

## PROGRAMME SPECIFICATION

### Course record information

Name and level of final awards:	<p><b>BSc Honours Computer Networks and Communications</b></p> <p><b>BSc Honours Computer Networks and Communications (with Industrial Placement)</b></p> <p><b>BSc Honours Computer Network Security</b></p> <p><b>BSc Honours Computer Network Security (with Industrial Placement)</b></p> <p>These BSc degrees are Bologna FQ-EHEA first cycle degree or diploma compatible.</p>
Name and level of intermediate awards:	<p>BSc Honours Computer Networks and Communications</p> <p>BSc Honours Computer Networks and Communications (with Industrial Placement)</p> <p>BSc Computer Network Security</p> <p>BSc Computer Network Security (with Industrial Placement)</p> <p>Diploma of HE in Computer Networks</p> <p>Certificate of HE in Computer Networks</p>
Awarding body/institution:	University of Westminster
Teaching Institution:	University of Westminster
Status of awarding body/institution:	Recognised Body
Location of delivery:	Central London, New Cavendish Street site
Language of delivery and assessment:	English
Mode, length of study and normal starting month:	Full time/Placement: 3/4 yrs. September start.
QAA subject benchmarking group(s):	<a href="#">Engineering</a>

Professional statutory or regulatory body:	British Computer Society CITP, Partial CEng
Date of course validation/review:	2015
Date of programme specification approval:	2015
Valid for cohorts :	2016/17 Levels 4 and 5; 2017/18 Levels 4,5 and 6
Course Leader	Dragana Barjamovic
UCAS code and URL:	Computer Nets & Comms: PG94 G427 (with Foundation) Computer Nets Security: G423 G425 (with Foundation) <a href="http://www.westminster.ac.uk/courses/undergraduate">http://www.westminster.ac.uk/courses/undergraduate</a>

## What are the minimum entry requirements for these programmes?

There are standard minimum [entry requirements](#) for all undergraduate courses. Students are advised to check the standard requirements for the most up-to-date information.

[westminster.ac.uk/courses/undergraduate/how-to-apply](http://westminster.ac.uk/courses/undergraduate/how-to-apply)

For most courses a decision will be made on the basis of your application form alone. However, for some courses the selection process may include an interview to demonstrate your strengths in addition to any formal entry requirements.

More information can be found here: [westminster.ac.uk/courses/undergraduate/how-to-apply](http://westminster.ac.uk/courses/undergraduate/how-to-apply)

## What are the aims of these programmes?

The BSc Honours programmes in Computer Networks and Communications and in Computer Network Security form an integrated suite of degree courses aimed to provide an inspiring learning experience with a curriculum that is highly relevant to the needs of industry and leading to many employment opportunities.

The emphasis of these programmes is on the design, operation, installation and maintenance of current and future state-of-the-art computer networks. This is supported by developing a working knowledge of the underpinning analytical foundations of these technologies and the technical and interpersonal skills necessary to allow the graduate to adapt to future technological developments.

These programmes aim to:

- provide an exciting, enjoyable and rewarding learning experience which will serve as a solid foundation for a professional engineering career leading eventually to registration as a Chartered IT Professional (CITP) and a Chartered Engineer (CEng);
- 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 industrial placement 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.

### **BSc Honours Computer Networks and Communications**

The BSc Honours programme in Computer Networks and Communications has been 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.

In addition to the aims listed above, this programme specifically aims to:

- 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;
- equip students with knowledge and understanding of current mobile and cellular radio networks;
- equip students with knowledge and understanding of modern computer architectures.

### **BSc Honours Computer Network Security**

The BSc Honours programme in Computer Network Security has been 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) Security curriculum giving you the opportunity to complete the CCNA Security qualification while studying for your degree.

In addition to the aims listed above, this programme specifically aims to:

- establish fundamental principles of computing, programming and network engineering, and develop the connection between these and a broad range of network systems with special emphasis placed on optimisation of converged networks;
- equip students with knowledge and understanding of current technologies applied to network security;
- equip students with knowledge and understanding of modern computer architecture.

### **What will you be expected to achieve?**

Learning outcomes are statements on what successful students have achieved as the result of learning. These are threshold statements of achievement the learning outcomes broadly fall into four categories:

- The overall **Knowledge and Understanding** students will gain from the programme (KU).
- **Graduate Attributes** are characteristics that students will have developed during the duration of the programme (GA).
- **Professional and Personal Practice learning outcomes** are specific skills that students will be expected to have gained on successful completion of the programme (PPP).
- **Key Transferable Skills** that students will be expected to have gained on successful completion of the programme (KTS).

### **Level 4 learning outcomes – both programmes**

Upon completion of Level 4 the student will be able to:

- LN4.1 demonstrate a knowledge and understanding of essential facts, concepts, theories and principles pertaining to computer and network engineering (KU, GA);
- LN4.2 explain the use of current computer and network technologies applied to a variety of commercial and industrial applications (KU, KTS);

- LN4.3 represent in words, mathematics and diagrams electronic, software and mathematical concepts, and use these in the description and analysis of simple systems and networks (KU, KTS);
- LN4.4 analyse simple real-world problems and synthesise appropriate solutions using fundamental concepts and methods of mathematical principles necessary to underpin network engineering (KU, PPP);
- LN4.5 given prescribed methods, design, implement, debug and test programs in high-level language, computer networks and security in computer networks (PPP, KTS);
- LN4.6 communicate technical information correctly, by means of presentations, written reports, appropriate diagrams and discussion (GA, KTS).

### **Level 5 learning outcomes – BSc Honours Computer Networks and Communications**

Upon completion of Level 5 students will be able to:

- LN5.1 analyse and compare technologies governing the operation of computer networks to inform the specification of a computer network for a given application (KU, GA);
- LN5.2 explain and classify essential concepts, principles and theories required for the synthesis and analysis of a modern digital communication system and its performance (KU, PPP);
- LN5.3 interpret and differentiate appropriate theory, practices and tools for the specification, design, implementation and evaluation of modern computer networks (PPP, KU);
- LN5.4 analyse and develop programs to interface with existing software on a system level and utilise network and computer system resources (PPP, GA);
- LN5.5 evaluate and assess the wider social and environmental implications in network engineering, including sustainability limitations, health and safety and risk assessment issues (GA, PPP);
- LN5.6 work on structured group tasks, given direction and guidance, collaborating in the production of practical products and documentation (KTS, GA).

### **Level 5 learning outcomes – BSc Honours Computer Network Security**

Upon completion of Level 5 students will be able to:

- LT5.1 analyse and compare technologies governing the operation of computer networks to inform the specification of a computer network for a given application (KU, GA);
- LT5.2 explain and classify the fundamental concepts of security and categorise common threats to computer systems and networks with possible mitigation (KU, PPP);
- LT5.3 interpret and differentiate appropriate theory, practices and tools for the specification, design, implementation and evaluation of modern computer networks (PPP, KU);
- LT5.4 analyse and develop programs to interface with existing software on a system level and utilise network and computer system resources (PPP, GA);
- LT5.5 evaluate and assess the wider social and environmental implications in network engineering, including sustainability limitations, health and safety and risk assessment issues (GA, PPP);
- LT5.6 work on structured group tasks, given direction and guidance, collaborating in the production of practical products and documentation (KTS, GA).

### **Level 6 learning outcomes – BSc Honours Computer Networks and Communications**

Upon completion of Level 6 students will be able to:

- LN6.1 design, configure and critically analyse local and wide area networks, using a range of techniques to manage network operation and diagnose network faults (KU, PPP);
- LN6.2 apply a knowledge of network technologies and the use of network simulation tools to the design and evaluation of mobile radio communication system to meet a specified type and quality of service (KU, PPP);
- LN6.3 formulate, articulate and appraise an engineering problem in a disciplined fashion, making decisions with support and assistance (GA, KTS);
- LN6.4 independently gather, assimilate and critically evaluate information specific to a given network issue, choose and formulate cost and effectiveness of a given set of solutions, and select and implement the most viable solution based on specific constraints applying and integrating the knowledge and understanding gained throughout the course (KU, PPP, GA);
- LN6.5 select, analyse and communicate complex technical information succinctly and accurately, reviewing its reliability, validity and significance using detailed and coherent written reports and presentations (KTS, KU);
- LN6.6 manage project work, adhering to given timetables and targets (GA, KTS).

### **Level 6 learning outcomes – BSc Honours Computer Network Security**

Upon completion of Level 6 students will be able to:

- LT6.1 design, configure and critically analyse local and wide area networks, using a range of techniques to diagnose network faults and security threats (KU, PPP);
- LT6.2 identify, define and apply the underpinning requirements for the design, configuration and testing of a secure network; (KU), (PPP)
- LT6.3 formulate, articulate and appraise an engineering problem in a disciplined fashion, making decisions with support and assistance (GA, KTS);
- LT6.4 independently gather, assimilate and critically evaluate information specific to a given network security issue, choose and formulate cost and effectiveness of a given set of solutions, and select and implement the most viable solution based on specific constraints applying and integrating the knowledge and understanding gained throughout the course (KU, PPP, GA);
- LT6.5 select, analyse and communicate complex technical information succinctly and accurately, reviewing its reliability, validity and significance using detailed and coherent written reports and presentations (KTS, KU);
- LT6.6 manage project work, adhering to given timetables and targets (GA, KTS).

### **How will you learn?**

The fundamental principle underlying the learning process and 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.

This learning-by-doing approach applies to both practical skills, which you will learn through project and laboratory work as well as to analytical skills, which you will learn by applying taught principles to problem-solving tasks often involving the use of advanced software tools for simulation and design.

In order to be effective, we tailor our teaching methods to both the diversity of the subject matter as well as the diversity of students’ optimal learning preferences.

The range of teaching methods you will experience includes such diverse elements as:

- 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. Feedback may be given individually or to the class collectively.

Unlike some programmes offering a wide choice of disparate modules, this course builds on a select number of tightly interrelated themes which have been designed to interleave elegantly. Knowledge and skills feed across from one topic to another creating a holistic, synoptic learning experience, thereby avoiding the danger of "compartmentalising" ideas.

### How will you be assessed?

The modules in comprising this course 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 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 such diverse elements as:

	<b>Some formative elements of the assessment</b>
• In-class tests	providing self-appraisal of technical expertise as well as valuable pointers to good exam technique
• Group work	developing team working skills
• Laboratories	developing essential practical skills
• Viva-voce examinations	developing oral and written communication skills
• Written reports	
• Presentations and posters	
• Computer-based quizzes and exercises	developing computer-based engineering skills
• Design and implementation of hardware and software	
• Analysis, testing and	

modification of existing hardware or software	
• Formal examinations	summative

### Employment and further study opportunities

University of Westminster graduates will be able to demonstrate the following five Graduate Attributes:

- Critical and creative thinkers
- Literate and effective communicator
- Entrepreneurial
- Global in outlook and engaged in communities
- Social, ethically and environmentally aware

University of Westminster courses capitalise on the benefits that London as a global city and as a major creative, intellectual and technology hub has to offer for the learning environment and experience of our students.

These programmes aim to create graduates who will have flexibility to work at different levels with networked communication systems as network designer, network manager or network engineer.

These degrees provide the ideal educational base for entry to a career in computer networks and security industries with a growing need for versatile engineers who would be able to design, support, problem-solve and maintain network systems of high quality and reliability.

Today's employers are looking for 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

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.

### 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. Course structures can be subject to change each academic year following feedback from a variety of sources.

Note that the first year (Level 4) is common to both programmes so it is possible to transfer between these programmes at the end of the first year.



<b>Credit Level 4 – both programmes</b>				
<b>Module code</b>	<b>Module title</b>	<b>Status</b>	<b>UK credit</b>	<b>ECTS</b>
4NTCM004W	Programming Methodology I	core	20	10
4NTCM005W	Programming Methodology II	core	20	10
4ELEN010W	Mathematics for Computing	core	20	10
4NTCM001W	Digital Principles	core	20	10
4NTCM002W	Introduction to Networks	core	20	10
4NTCM003W	Networks and Communications	core	20	10
<b>Award of Certificate of Higher Education available</b>				
<b>Credit Level 5 – BSc Honours Computer Networks and Communications</b>				
<b>Module code</b>	<b>Module title</b>	<b>Status</b>	<b>UK credit</b>	<b>ECTS</b>
5ELEN008W	Professional Engineering Practice and Industrial Management	core	20	10
5NTCM005W	Network Technologies	core	20	10
5NTCM003M	Network Software Engineering	core	20	10
5ELEN011W	Signals and Communication Principles	core	20	10
5NTCM004W	Network Simulation	core	20	10
	Plus <b>one option module</b> from::			
5NTCM002W	Introduction to Network Security	option	20	10
5ELEN006W	Operating Systems and Systems Programming	option	20	10
<b>Award of Diploma of Higher Education available</b>				
<b>Credit Level 5 – BSc Honours Computer Network Security</b>				
<b>Module code</b>	<b>Module title</b>	<b>Status</b>	<b>UK credit</b>	<b>ECTS</b>
5ELEN008W	Professional Engineering Practice and Industrial Management	core	20	10
5NTCM005W	Network Technologies	core	20	10
5NTCM003M	Network Software Engineering	core	20	10
5NTCM002W	Introduction to Network Security	core	20	10
5NTCM001W	Cryptographic Techniques for Network Security	core	20	10
	Plus <b>one option module</b> from::			
5NTCM004W	Network Simulation	option	20	10
5ELEN007W	Scripting for Engineering	option	20	10
5ELEN006W	Operating Systems and Systems Programming	option	20	10
<b>Award of Diploma of Higher Education available</b>				
<b>Credit Level 6 – BSc Honours Computer Networks and Communications</b>				
<b>Module code</b>	<b>Module title</b>	<b>Status</b>	<b>UK credit</b>	<b>ECTS</b>
6ELEN012W	Individual Project	core	40	20
6NTCM002W	Enterprise Networks	core	20	10
6NTCM001W	Applied Distributed Systems Programming	core	20	10
6ELEN005W	Mobile Communication Systems	core	20	10
	Plus <b>one option module</b> from:			
6NTCM004W	Security Testing and Implementation	option	20	10
6ELEN013W	Operating Systems and Drivers	option	20	10
<b>Award of BSc available</b>				
<b>Award of BSc Honours available.</b>				

Credit Level 6 – BSc Honours Computer Network Security				
Module code	Module title	Status	UK credit	ECTS
6ELEN012W	Individual Project	core	40	20
6NTCM002W	Enterprise Networks	core	20	10
6NTCM001W	Applied Distributed Systems Programming	core	20	10
6NTCM004W	Security Testing and Implementation	core	20	10
	Plus <b>one option module</b> from:			
6NTCM003W	Network Security Evaluation and Design	option	20	10
6ELEN013W	Operating Systems and Drivers	option	20	10
<b>Award of BSc available</b>				
<b>Award of BSc Honours available.</b>				

Note: not all option modules will necessarily be offered in any one academic year.

### Professional Body Accreditation and other external references

These programmes are intended to fulfil the educational requirements of the British Computer Society (BCS) to fulfil the educational requirements registration as a Chartered IT Professional (CITP).

In addition these programmes are intended to fulfil the educational requirements of the Engineering Council for Chartered Engineer (CEng) when presented with an accredited MSc (or equivalent further learning). In addition, the programme is intended to fulfil the educational requirements for registration as an Incorporated Engineer (IEng).

The course has been designed with reference to:

The Accreditation of Higher Engineering Programmes UK Standard for Professional Engineering Competence Third edition (AHEP3), Engineering Council, 2014

QAA Subject Benchmark for Engineering

Also:

QAA Guidelines for Preparing Programme Specifications

SEEC Credit Level Descriptors for Further and Higher Education

### Academic regulations

The current Handbook of Academic Regulations is available at [westminster.ac.uk/academic-regulations](http://westminster.ac.uk/academic-regulations)

## **How will you be supported in your studies?**

### **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 it.

### **Academic Support**

Upon arrival, an induction programme will introduce you to the staff responsible for the course, the campus on which you will be studying, the Library and IT facilities, additional support available and to your Faculty Registry Office. You will be provided with the Course Handbook, which provides detailed information about the course. Each course has a course leader or Director of Studies. All students enrolled on a full-time course and part time students registered for more than 60 credits a year have a personal tutor, who provides advice and guidance on academic matters. 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.

### **Learning Support**

The Academic Learning Development Centre supports students in developing the skills required for higher education. As well as online resources in Blackboard, students have the opportunity to attend Study Skills workshops and one to one appointments.

Learning support includes four libraries, each holding a collection of resources related to the subjects taught at that site. 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.

### **Support Services**

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

## **How do we ensure the quality of our courses and continuous improvement?**

The course was initially approved by a University Validation Panel in 2015. The panel included internal peers from the University, academic(s) from another university and a representative from industry. This helps to ensure the comparability of the course to those offered in other universities and the relevance to employers.

The course is also 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 Course Committees, evidence of student progression and achievement and the reports from external examiners, to evaluate the effectiveness of the course. Each Faculty puts into place

an action plan. This may for example include making changes on the way the module is taught, assessed or even how the course is structured in order to improve the course, in such cases an approval process is in place.

A Course review takes place periodically to ensure that the curriculum is up-to-date and that the skills gained on the course continue to be relevant to employers. Students meet with review panels to provide feedback on their experiences. Student feedback from previous years e.g. from Course Committees is also part of the evidence used to assess how the course has been running.

### **How do we act on student feedback?**

Student feedback is important to the University and student views are taken seriously. Student feedback is gathered in a variety of ways.

- Through Course Committees students have the opportunity to express their voice in the running of their course. Student representatives are elected to Committee to expressly represent the views of their peer. The University and the Students' Union work together to provide a full induction to the role of the student representatives.
- Each Faculty also has its own Faculty Student Forum with student representatives; this enables wider discussions across the Faculty. Student representatives are also represented on key Faculty and university committees.
- All students are invited to complete a 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 seeks the opinions of students about their course and University experience. Final year Undergraduate students will be asked to complete the National Student Survey which helps to inform the national university league tables.

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

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