PROGRAMME SPECIFICATION

Course Record Information	
Name and level of **final** & intermediate Awards	**BSc Honours in Computer Networks Security** **BSc Honours in Computer Networks Security (Sandwich)** **BSc in Computer Networks Security** Diploma of HE in Computer Networks Security Certificate of HE in Computer Networks Security
Awarding Body	University of Westminster
Location of Delivery	University of Westminster, New Cavendish Street, Central London
Mode of Study	Full time/Sandwich
UW Course Code	W50
JACS Code	I120
UCAS Code	G423
QAA Subject Benchmarking Group	
Professional Body Accreditation	British Computer Society (BCS) Partial Chartered Engineer (CEng)
Date of initial course approval/last review	
Date of Programme Specification	April 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

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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

These courses are designed to meet the demand from employers for graduates with application-oriented engineering skills and know-how. In particular, it is targeted towards the rapidly growing and changing technologies involving local, wide and wireless area networks and network security. These programmes incorporate the Cisco Certified Network Associate (CCNA) curriculum giving you the opportunity to complete the CCNA qualification while studying for your degree.

The course aims to

- Provide an enjoyable learning experience which will serve as a solid intellectual basis for a professional engineering career in local, wide and wireless area networks and network security or related fields.
- Establish fundamental principles of computing and network engineering, and develop the connection between these and a broad range of network systems with special emphasis placed on the transportation of real-time audio and video media.
- 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.
- Focuses on the security aspect of networks and aims to equip students with knowledge and skills in order to combat common threats.

In addition, the course aims to 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 graduates with relevant workplace experience and to launch their initial professional development with a view to becoming a Chartered Engineer.

Employment and Further Study Opportunities

Today, communications technology requires knowledge of the interaction of hardware and software in complex networks. There is a growing need for versatile engineers who would be able to design, support, problem-solve and maintain network systems of high quality and reliability.

These degrees provide the ideal educational base for entry to a career in computer networks

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and security industries. The courses aim to equip graduate with the flexibility to work at different levels with networked communication systems as network designer, network manager or network engineer.

Students on these degree courses have gone on to work for small and large size companies setting up, developing, managing and maintaining network systems.

Students will also be well equipped to progress to postgraduate study in software and engineering area.

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 their knowledge and understanding of essential facts, concepts, theories and principles pertaining to network engineering;
- demonstrate some knowledge of current technology, applications and techniques as taught;
- read, use and create simple descriptions in words, software and programming 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 programs in high-level language, computer networks and security in computer networks;
- 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 network topology governing the operation of computer networks;
- demonstrate an awareness of the industrial and social context of network engineering;
- demonstrate knowledge of current technology, applications and techniques;
- read, use and create simple descriptions in words, software and programming concepts, and use these in the description and analysis of simple systems and interfacing of systems;
- analyse given real-world requirements and synthesise appropriate solutions from standard engineering techniques;

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- analyse and develop programs to interface with existing software and utilise (network) system resources
- 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 network 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.

Specific Learning Outcomes

1. Underpinning science and mathematics

Graduates will be able to demonstrate:

- Knowledge and understanding of scientific principles and methodology necessary to underpin their education in network engineering, to enable appreciation of its scientific and engineering context, and to support their understanding of historical, current, and future developments and technologies;
- Knowledge and understanding of mathematical principles necessary to underpin their education in network engineering and to enable them to apply mathematical methods, tools and notations proficiently in the analysis and solution of engineering

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problems;

- Ability to apply and integrate knowledge and understanding of other engineering disciplines to support study of their own engineering discipline.

2. Engineering Analysis

Graduates will be able to demonstrate:

- Understanding of engineering principles and the ability to apply them to analyse key engineering processes;
- Ability to identify, classify and describe the performance of systems and components through the use of analytical methods and modelling techniques;
- Ability to apply quantitative methods and computer software relevant to network engineering, in order to solve engineering problems;
- Understanding of and ability to apply a systems approach to engineering problems.

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.

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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 can include:

- Knowledge of characteristics of particular materials, equipment, processes, or products;
- Workshop and laboratory skills;
- Understanding of contexts in which engineering knowledge can be applied (eg 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.

Teaching, Learning and Assessment Methods

Teaching and Learning Methods

The fundamental principle underlying the teaching methods used on these courses 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.

Unlike some programmes with a wide choice of separate modules, these courses build 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);

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- 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 this course and their credit value. Full-time undergraduate students study 120 credits per year. Modules marked * are project-based.

Credit Level 4

Code	Title	Status	Value
ECSC402	Programming Methodology with C/C++	Core	15
ECSC406	Software Development Principles with C/C++	Core	15
EECT402	Computer Systems and Networks	Core	15
EECN401	Computer Networks and Communications	Core	15
EEEL445	Electronics and Circuits	Core	15
ECSC408	Mathematics for Computing	Core	15
EECT406	Digital Principles	Core	15
EEEL440 1EAPP04	Engineering Problem-Solving Skills OR English for Academic Purposes	Core	15

Award of Certificate of Higher Education available

Credit Level 5

Code	Title	Status	Value

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EECN500	Network Engineering	Core	15
EECN505	Wide Area Networks	Core	15
EECT520	Event-Driven and GUI Programming	Core	15
EECN510	Network Software Engineering	Core	15
EECT515	Operating Systems	Core	15
EECT525	Professional Engineering Practice	Core	15
EECN515	Applied Cryptography	Core	15
EECN520	Threats and Countermeasures	Core	15

Award of Diploma of Higher Education available

Credit Level 6

Code	Title	Status	Value
EECN600	Enterprise Network Engineering	Core	15
EECN605	Multimedia Streaming	Core	15
EECN610	Distributed Systems and Network Software	Core	15
EECT625	Industrial Management	Core	15
EECT699	Individual Project	Core	30
EECN615	Secure System Planning	Core	15
EECN620	Networks Security Systems	Core	15

Award of BSc available.
Award of BSc Honours available

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Assessment of Modules

A *pass* in a module is achieved when the overall mark is at least 40% and the marks for separate aspects of assessment (e.g. coursework and exam or group-work and individual-work) are individually at least 35%.

A student may be awarded *condoned credit* for no more than 15 credits at each of levels 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 standard in one or more aspect of assessment.

Where a student is awarded condoned credit, the recorded module mark will be capped at 40%.

Where a student is awarded condoned credit in a module but subsequently achieves an overall pass at a re-attempt, credit may contribute only once to an award.

Progression Requirements

The University has regulations that govern the progression through the course.

In order to progress to Level 5, a student must obtain a minimum of 90 credits 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.

Honours Award

In respect of the modules described in this course scheme, to qualify for the award of **BSc Honours in Computer Networks Security** 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.)

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

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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 Campus Administration. 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 printed collections of 412,000 books, 1,600 journal subscriptions and substantial audio visual collections. Access to over 6,500 electronic resources (databases, e-journals, e-books, exam papers and links to recommended websites) is facilitated through infoLinX, the library portal.

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 Education 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

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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 its initial launch. 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: Dragana Barjamovic
Web site: http://www.westminster.ac.uk/schools/computing/undergraduate/computer-networks

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

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Module Handouts which provide more detailed information on the specific learning outcomes, content, teaching, learning and assessment methods for each module.	