirements to that level. In addition, specific prerequisites and co-requisites have to be met in order to study each individual module at Credit Levels 5 and 6.

Progression(for level 6 students 2009 entry):

To progress from Level 4 to 5 in full time study, a student must pass at least 90

credits at the end of Credit Level 4; to progress from Level 5 to 6 full-time study, a student must pass at least 165 credits, including 75 credits at Credit Level 5.

Honours Award(for level 6 students 2009 entry):
In respect of the modules described in this course scheme, to qualify for the award of **BSc Honours Computer Systems Engineering** a student must:

(a) have obtained at least 360 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, of which no more than 15 shall be condoned; and

(iii) a minimum of 120 credits at Level 6 or higher, of which no more than 15 credits shall be condoned (The modules passed must include the final-year individual project.); and

(b) have attempted modules worth no more than 330 credits at Levels 5 and 6. (An attempt includes a first attempt and any subsequent retake of any module but does not include reassessment without attendance.)

(c) Satisfied the requirements contained within any course specific regulations for the relevant course Scheme

The class of the Honours degree awarded is decided by two criteria: the average of the best 105 credits passed at Level 6 being in the range of the class to be awarded, and the average of the next best 105 credits passed at Levels 5 and 6 provided the next best 105 credits passed are no more than one classification below this

http://www.wmin.ac.uk/page-20460 section 17

Honours Award (for students 2010 & 2011 entry):
To qualify for the award of **BSc Honours Computer Systems Engineering** , a student must:

a) obtained at least 360 credits including:

- passed 75 credits at 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 Level 5 or higher; and
- passed a minimum of 120 credits at Level 6 or higher.

b) attempted modules with a maximum value of 330 credits at Levels 5 and 6;and

c) 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 (Sandwich)**, 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.

Support for Students

On 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 the Library which, across its four sites, holds print collections of 356,000 printed books, 29,000 print and e-journals, over 45,000 electronic resources (databases, e-journals, e-books). Access to all resources is facilitated through Library Search, a new online service.

There are over 3,500 computers spread over the four University campuses available for students use. The University uses a Virtual Learning Environment called Blackboard where students can access course materials and communicate with staff and other students via message boards.

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 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

Quality Management and Enhancement

Course Management

This course is managed by staff from the Department of Electronic, Network and Computer Engineering in the School of Electronics and Computer Science. 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 School of Electronics and Computer Science takes overall responsibility for all departments within this School.

Course approval, monitoring and review

The present structure of this course has been developed since the first review. The Panels included internal peers from the University and external subject specialists from academia and industry to ensure the comparability of the courses to those offered in other Universities and the relevance to employers. Quinquennial Course Reviews help to ensure that the curriculum is up-to-date and that the skills gained on the courses continue to be relevant to employers.

Our courses are monitored each year by the School of Electronics and Computer Science to ensure that they are running effectively and that issues that might affect the student experience have been appropriately addressed. Staff will consider the outcomes from the Course Committee, evidence of student progression and achievement and the reports from External Examiners to evaluate the effectiveness of the course. The Campus Academic Standards Group audits these processes and the outcomes are reported to the Academic Council of the University, 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 comment is taken seriously. The most formal mechanism for feedback on the course is the course committee. Student representatives are elected to sit on the committee to represent the views of their peer group in the discussions held at the committee. The University and the Students' Union work together to provide a full induction to the role of the Course Committee.

Students are asked to complete an end-of module questionnaire at the end of each module. The feedback from this informs the Module Leader on the effectiveness of the module and highlights areas that could be enhanced.

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 meetings are also held on an annual basis with representatives of the School Academic Standards Group as part of the annual monitoring process.

For more information about this course:

Admissions tutor:	Dr Mohammed Al-Janabi
Course leader:	Dr George Charalambous
Web site:	http://www.wmin.ac.uk/electronics

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