Programme Specification for

MSci Mathematics with Computing

1. Programme title	MSci Mathematics with Computing
2. Awarding institution	Middlesex University
3. Teaching institution	Middlesex University
4. Details of accreditation by professional/statutory/regulatory body	
5. Final qualification	Master of Science (Honours)
6. Year of validation **Year of amendment**	2016 - 2017
7. Language of study	English
8. Mode of study	Full time/Part time/TKSW

9. Criteria for admission to the programme

Admission to the MSci (Hons) Mathematics with Computing programme will require 280 UCAS tariff points normally including a grade B in A-level Mathematics.

In addition Middlesex University general entry requirements apply as outlined in the university's regulation B2. Applicants whose first language is not English are required to achieve 6.0 in IELTS overall (with a minimum of 5.5 in each component) or an equivalent qualification recognised by Middlesex University. The equivalence of qualifications from outside UK will be determined according to NARIC guidelines.

It is possible to transfer to the MSci Mathematics with Computing from the BSc Mathematics with Computing at the end of the second year providing sufficiently good performance is demonstrated on core modules, see section 12.2 below.

10. Aims of the programme

The programme aims to:

- provide a broad and comprehensive knowledge of core areas of mathematics and computing in a supportive teaching environment;
- provide an advanced understanding of specific areas of mathematics and computing;
- stimulate an interest in all aspects of modern mathematics with an emphasis on its application in computing;
- prepare students for work as professional mathematicians or computer scientists either in academia or elsewhere;
- foster skills including problem solving, communication, team work and the ability to work individually on complex problems;
- develop an appreciation of the importance of mathematics and computer science research.

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. core areas of pure mathematics including geometry, algebra, mathematical analysis and discrete mathematics; 2. core areas of computer science including complexity and machine learning; 3. core areas of applied mathematics including statistics, operational research and differential equations; 4. several specialised areas of advanced mathematics, computing and their applications; 5. the correct use of mathematical language to express both theoretical concepts and logical argument; 6. the use of computers both as an aid and as a tool to study problems in mathematics; 7. the development of contemporary mathematical theories and methods.	Students gain knowledge and understanding through lectures, workshops and computer laboratory sessions where topics are introduced and explored thoroughly before moving forward. **Assessment methods** Students' knowledge and understanding is assessed by a combination of examinations, coursework assignments and presentations.
B. Cognitive (thinking) skills On completion of this programme the successful student will be able to: 1. formulate problems in appropriate theoretical frameworks to facilitate their solution; 2. develop strategies to solve mathematical problems in a range of relevant areas; 3. construct logical arguments solving abstract or applied mathematical problems; 4. criticise mathematical arguments developed by themselves and others; 5. demonstrate advanced levels of critical understanding of current mathematics; 6. demonstrate advanced levels of learner autonomy to synthesise a body of knowledge in mathematics or computing beyond undergraduate level.	**Teaching/learning methods** Students learn cognitive skills through working in class, in groups or independently on designated problems and theoretical content under the guidance of staff. **Assessment methods** Students' cognitive skills are assessed formatively in class employing group and individual working sessions, and summatively using a combination of presentations, examinations and coursework.
C. Practical skills On completion of the programme the successful student will be able to: 1. solve practical problems in a range of areas of mathematics and computer science; 2. determine the appropriateness of different methods of solving mathematical problems; 3. communicate mathematics effectively to a wide range of audiences; 4. develop and use software solve given problems; 5. communicate at masters level a specialist topic in mathematics or computing beyond undergraduate level.	**Teaching/learning methods** Students learn practical skills through a series of hands-on sessions throughout their studies designed to explore theoretical content more thoroughly. **Assessment methods** Students' practical skills are assessed formatively in class employing group and individual working sessions, and summatively using a combination of presentations, examinations and coursework.

D. Graduate skills	Teaching/learning methods
On completion of this programme the successful student will be able to: 1. work effectively and constructively as part of a team; 2. motivate and communicate complex ideas accurately using a range of formats; 3. identify and benefit from opportunities for personal and career development; 4. work confidently and accurately with formulae and numerical information 5. learn effectively	Students acquire graduate skills through contribution in class to group and individual work, and outside class through development of assignment work. **Assessment methods** Students' graduate skills are assessed using a combination of presentations, examinations and coursework.

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

12. 1 Overall structure of the programme

Year 1				
Term 1	MSO1110 Vectors and Matrices [30]	MSO1120 Calculus and Differential Equations [30]	MSO1130 Logic and Structures [30]	MSO1140 Data and Information [30]
Term 2				
Year 2				
Term 1	CSD2101 Algorithmic Complexity and Machine Learning [30]	MSO2110 Groups and Rings [30]	MSO2120 Mathematical Analysis [30]	MSO2140 Problem Solving Methods [30]
Term 2				
TKSW mode	MSO3800 Placement Year [120]			
Year 3/4				
Term 1	Students must take 1 of CSD3340 Computer Graphics [30] CSD3939 Artificial Intelligence [30]	Students must take 1 of MSO3110 Advanced Algebra [30]	MSO3130 Communicating Maths [15]	Students must select either 2 [15] credit options or one [30] credit option
Term 2		MSO3120 Real and Complex Analysis [30]	MSO3140 Project [15]	

Year- long 30 credit options	Options
MSO3110 Advanced Algebra [30] MSO3120 Real and Complex Analysis [30]	Term 1 MSO3225 Functional Analysis [15] MSO3310 Multivariate Statistics [15] Term 2 MSO3170 Combinatorics [15] MSO3220 Differential Equations [15] MSO3510 Simulation and Decision Making [15]

Year 4/5				
Term 1	Students must take one of:	Students must take one of:	Students must take one of:	Students must select either 2 [15] credit options or one [30] credit option
Term 2	MS04101 Mathematics Reading course [30] MSO4150 Project [30]	CSD4340 Computer Graphics [30] CSD4939 Artificial Intelligence [30]	MSO4111 Advanced Algebra [30] MSO4120 Real and Complex Analysis [30]	

Year- long 30 credit options	Options
MSO4200 Advanced Topics in Mathematics A [30] MSO4250 Advanced Topics in Mathematics B [30]	Term 1 MSO4225 Functional Analysis [15] MSO4310 Multivariate Statistics [15] Term 2 MSO4170 Combinatorics [15] MSO4220 Differential Equations [15] MSO4510 Simulation and Decision Making [15]

12.2 Levels and modules

Starting in academic year 2010/11 the University is changing the way it references modules to state the level of study in which these are delivered. This is to comply with the national Framework for Higher Education Qualifications. This implementation will be a gradual process whilst records are updated. Therefore the old coding is bracketed below.

Level 4 (1)

COMPULSORY	OPTIONAL	PROGRESSION REQUIREMENTS
Students must take all of the following: MSO1110 MSO1120 MSO1130 MSO1140		Students must pass all four level 4 modules to progress normally
Level 5 (2)		
COMPULSORY	OPTIONAL	PROGRESSION REQUIREMENTS
Students must take all of the following: CSD2101 MSO2110 MSO2120 MSO2140		In order to progress on the MSci students must normally pass all level 5 modules at grade 12 or better. Students not achieving this can transfer to the BSc Mathematics with Computing programme.
Level 6 (3)		
COMPULSORY	OPTIONAL	PROGRESSION REQUIREMENTS
Students must take the following: MSO3130	Students must choose **one** of the following*: CSD3340 CSD3939 Students must choose **one** of the following*: MSO3110 MSO3120 Students must choose **30 credits** worth of modules from*: MSO3110 (30 credit) MSO3120 (30 credit) MSO3140 (15 credit) MSO3225 (15 credit) MSO3310 (15 credit) MSO3170 (15 credit) MSO3220 (15 credit) MSO3510 (15 credit)	Students must pass all four level 6 modules to progress normally
Level 7 (4)		
COMPULSORY	OPTIONAL	PROGRESSION REQUIREMENTS

	Students must choose **one** of the following: MSO4101 MSO4150 Students must choose **one** of the following: MSO4111 MSO4120 Students must choose **one** of the following: CSD4340 CSD4939 Students must choose **30 credits** worth of modules from*: MSO4225 (15 credits) MSO4200 (30 credits) MSO4250 (30 credits) MSO4310 (15 credits) MSO4170 (15 credits) MSO4220 (15 credits) MSO4510 (15 credits)	

* where option modules appear more than once this indicates an opportunity to take multiple designated modules, e.g. students may take MSO3110 or MSO3120 or both.

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

13. Curriculum map

See attached.

14. Information about assessment regulations

University assessment regulations apply.

15. Placement opportunities, requirements and support (if applicable)

Students on the TKSW mode take a 12 month placement at the end of year 2. A dedicated Employability Advisor helps in the search for an appropriate employer and provides students with appropriate Placement. They also provide students with appropriate guidance and support in preparation for, during and after placement. The placement forms the basis for an assessed report based on the organisation. At the start of the placement students are allocated an

individual supervisor who provides support and advice for the duration of the project.

16. Future careers (if applicable)

Graduates of mathematics courses are employed as professional mathematicians in many organisations, for example GCHQ, where they work on solving abstract problems that directly influence government policy. Mathematics is also fundamental to many other sectors such as commerce, economics, computing, finance, and accounting.

The analytical and logical skills that maths students develop make them well suited to careers in areas such as law. Their ability to analyse and solve complex problems means they are sought after by employers and also demand some of the highest starting salaries.

17. Particular support for learning (if applicable)

- English Language Support
- Learning Resources
- Programme Handbook and Module Handbooks
- Induction and orientation programme
- Access to student counsellors
- Student e-mail and internet access

18. JACS code (or other relevant coding system)	G190
19. Relevant QAA subject benchmark group(s)	MSOR

20. Reference points

- QAA Guidelines for programme specifications
- QAA Qualifications Framework
- QAA Subject Benchmark Statement: MSOR
- Middlesex University Regulations
- Middlesex University Learning Framework – Programme Design Guidance, 2012
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21. Other information

Indicators of quality:

- Student achievement
- Buoyant enrolment
- Student feedback evaluation forms
- External examiners reports
- Student employability

Methods for evaluating and improving the quality and standards of learning are:

- External Examiner reports
- Board of Study
- Module evaluation and report

- Peer teaching observations
- Student evaluation
- Validation and review panels

See Middlesex university's Learning and Quality Enhancement Handbook for further information

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 rest of your programme handbook and the university regulations.

Curriculum map for *MSci Mathematics with 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.

Programme learning outcome

Knowledge and understanding			Practical skills
A1	core areas of pure mathematics including geometry, algebra, mathematical analysis and discrete mathematics	C1	solve practical problems in a range of areas of mathematics and computer science
A2	core areas of computer science including complexity and machine learning	C2	determine the appropriateness of different methods of solving mathematical problems
A3	core areas of applied mathematics including statistics, operational research and differential equations	C3	communicate mathematics effectively to a wide range of audiences
A4	several specialised areas of advanced mathematics, computing and their applications	C4	develop and use software to solve given problems
A5	the correct use of mathematical language to express both theoretical concepts and logical argument	C5	communicate at masters level a specialist topic in mathematics or computing beyond undergraduate level.
A6	the use of computers both as an aid and as a tool to study problems in mathematics		
A7	the development of contemporary mathematical theories and methods.		
Cognitive skills			Graduate Skills
B1	formulate problems in appropriate theoretical frameworks to facilitate their solution;	D1	work effectively and constructively as part of a team
B2	construct logical arguments solving abstract or applied mathematical problems	D2	motivate and communicate complex ideas accurately using a range of formats
B3	develop strategies to solve mathematical problems in a range of relevant areas	D3	identify and benefit from opportunities for personal and career development
B4	criticise mathematical arguments developed by themselves and others	D4	work confidently and accurately with formulae and numerical information
B5	demonstrate advanced levels of critical understanding of current mathematics	D5	learn effectively
B6	demonstrate advanced levels of learner autonomy to synthesise a body of knowledge in mathematics or computing beyond undergraduate level.		

Programme outcomes																											
A1	A2	A3	A4	A5	A6	A7	B1	B2	B3	B4	B5	B6	C1	C2	C3	C4	C5				D1	D2	D3	D4	D5		
Highest level achieved by all graduates																											
6	6	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7				6	7	6	7	7		

Module Title	Module Code by Level	Programme outcomes																							
		A1	A2	A3	A4	A5	A6	A7	B1	B2	B3	B4	B5	B6	C1	C2	C3	C4	C5	D1	D2	D3	D4	D5
Vectors and Matrices	MSO1110	X						X			X												X	
Calculus and Differential Equations	MSO1120	X		X				X	X						X								X	
Logic and Structures	MSO1130	X				X		X		X	X												X	X
Data and Information	MSO1140	X	X	X		X	X	X	X						X		X	X			X		X	X
Algorithmic Complexity and Machine Learning	CSD2101		X				X		X						X								X	
Groups and Rings	MSO2110	X						X			X												X	X
Mathematical Analysis	MSO2120	X						X	X	X	X												X	X
Problem Solving Methods	MSO2140			X		X						X				X	X	X		X	X		X	X
Computer Graphics	CSD3340		X	X			X								X			X					X	X
Artificial Intelligence	CSD3939		X	X			X								X			X					X	X
Advanced Algebra	MSO3110	X			X			X	X		X					X							X	X
Real and Complex Analysis	MSO3120	X			X			X	X		X	X				X							X	X
Communicating Mathematics	MSO3130																X			X		X	X	X
Project	MSO3140					X				X						X					X		X	X
Functional Analysis	MSO3225				X				X		X	X											X	X
Multivariate Statistics	MSO3310			X			X								X	X		X			X		X	X
Combinatorics	MSO3170		X		X				X	X	X					X							X	X
Differential Equations	MSO3220			X	X				X		X	X				X							X	X
Simulation and Decision Making	MSO3510			X			X								X	X		X			X		X	X

Module Title	Module Code by Level	Programme outcomes																					
		A1	A2	A3	A4	A5	A6	A7	B1	B2	B3	B4	B5	B6	C1	C2	C3	C4	C5	D1	D2	D3	D4	D5
Advanced Topics in Mathematics A	MSO4200				X	X		X			X			X		X	X				X		X	X
Advanced Topics in Mathematics B	MSO4250				X	X		X			X			X		X	X				X		X	X
Advanced Algebra	MSO4111	X			X				X	X						X							X	X
Real and Complex Analysis	MSO4120	X			X				X	X						X							X	X
Computer Graphics	CSD4340		X	X			X								X			X					X	X
Artificial Intelligence	CSD4939		X	X			X	X	X				X		X			X					X	X
Mathematics Reading course	MSO4101				X	X		X			X	X	X	X			X		X	X	X		X	X
Project	MSO4150				X	X		X			X	X	X	X	X		X		X		X		X	X
Functional Analysis	MSO4225				X			X				X	X			X					X		X	X
Multivariate Statistics	MSO4310			X			X								X		X	X					X	X
Combinatorics	MSO4170		X		X			X	X	X					X	X							X	X
Differential Equations	MSO4220			X	X				X						X						X		X	X
Simulation and Decision Making	MSO4510			X			X								X	X		X					X	X