3 PROGRAMME SPECIFICATION

Course record information

Name and level of final award:	**BSc Honours in Computer Networks Security**, **BSc Honours in Computer Networks Security (with Industrial Placement),** are BSc degrees that are Bologna FQ-EHEA first cycle degree or diploma compatible.
Name and level of intermediate awards:	BSc Computer Networks Security Diploma of HE in Computer Networks Security Certificate of HE in Computer Networks Security
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:	Dragana Barjamovic
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:	W50
JACS code:	I120
UCAS code:	G423
QAA subject benchmarking group:	Computing
Professional body accreditation:	British Computer Society (BCS) Partial Chartered Engineer (CEng)
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 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. This programme incorporates 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.
- Equip students with knowledge and understanding of current mobile and cellular radio networks.
- Equip students with knowledge and understanding of modern computer architecture.

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'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.

This degree provides the ideal educational base for entry to a career in computer networks and security industries. 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. The course aims 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 this degree course 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. These threshold statements of achievement and 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 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.

Specific skills

Students 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.

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.

In summary, students will have the following skills:

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 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.

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.

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, teaching and assessment methods

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 learning outcomes are:

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;
- 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.

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.

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	36	17.5	47.5
6	37	14.8	48.2

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 with C/C++	Core	15	7.5
EECT402	Computer Systems and Networks	Core	15	7.5
EECN401	Computer Networks and Communications	Core	15	7.5
EEEL445	Electronics and Circuits	Core	15	7.5
EEEL440	Engineering Problem-Solving Skills	Core	15	7.5
EECT406	Digital Principles	Core	15	7.5

ECSC408 SACE400 EBSY400	Mathematics for Computing OR Academic English 4 OR Communication and Learning Skills	Option	15	7.5
Award of Certificate of Higher Education available				
Credit Level 5				
Module code	**Module title**	**Status**	**UK credit**	**ECTS**
EECN500	Network Engineering	Core	15	7.5
EECN505	Wide Area Networks	Core	15	7.5
EECT520	Event-Driven and GUI Programming	Core	15	7.5
EECN510	Network Software Engineering	Core	15	7.5
EECT515	Operating Systems	Core	15	7.5
EECT525	Professional Engineering Practice	Core	15	7.5
EECN515	Applied Cryptography	Core	15	7.5
EECN520	Threats and Countermeasures	Core	15	7.5
Award of Diploma of Higher Education available				
Credit Level 6				
Module code	**Module title**	**Status**	**UK credit**	**ECTS**
EECN600	Enterprise Network Engineering	Core	15	7.5
EECN605	Multimedia Streaming	Core	15	7.5
EECN610	Distributed Systems and Network Software	Core	15	7.5
EECT625	Industrial Management	Core	15	7.5
EECT699	Individual Project	Core	30	15
EECN615	Secure System Planning	Core	15	7.5
EECN620	Networks Security Systems	Core	15	7.5
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 in Computer Networks Security 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 the Modular Fr*amework 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 Networks Security, a student must:

- obtained at least 360 credits including:
- a minimum of 120 credits at Level 4 or higher, of which no more than 15 shall be condoned; 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.

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 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 Networks Security (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 Networks Security 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 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 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*
- BCS (British Computer Society) *Academic Accreditation Guidelines*
- QAA Subject Benchmark for Computing

Also:

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

Professional body accreditation

British Computer Society (BCS) - Partial Chartered Engineer (CEng)

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 and Technology takes overall responsibility for all departments within this Faculty.

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 Faculty of Science and Technology 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 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:

Admissions tutor: Dr Mohammed Al-Janabi
Course leader: Dragana Barjamovic
Web site: http://www.westminster.ac.uk/schools/computing/undergraduate/computer-networks