Programme Specification

MSc Network Security and Pen Testing

1. Programme title	MSc Network Security and Pen Testing
2. Awarding institution	Middlesex University
3. Teaching institution	Middlesex University
4. Details of accreditation by professional/statutory/regulatory body	
5. Final qualification	MSc
6. Year of validation **Year of amendment**	
7. Language of study	English
8. Mode of study	FT/PT

9. Criteria for admission to the programme

Applicants should normally have one of the following:

A minimum of a second-class Honours degree (UK), or an equivalent overseas qualification – in computer science or in a science or engineering subject. Candidates with other degrees but with relevant work experience may also be considered and are encouraged to apply.

International students whose first language is not English or who have not been taught in the English medium throughout, and whose first degree is not from a British university, must achieve an IELTS score of 6.5 or TOEFL 575 (paper based) 233 (computer based).

Note: *University policies supporting students with disabilities apply, as described in the University Regulations, 'Information for Students with Disabilities'.*

10. Aims of the programme

The programme aims to:

- An understanding of the fundamental importance of computer, network, and communication system security for an organisation.
- The ability to involve both the management and the user in the process of awareness, decision and implementation with regard to computer and network security.
- The skills to analyse the security risks a communication system may have and to propose/devise solutions.
- The knowledge necessary to evaluate new threats to authentication, confidentiality and privacy with a view of implementing solutions to combat such threats.
- The ability to make a functional security design for a communication system and implement it successfully.

A balance of theory, advanced practical skills and experience to enable students to develop a sound knowledge and analytical ability to facilitate their intellectual and professional development.

11. Programme outcomes

A. Knowledge and understanding	**Teaching/learning methods**
On completion of this programme the successful student will have knowledge and understanding of: 1. Algorithms used in computer and network security and be able to perform implementations of selected algorithms in this area together with their potential for increased organisational efficiency. 2. Threats faced by computer operating systems, applications and networks and various countermeasures that can be used 3. Analysis, design and implementation of security systems, with an understanding of how cryptography can be used for providing security within applications. 4. Analysing a problem specification and to design and implement a solution. 5. Relevant professional, ethical and legal issues in computer and network security 6. A range of problems of computer and network security, and the available solutions and trade-offs	. Students gain knowledge and understanding through understanding and develop cognitive skills and abilities through self-directed, resource based learning, small group discussions, small group and individual exercises, laboratory sessions, demonstration software, on-line examples and research project. Weekly seminar sessions provide students with the opportunity to address questions, queries and problems. • Traditional lecture delivery (outcomes 1-7), • Group and individual research, presentations and written reports (outcomes 1-8), • Laboratory sessions (outcome 3, and 6), • Individual and group design work (outcomes 3, 4, 5, and 8), • Individual project. Throughout the student is encouraged to undertake independent reading both to supplement and consolidate what is

7. Applying secure methods for transmission and storage of data 8. The use of different research methods to develop policies and select suitable mechanisms to enforce such policies	being taught/learnt and to broaden their individual knowledge and understanding of the subject (outcomes 1-8). **Assessment Method** Students' knowledge and understanding is assessed by Group and individual coursework, presentations, group and individual reports, and the unseen examination and the project thesis assess students' knowledge and understanding. • Outcomes 1-7 assessed by examination. • Outcomes 3 and 6 are assessed by laboratory sessions and practical assignments *Outcome 1-8 are assessed by individual essay and final project thesis*
B. Cognitive (thinking) skills On completion of this programme the successful student will be able to: 1. Critically evaluate the needs for security provision for communication networks and apply security policies and regulations for existing security systems. 2. Have a critical and clear understanding of current theories and techniques for apprising user interfaces and practical designs skills for effective user interactions 3. Critically analyse and evaluate security applications and techniques and recommend and propose new measures to improve security 4. Make informed choices of the appropriate security measures to put into place for a given network and/or an operating system 5. Demonstrate fundamental security management skills and techniques relating to the leadership of projects. 6. Draw up security measures for computer networks and communication systems	**Teaching/learning methods** • Students learn cognitive skills through traditional lecture delivery (outcomes 1 and 3), • Group and individual research, presentations and written reports (outcomes 1-5), • Small group and individual exercises (outcomes 1-6), • Laboratory sessions (outcome 4 and 5), • Individual project (outcomes 1-6: depending on project title). Analysis, design and problem solving skills are further developed through various design activities as well as case studies, and extensive computer laboratory sessions. Feedback is given to students on all assessed coursework as well as written exams (In the form of exam reports produced each term). **Assessment methods** • Students' cognitive skills are assessed by group and individual coursework

	(outcomes 1-6) • Laboratory tests (outcome 4 and 5), • The unseen examination (outcomes 1, 3 , and 5), and • The project thesis (outcomes 1-6 depending on project title).Group and individual *Students will be required to conduct presentations, to produce Laboratory logbooks, and write informal/formal Reports.*
C. Practical skills On completion of the programme the successful student will be able to: 1. Acquire and apply relevant mathematical techniques to carry our security algorithms 2. Analyse a problem systematically and implement an effective solution both individually and within a group 3. Communicate effectively with peers and senior managers in writing, verbally and through graphical notations. 4. Apply learnt knowledge in computer and network security to better protect a networking environment 5. Effectively manage resources and time and share information with peers and senior managers 6. Learn independently in familiar and unfamiliar situation with open-mindedness and in the spirit of critical enquiry learn effectively for the purpose of continuing professional development in a wider context throughout their career .	**Teaching/learning methods** Students learn practical skills through the teaching and learning programme outlined above. These skills are also nurtured through: • Small group and individual presentations and exercises (outcome 1-4) • Laboratory sessions (outcomes 2-4, and 6) • The individual project (outcomes 1, and 3-6) **Assessment methods** Students' practical skills are assessed by coursework reports and the thesis report. • Skills 1-6 are assessed through coursework and written exam (seminars) Skills 2-4 and 6 are assessed by laboratory sessions.
D. Graduate skills On completion of this programme the successful student will be able to:	**Teaching/learning methods** **Assessment methods**

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

12. 1 Overall structure of the programme

The programme is designed as a full-time course including industrial placement where applicable, or as a part-time programme. The normal University year is 24 weeks split into two terms of approximately 12 weeks each and students can start the programme in either Autumn term (September) or winter term (Late January/February).

The programme conforms to the requirements of the Academic Learning Framework (LF) of Middlesex University and comprises seven taught modules (2 of which are worth 30cps, 4 of 15cps and one of 0 cps) and a final project module (worth 60cps). Each 30cps module involves approximately 180 hours of study and each 15 cps module involves approximately 90 hours of stduy. This includes attendance at lectures, tutorials, laboratory activities and study at home or in industry. All modules on the programme are compulsory.

1- **Full-time** students joining the programme in **September** pursue the following study schedule (see page 13 below):
   - ❖ seven modules (totalling 120cps) for Autumn Term start (September)
   - ❖ One research skill module (0 cps) for Autumn/Winter terms (weeks 6 to 18)
   - ❖ Undertake the postgraduate project module (60cp) in the Summer Term

Students who enrol in September may be able to complete their project over the following Spring term, thereby completing the programme in one year.

2- **Full-time** students joining the programme in **January** pursue the following study schedule (see page 14 below):
   - ❖ seven modules (totalling 120cps) For Winter start Term (January)
   - ❖ One research skill module (0 cps) for Winter/Spring terms (weeks 6 to 18)
   - ❖ Undertake the postgraduate project module (60cp) in the Autumn Term

Students who enrol in January may be able to complete their project over the following Autumn, thereby completing the programme in one year.

3- **Part-time** students joining the programme in September pursue the following study schedule (see page 15 below):
   - ❖ Three module (60cps) in the Autumn Term of the 1st year
   - ❖ Three module (60cps) in the Autumn Term of the 2nd year
   - ❖ One research skill module (0 cps) for Autumn/Winter terms (weeks 6 to 18) of 2nd year
   - ❖ Undertake the postgraduate project module (60cp) in the Spring and Autumn Terms of the 2nd year

4- **Part-time** students joining the programme in **January** pursue the following study schedule (see page 16 below):
   - ❖ Three module (60cps) in the Winter Term of the 1st year
   - ❖ Three module (60cps) in the Spring Term of the 2nd year

- One research skill module (0 cps) for Winter/Spring terms (weeks 6 to 18) of 2nd year
- Undertake the postgraduate project module (60cp) in the Spring and Autumn Terms of the 2nd year

Students must successfully complete all the modules of the taught part of the programme before they can register for the Project Module.

The duration of postgraduate project is one term for full-time and two terms for part-time students.

Examinations for taught modules take place at the end of the Winter and Spring Terms only, with a reassessment opportunity before the start of the Autumn Term. There are no examinations at the end of the Autumn Term.

The general teaching and learning strategy is a lecture programme, with a module handbook, handouts and tutorial material supported by seminar sessions and practical laboratory activities and extended exercises for private study.

Projects should be appropriate to the Programme studied (i.e. Computer Network Security and supervised accordingly. All project proposals must be approved by the Programme Leader or a member of the academic team delegated by the Programme Leader. Students must pass all the taught modules before they can progress to the project.

Details of each module can be found on MISIS or in the Science and Technology Subject Handbook.

12.2 Levels and modules		
Level 7		
COMPULSORY	OPTIONAL	PROGRESSION REQUIREMENTS

Students must take all of the following: **CCE4300** (15cps) Computer Networks and Internetworking **CCE4320** (15cps) Operating Systems and Applications Environment **CCE4330** (30cps) Security Architecture and Mechanisms **CCE4350** (30cps) Penetration Testing and Digital Forensics **CCE4360** (15cps) Network Security and Services **CCE4390** (15cps) Cyber security and Legal Regulations **CCE4900** (0cps) Project Research and Communication Skills **CCE4910**(60cps**)** Postgraduate Project in Computer Communications	NONE	**Students must <u>pass all the taught modules and including CCE4900</u> before they can progress onto the project.** **To pass a module, students must pass all components of assessment (i.e. examinations and/or coursework**

12.3 Non-compensatable modules (note statement in 12.2 regarding FHEQ levels)	
Module level	**Module code**
7	CCE4900
7	CCE4910

13. Curriculum map

See attached.

14. Information about assessment regulations

Compulsory modules are those that must be taken; that is, the qualification cannot be made unless these modules have been successfully completed.

Each of these modules makes a unique contribution to the learning objectives of the programme or subject major/minor.

[1]Optional modules are modules that may be taken at the discretion of the student. It is not necessary to complete optional modules to achieve the award (assuming other awarding conditions are met). Optional modules make a non-unique contribution to the achievement of the learning objectives of the programme or subject major/minor.

- 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/.
- Modules are assessed in accordance with the School of Engineering and Information Sciences' assessment strategy. Most modules adhere to a standard pattern of final grades of examinations and coursework. Different patterns are permitted if approved by the School Academic Planning Committee.
- 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 normally assessed by coursework only at levels 3 and 4 and normally by a combination of both coursework and examination at levels 5, 6 and 7.
- 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 (if applicable)

- Industrial placement is an option available for students who wish to work in industry for a maximum period of 12 weeks. During this period students are expected to work on their project, part of which should be relevant to the company where the placement is arranged.
- Industrial placement is conditional on the successful completion of all taught modules. Therefore 120 credits at level four need to be successfully completed before embarking on an industrial placement.
- The campus Placement Office manages University-industry relations and assists students in obtaining industrial placements. Further information on placement opportunities can be obtained there. Students are visited by an academic from the programme team at least once.

Postgraduate placements are normally a student initiated process for which the University will provide support

16. Future careers (if applicable)

All programmes in the Faculty of Science & Technology – their curricula and learning outcomes – have been designed with an emphasis on currency and the relevance to future employment.

- Campus Careers Offices can be found on each campus for advice, support and guidance.
- The majority of graduates are employed in IT posts relevant to the subject.
- Over 20% of students pursue further postgraduate study or research.
- The School has an Industrial Advisory Group which meets to advise and inform the School.

The employer links with the School are encouraged and take part in a number of ways: 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 alumni both in the UK and overseas.

17. Particular support for learning (if applicable)

The School's Teaching and Learning Strategy is compliant with that of the University; it aims to develop learner autonomy and to encourage resource-based learning.

In support of the student 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 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 on Unihub.
- Each term new and existing students are given access to module handbooks for each module they study. Soft copies of all module handbooks are available to students at enrolment. Web-based learning materials are provided to further support learning on unihub.
- Extensive library facilities are available on all campuses. Unihub pages are available as learning resources through mylearning.
- Campus Student Offices offer advice and support to students through their Student Advice Centres.
- A Dean of Students for general academic advice is available on each campus.
- High quality specialist laboratories equipped with industry-standard software and hardware are available for formal teaching and personal study.
- To provide assistance and guidance in support of particular learning needs, campus-based, drop-in sessions are arranged by the School as needed.
- School Academic Advisors for each subject are available to offer personal academic advice and help. Rotas for the operation of Academic Advice Rooms at each campus can be found at the Unihelp.
- 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 on the Unihub.
- In undergraduate programmes students can exercise choice and take responsibility for their particular learning: at level 1 (in the second term of study) an elective module can be taken from another subject; at levels 2 and 3 there are options for choosing specialist modules with some forming a pathway that forms part of the degree title.
- 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 Systems 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 Sobia Hussain at the Disability Support Service (Email: s.hussain@mdx.ac.uk)

18. JACS code (or other relevant coding system)	*G420*

19. Relevant QAA subject benchmark group(s)	Computing

20. Reference points

The following reference points were used in designing and reviewing the programme:

- QAA Framework for Higher Education Qualification in England, Wales and Northern Ireland
- QAA Computing subject benchmarks
- QAA/QAAS guidelines for programme specification
- QAA Code of Practice for the assurance of academic quality and standards in HE
- University' Policy, Regulations and guidelines
- British Computer Society (BCS) Guidelines for Exemption and Accreditation
- Module Narratives
- Middlesex University and Faculty of Science & Technology
- 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.

Appendix 2: Curriculum Map

Curriculum map for *MSc Network Management and Cloud Computing*

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.

Module Title	Module Code and Level	Programme outcomes																			
		A1	A2	A3	A4	A5	A6	A7	A8	B1	B2	B3	B4	B5	B6	C1	C2	C3	C4	C5	C6	C7
Computer Networks and Internetworking	CCE4300	✓	✓	✓		✓	✓	✓			✓			✓	✓	✓	✓	✓			✓	✓
Operating Systems and Application Environment	CCE4320		✓		✓	✓	✓	✓	✓		✓				✓	✓	✓	✓		✓		
Security Architecture and Mechanisms	CCE4330	✓		✓		✓		✓		✓	✓		✓	✓				✓		✓		
Penetration Testing and Digital Forensics	CCE4350	✓	✓	✓	✓		✓		✓	✓		✓		✓	✓	✓			✓	✓	✓	✓
Network Security and Services	CCE4360		✓		✓			✓					✓	✓				✓		✓		
Cyber security and Legal Regulations	CCE4390					✓			✓				✓						✓		✓	
Project Research and Communication Skills	CCE4900			✓					✓	✓		✓					✓	✓	✓	✓	✓	✓
Postgraduate Project in Computer Communications	CCE4910	✓	✓	✓	✓			✓		✓		✓	✓	✓	✓			✓	✓	✓		✓