Programme Specification and Curriculum Map for BSc Honours Network Management and Security

1. Programme title	BSc Honours Network Management and Security
2. Awarding institution	Middlesex University
3. Teaching institution	Middlesex University
4. Programme accredited by	NA
5. Final qualification	BSc Honours
6. Academic year	2009/2010
7. Language of study	English
8. Mode of study	Full Time & Part Time

9. Criteria for admission to the programme

Entry requirements are in accordance with the University regulations. We accept students from a range of backgrounds. Most students educated in the UK will have studied A levels, AVCEs or an accredited Access Course. To enter a degree programme you would be expected to have achieved 160-240 UCAS tariff points including a minimum of 120-160 from two 6-unit awards or 60 points, or have successfully completed the Middlesex University School of Engineering and Information Sciences Foundation Year in Computing with Business. All candidates should possess at least grade C in GCSE maths and English language, or equivalent. Mature applicants with relevant work experience are also welcome to apply.

You may be credited for part of the course provided you have appropriate prior learning such as a Higher National Diploma or similar. To obtain any qualification you must complete at least one academic year - 4 modules of the programme.

International students who have not been taught in the English medium must show evidence of proven ability in English such as TOEFL grade 550 or IELTS grade 6.0. The University provides pre-sessional English language courses throughout the year for candidates who do not meet the English requirements. For further information, visit the learning resources web site at: http://www.lr.mdx.ac.uk/lang/index.htm.

University policies supporting students with disabilities apply, as described in the University Regulations, 'Information for students with disabilities'.

10. Aims of the programme

Computer networks are among the most significant and exciting technological innovations that have taken place in the last few decades. It is safe to say that while the exact pattern of future network development cannot be predicted, their development will continue, and they will have a decisive impact on important walks of life such as business, government, sciences, industry, the arts and entertainment.

In particular, computer networks underpin almost every aspect of corporate communications; it is important that they are appropriately designed, operate at their optimal efficiency, and are secure.

Hackers, worms, phishing and *cyberterrorism* all pose significant threats to the security of business communications and of individual computer users. Governments and users of corporate networks and the Internet are increasingly concerned about the security of sensitive data

This programme is designed to provide the understanding and skills needed to design and manage computer networks in order to assure their security.

Graduates from the programme will have an understanding of the critical role networks play in organisations and will appreciate the importance of information management and security in relation to business objectives. They will be able to operate, manage, design and implement secure networks on a professional footing, and they will appreciate threats to network security and understand defence strategies and mechanisms.

This programme offers the opportunity for students to develop the skills and understanding required to manage secure networks professionally in response to the growing global demand for practitioners with these abilities.

The programme enables students to gain an understanding of underpinning theory and experience a range of hands-on, laboratory-based activities needed to develop skills in secure networking.

11. Programme outcomes

A. Computing-related cognitive abilities *On completion of this programme, you will be able to:*	**Teaching/learning methods**
1. Deploy the mathematics, scientific and data communication theory relevant to the efficient, secure transmission and storage of data in the analysis and solution of computer network problems typically arising in the context of a given set of security and other requirements, and to simulate systems designed; 2. Specify, plan, adapt, construct and test a range of secure computer networks taking into account current network, wireless, Internet and security standards, models, protocols, functional and operational characteristics of Internet and network infrastructure, and criteria of network and network component quality; 3. Plan, conduct and report a significant secure computer network project, demonstrating awareness of secure system management and administration implications; 4. Apply a range of modelling techniques, semi-formal, and formal notations as appropriate to clarify, evaluate and communicate secure computer network or distributed system design concepts effectively; 5. Determine the main business and product development issues in secure computer communication development and exercise judgement required for successful project development within the constraints of professional practice; 6. Critically evaluate secure communication system feasibility, sustainability and compliance with current and future needs by taking into account the main relevant economic, ethical, social, legal and environmental facts, principles and issues.	At Level 1, modules address the conceptual, technical and mathematical underpinnings of the study of computer networks. A1 and A2 are introduced in contexts relating to networks and computer communication by means of lectures, seminars and laboratories; students are helped to understand the relevance of topics to the development and analysis of network systems and network applications. Tasks will be set to engender confidence and proficiency within the particular topics addressed. Elements of A3-A5 are addressed implicitly to motivate initial understanding and to place technical topics into a wider context Learning materials are designed to relate to computers and networks. Wherever in timetabled sessions case studies or problems concerning networks or applications at system -level are addressed, additional learner support is offered by tutors. Problem solving, and design tasks are used in seminars to reinforce and deepen understanding and students are given the opportunity of practically applying theory in network laboratory tasks and seminars. At Level 1, there is significant horizontal integration of learning materials; for example networking concepts and terminology are introduced in one module and in another simple but real life scenarios are used to deepen and refine understanding by students engaging in practical application at topic level. At Level 2, material further addressing A1, A2 and A4 is introduced by lectures, seminars and concepts, and principles are frequently applied in laboratory-based tasks. Topics introduced typically involve an increasingly systems -level content and orientation as modules progress. There is an increasing level of design, problem solving and analysis skills expected as measured by the demands of coursework and seminar-based tasks.

	In general, learning materials and teaching acknowledge the diverse cultural background of students on this programme and are intended to permit equality of access. **Assessment** Outcomes A1, A2 and A4-A5 are assessed using coursework assignments involving a range of problem-solving, design , analysis, modelling and simulation tasks individual and group work (including presentations and formal reports of work undertaken) increasingly framed at system level, through the programme multiple choice questions, presentations of work-in-progress, and unseen written examinations at Levels 2 and 3. Outcomes A4-A6 are not explicitly assessed at Level 1. Typically a module will involve a variety of assessment types to target students' differing learning styles. Written formative feedback is given on return of coursework and formative feedback is given within seminars and laboratories.A3 is assessed by coursework, and viva/demonstration as appropriate and is supported by regular supervision and formative feedback.
B. Computing-related practical abilities On completion of this programme the successful student will be able to: 1. Select, configure, and operate the principal components of Internet and network infrastructure and tools, safely and effectively; 2.Implement algorithms in software and develop a range of network software communication applications; 3.Use and configure a variety of operating systems for secure operation and for given purposes; 4. Evaluate the security weaknesses and vulnerabilities of a range of networks and devices; develop trusted computing bases and formulate security policies; *5.* Specify a range of network and computer security services and mechanisms at various levels of abstraction and develop systems to enable secure access to services and applications from networked computers, access terminals and mobile devices.	**Teaching/learning methods** Skill development within this programme is intended to be progressive across all study levels. A variety of digital, wireless, network, computer and software laboratories provide environments and tools for system design, simulation, and test are used to foster the development of practical skills B1-B5 through a range of laboratory and/or seminar-based tasks typically relying on learning-in-action. Supportive environments allow the development of B1-B5 and formative feedback on performance of B1-B5 development is offered by tutors within laboratories and seminars prior to assessment, and then more formal feedback is offered. At Level 1 students are taught how to operate specialist equipment effectively and safely and to respect rules of conduct in laboratories. **Assessment** Student's practical skills are typically summatively assessed by combinations of practical assignments, group and individual presentations, laboratory exercises, production of design documentation and specific demonstration of work and unseen written examination.

	Formative feedback is given with returned assessed coursework; generic feedback on examination performance is given in the form of an Examiners Examination Report.
C. Additional Transferable Skills On completion of this programme the successful student will be able to: 1. Work effectively both autonomously in independent project-oriented activity, and co-operatively as a member of a group or project-team and manage time and other resources; 2. Apply mathematical skills and understanding to tasks requiring modelling, system analysis and problem-solving; 3. Learn effectively for life-long personal and career development and to reflect on progress of learning; 4. Communicate effectively and explain technical information, concepts, arguments, design information effectively, using a variety of media, and range of methods appropriate to a given type of audience or communication objective; 5. Conduct research effectively, drawing on a wide variety of sources (including libraries, the Internet and electronic catalogues) under minimal direction, and be proficient in the use of referencing sources of information.	**Teaching/learning methods** Transferable skills are developed initially at Level 1 where communication skills, basic research skills and skills in using mathematical principles and concepts. The ability to work effectively both as an individual and as a group member is summatively assessed at Level 1 and is generally actively and continuously encouraged, monitored and formatively assessed both in Level 1 seminars and laboratories. At Level 1, students become involved in many different activities requiring the exercise of C1-C5 whose development is supported by regular and frequent formative feedback on assessed and non-assessed work in laboratories and seminars The development of transferable skills C4 and C5 is progressed at Level 2 in the contexts of group project work and, at Level 3, in that of individual project work. These transferable skills coincide with the University's Graduate Skills. **Assessment** A variety of assessment types are typically used for each of the intended transferable skills outcomes. These include seminar-based assessment, multiple-choice questions and coursework, laboratory tasks taking place in learning environments including specialist development tools or equipment, as appropriate, group and individual projects, and mini projects. Reports reflecting research undertaken at all levels of study are assessed and formative feedback provided. Individual and group project research presentations are assessed. Skills outcomes C1-C5 are designed to reflect the University's Graduate Skills requirements. These skills are taught, and assessed at Level 1, and skills development allows students the opportunity of contributing to their PDPs.

12. Programme structure (levels, modules, credits and progression requirements)

12. 1 Overall structure of the programme

The programme can be taken in three modes (a) full-time, (b) part-time and (c) thick-sandwich mode. In full-time mode, the programme will take three years to complete; in part-time mode the programme will take a minimum of six years to complete and (c) will take a minimum of four years to complete. The programme is structured into three academic levels.

Each module is worth 30 credit points and so you need to gain 120 credit points to complete a level. In part-time mode, you will take a maximum of 60 credit points in any academic year (which is defined to be the period from September t o the following September). In thick sandwich mode you will spend a year on a placement module after having completed the first two academic levels, and then resume your studies by taking the specified level 3 modules. Even though the placement module is credit-rated (worth 120 credit points) it does not contribute to the number of credit points needed to gain your honours degree, but leads to a certificate of industrial achievement in its own right.

In this programme all modules are compulsory and you need 360 credit points to graduate with honours. The modules at Level 1 of this programme is identical to that offered by four other programmes and it is possible that you could transfer your studies to one of these in order programmes to take a range of computer communication modules that are not featured in this programme.

Students may be eligible for pre-accreditation of some modules, especially at Level 1 if you have already passed courses relevant to those modules and at the same academic level or if you have significant employment experience prior to starting the programme.

12.2 Levels and modules

Level 1

COMPULSORY[1]	PROGRESSION REQUIREMENTS
Students must take all of the following: CCM1418 Introduction to Operating Systems, Computer Architectures and Networks CCM1412 Fundamentals of Computing CCM1416 Computer Networks CMT1314 Programming with Data Structures and Algorithms	Students must pass 120 credit points to progress to level two full-time study or level two part-time study

Level 2

COMPULSORY	PROGRESSION REQUIREMENTS
Students must take all of the following: CCM2426 Professional Project Development and Management CCM2420 Data Communications CCM2412 Network Routing and Protocols CCM2424 Host Operating Systems and Security	Students must pass at least 180 credit points (including 60 at level 2) in order to be eligible to enrol on modules at level 3, and at least 210 credits (including 90 at level 2) in order to be eligible to enrol on the level 3 Computer Communications project module.

[1] Compulsory modules are those that must be taken, that is, the qualification cannot be awarded unless these modules have been successfully completed. Each of these modules makes a unique contribution to the learning objectives of the programme.

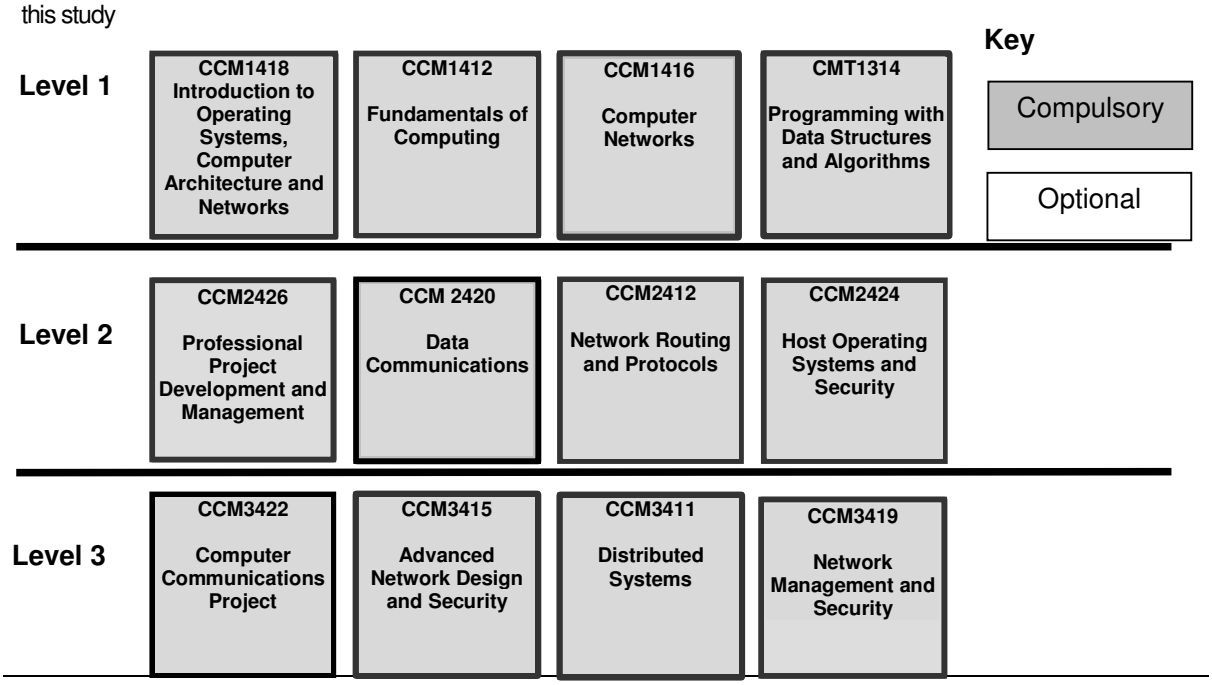
Level 3	
COMPULSORY	PROGRESSION REQUIREMENTS
Student must take all of the following: CCM3422 Computer Communications Project CCM3415 Advanced Network Design and Security CCM3419 Network Management and Security CCM3411 Distributed Systems	In order to graduate with an honours degree i.e. a BSc Hons Network Management and Security, students must have achieved 360 credit points, or to graduate with an ordinary degree, 300 credit points with a minimum of 60 credit points at Level 3

12.3 Non-compensatable modules	
Module level	***Module code***
Level 3	*CCM3422 (Computer Communications Project module)*

[1] Optional modules are those from which a specified minimum number must be taken, that is, the qualification cannot be awarded unless this specified minimum number of optional modules has been successfully completed. Each of the possible combinations of optional modules will make a similarly unique contribution to the achievement of the learning objectives of the programme.

13. Programme Diagram for BSc Honours Network Management and Security

Students enrolled on the four year programme with the Foundation Year complete the Foundation Year before starting this study



Students taking the programme in part-time mode study at a reduced rate, typically two modules at the appropriate level per academic year and should complete a given academic level before proceeding to the next.

14. Information about assessment regulations

- Information on how the University formal assessment regulations work, including details of how award classifications are determined, can be found in the University Regulations at www.mdx.ac.uk/regulations/.
- Practical aspects of the programme are often assessed via coursework that may be carried out using specialist software and may include lab tests.
- Theoretical material is assessed by coursework and examinations.
- Grades are awarded on the standard University scale of 1–20, with Grade 1 being the highest. To pass a module all components, both coursework and examination, must be passed individually with a minimum grade of 16. Failure in one of the components will result in the failure of the module.

For additional information on assessment and how learning outcomes are assessed please refer to the individual module narratives for this programme.

15. Placement opportunities, requirements and support

All Undergraduate students have the opportunity to go on Industrial Placement. Industrial Placements are encouraged as this valuable experience enhances a student's future career prospects. Additionally students normally achieve better results in their final year. In brief:

- The placement provides a years experience as an appropriately paid graduate trainee.
- Industrial placement is conditional on the successful completion of all modules at Level 1 and Level 2, therefore students need 240 credits before they are able to embark on an industrial placement.
- Obtaining a placement is co-ordinated through the Campus Placement Office.
- For Undergraduate programmes, students wishing to undertake a placement position must register for CMT3985.
- Each placement will be assigned to an industrial tutor who will visit the student on placement.
- On graduation the degree will be qualified with the term "…with approved industrial experience".

The placement option is not available to direct-entry students in their final year.

16. Future careers

All programmes in the School of Engineering and Information Sciences – their curricula and learning outcomes – have been designed with an emphasis on currency and the relevance to future employment.

- The majority of graduates are employed in IT posts relevant to the subject.
- Over 20% of students pursue further postgraduate study or research.

The employer links with the School are encouraged in a number of ways e.g. by inviting practitioners from industry as guest speakers in lectures; through links with companies where students are employed as part of their Industrial placement and through alumni both in the UK and overseas

Campus Careers Offices can be found on each campus for advice, support and guidance – or go to www.intra.mdx.ac.uk/annex/careers/coreered.htm

17. Particular support for learning

The School's Teaching and Learning Strategy is compliant with those of the University, in seeking to develop learner autonomy and resource-based learning.

In support of the students learning experience:

- All new students go through an induction programme and some have early diagnostic numeric and literacy testing before starting their programme. Learning Resources (LR) provide workshops for those students needing additional support in these areas.
- Students are allocated a personal email account, secure networked computer storage and dial-up facilities
- New students are provided with a CD containing the schools Subject Handbook at enrolment (electronic copies for all students can also be found at http://www.mdx.ac.uk/24-7/cs/#subjecthandbook). If you require a hard copy of this Subject Handbook please request them from Catherine Riley (c.riley@mdx.ac.uk) or 020 8411 2623)
- New and existing students are given module handbooks for each module they study. Soft copies of all module handbooks can be found on Oasis. Web-based learning materials are provided to further support learning
- Extensive library facilities are available on all campuses. WebCT pages are available as learning resources through the Oasis system
- Students can access advice and support on a wide range of issues from the Student Services Counter and the Student Information Desk. Student Advisers aligned to subject areas offer confidential one to one advice and guidance on programme planning and regulations
- Placements are supported by Campus Placement Offices and School academics; please refer to section 19 of this programme specification
- High-quality specialist network, software, digital and wireless laboratories equipped with industry standard software, hardware and tools as appropriate, for formal teaching as well as self-study. Middlesex University is a Cisco Local Academy and a Xilinx University partner
- Access to campus based teaching and learning support drop in sessions, arranged by the school to provide assistance and guidance
- School Academic Advisers for each subject offering personal academic advice and help if needed. Rotas for the operation of Academic Advice Rooms at each campus can be found at http://www.mdx.ac.uk/24-7/cs/index.htm#tutor
- Tutorial sessions for each module organised for groups of up to 20 students are provided for additional teaching support
- Formative feedback is given on completion of student coursework
- Past exam papers with solutions and marking schemes for all modules are available for students in module handbooks and at http://www.mdx.ac.uk/24-7/cs/index.htm
    - Research activities of academic staff feed into the teaching programme, which can provide individual students with ad-hoc opportunities to work with academics on some aspect of research

Middlesex University encourages and supports students with disabilities. Some practical aspects of Engineering and Information Sciences programmes may present challenges to students with particular disabilities. You are encouraged to visit our campuses at any time to evaluate facilities and talk in confidence about your needs. If we know your individual needs we'll be able to provide for them more easily. For further information contact the Disability Support Service (email: disability@mdx.ac.uk) or contact Natalie Costa on 020 8411 2514.

18. JACS code (or other relevant coding system)	144G426
19. Relevant QAA subject benchmark group(s)	Computing

20. Reference points

The following reference points were used in designing the programme:

- QAA Computing subject benchmark statement
- QAA Framework for Higher Education Qualifications in England, Wales and Northern Ireland
- QAA/QAAS guidelines for programme specifications
- QAA Code of Practice for the assurance of academic quality and standards in HE
- University's Regulations
- Module Narratives
- British Computer Society (BCS) Guidelines for Exemption and Accreditation
- Middlesex University and School of Engineering and Information Sciences Teaching Learning and Assessment policies and strategies
- University policy on equal opportunities.

21. Other information

Middlesex University has formal links with 250 institutions world-wide, including student exchange agreements with more than 100 institutions. Currently a number of students both from the UK/EU and overseas take part in such exchanges. For further details please visit http://www.europe.mdx.ac.uk/ or contact Elli Georgiadou, the School of Engineering and Information Sciences coordinator of European Affairs & International Exchanges (email: e.georgiadou@mdx.ac.uk).

Please note programme specifications provide a concise summary of the main features of the programme and the learning outcomes that a typical student might reasonably be expected to achieve if s/he takes full advantage of the learning opportunities that are provided. More detailed information about the programme can be found in the student programme handbook and the University Regulations.

Curriculum map for BSc Honours Network Management and Security

This section shows the highest level at which programme outcomes are to be achieved by all graduates, and maps programme learning outcomes against the modules in which they are assessed.

Programme learning outcomes

Programme learning outcomes	
A. Computing-related cognitive abilities	
A1	Deploy the mathematics, scientific and data communication theory relevant to the efficient, secure transmission and storage of data in the analysis and solution of computer network problems typically arising in the context of a given set of security and other requirements, and to simulate systems designed.
A2	Specify, plan, adapt, construct and test a range of secure computer networks taking into account current network, wireless, Internet and security standards, models, protocols, functional and operational characteristics of Internet and network infrastructure, and criteria of network and network component quality.
A3	Plan, conduct and report a significant secure computer network project, demonstrating awareness of secure system management and administration implications.
A4	Apply a range of modelling techniques, semi-formal, and formal notations as appropriate to clarify, evaluate and communicate secure computer network or distributed system design concepts effectively.
A5	Determine the main business and product development issues in secure computer communication development and exercise judgement required for successful project development within the constraints of professional practice.
A6	Critically evaluate system feasibility, sustainability and compliance with current and future needs by taking into account the main economic, ethical, social, legal and environmental facts, principles and issues.
B. Computing-related practical abilities	
B1	Select, configure, and operate the principal components of Internet and network infrastructure and tools, safely and effectively.
B2	Implement algorithms in software and develop a range of network software communication applications.
B3	Use and configure a variety of operating systems for secure operation and for given purposes.
B4	Evaluate the security weaknesses and vulnerabilities of a range of networks and devices; develop trusted computing bases and formulate security policies.
B5	Specify a range of network and computer security services and mechanisms at various levels of abstraction and develop systems to enable secure access to services and applications from networked computers, access terminals and mobile devices.
Additional transferable skills	
C1	Work effectively both autonomously in independent project-oriented activity, and co-operatively as a member of a group or project-team and manage time and other resources.
C2	Apply mathematical skills and understanding to tasks requiring modelling, system analysis and problem-solving.
C3	Learn effectively for life-long personal and career development and to reflect on progress of learning.
C4	Communicate effectively and explain technical information, concepts, arguments, design information effectively, using a variety of media, and range of methods appropriate to a given type of audience or communication objective.
C5	Conduct research effectively, drawing on a wide variety of sources (including libraries, the Internet and electronic catalogues) under minimal direction, and be proficient in the use of referencing sources of information.

	Module	Code															
			A1	A2	A3	A4	A5	A6	B1	B2	B3	B4	B5	C1	C2	C3	C4	C5
1	Operating Systems, Computer Architecture and Networks	CCM1418	√								√		√		√		√	√
	Fundamentals of Computing	CCM1412	√												√			√
	Computer Networks	CCM1416	√	√					√					√		√	√	
	Programming with Data Structures & Algorithms	CMT1314								√								
2	Professional Project Development and Management	CCM2426					√	√						√		√	√	√
	Data Communications	CCM2420	√												√			
	Network Routing and Protocols	CCM2412		√		√			√	√								
	Host Operating Systems and Security	CCM2424		√		√			√		√	√	√		√			
3	Computer Communications Project	CCM3422		√	√		√	√						√		√	√	√
	Advanced Network Design and Security	CCM3415	√	√		√			√						√		√	
	Distributed Systems	CCM3411		√						√								
	Network Management and Security	CCM3419	√	√		√		√			√	√	√				√	√