

## Programme Specification



|  |                                |
|--|--------------------------------|
| <b>1. Programme title</b>  | BSc Mathematics with Computing |
| <b>2. Awarding institution</b>   | Middlesex University           |
| <b>3. Teaching institution</b>   | Middlesex University           |
| <b>4. Details of accreditation by professional/statutory/regulatory body</b> |                                |
| <b>5. Final qualification</b>  | Bachelor of Science (Honours)  |
| <b>6. Year of validation</b><br><b>Year of amendment</b>                     |                                |
| <b>7. Language of study</b>  | English                        |
| <b>8. Mode of study</b>  | Full time/Part time/TKSW       |

### **9. Criteria for admission to the programme**

Admission to the BSc (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.

### **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;
- stimulate an interest in all aspects of modern mathematics with an indication of 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.

| <b>11. Programme outcomes</b>   |  |
|---|--|
| <p><b>A. Knowledge and understanding</b></p> <p>On completion of this programme the successful student will have knowledge and understanding of:</p> <ol style="list-style-type: none"> <li>1. core areas of pure mathematics including geometry, algebra, mathematical analysis and discrete mathematics;</li> <li>2. core areas of computer science including complexity and machine learning;</li> <li>3. core areas of applied mathematics including statistics, operational research and differential equations;</li> <li>4. several specialised areas of advanced mathematics, computing and their applications;</li> <li>5. the correct use of mathematical language to express both theoretical concepts and logical argument;</li> <li>6. the use of computers both as an aid and as a tool to study problems in mathematics.</li> </ol> | <p><b>Teaching/learning methods</b></p> <p>Students gain knowledge and understanding through lectures, workshops and computer laboratory sessions where topics are introduced and explored thoroughly before moving forward.</p> <p><b>Assessment methods</b></p> <p>Students' knowledge and understanding is assessed by a combination of examinations, coursework assignments and presentations.</p>   |
| <p><b>B. Cognitive (thinking) skills</b></p> <p>On completion of this programme the successful student will be able to:</p> <ol style="list-style-type: none"> <li>1. formulate problems in appropriate theoretical frameworks to facilitate their solution;</li> <li>2. develop strategies to solve mathematical problems in a range of relevant areas;</li> <li>3. construct logical arguments solving abstract or applied mathematical problems;</li> <li>4. criticise mathematical arguments developed by themselves and others.</li> </ol>   | <p><b>Teaching/learning methods</b></p> <p>Students learn cognitive skills through working in class, in groups or independently on designated problems and theoretical content under the guidance of staff.</p> <p><b>Assessment methods</b></p> <p>Students' cognitive skills are assessed formatively in class employing group and individual working sessions, and summatively using a combination of presentations, examinations and coursework.</p> |
| <p><b>C. Practical skills</b></p> <p>On completion of the programme the successful student will be able to:</p> <ol style="list-style-type: none"> <li>1. solve practical problems in a range of areas of mathematics and computer science;</li> <li>2. determine the appropriateness of different methods of solving mathematical problems;</li> <li>3. communicate mathematics effectively to a wide range of audiences;</li> <li>4. develop and use software solve given problems.</li> </ol>  | <p><b>Teaching/learning methods</b></p> <p>Students learn practical skills through a series of hands-on sessions throughout their studies designed to explore theoretical content more thoroughly.</p> <p><b>Assessment methods</b></p> <p>Students' practical skills are assessed formatively in class employing group and individual working sessions, and summatively using a combination of presentations, examinations and coursework.</p>          |
| <p><b>D. Graduate skills</b></p> <p>On completion of this programme the</p>   | <p><b>Teaching/learning methods</b></p> <p>Students acquire graduate skills through</p>  |

|   |   |
|---|---|
| <p>successful student will be able to:</p> <ol style="list-style-type: none"> <li>1. work effectively and constructively as part of a team;</li> <li>2. motivate and communicate complex ideas accurately using a range of formats;</li> <li>3. identify and benefit from opportunities for personal and career development;</li> <li>4. work confidently and accurately with formulae and numerical information</li> <li>5. learn effectively</li> </ol> | <p>contribution in class to group and individual work, and outside class through development of assignment work.</p> <p><b>Assessment methods</b><br/>Students' graduate skills are assessed using a combination of presentations, examinations and coursework.</p> |
|---|---|

| 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]   |
| Year 2  |   |   |                                   |   |
| Term 1  | CSD2101   | MSO2110   | MSO2120                           | MSO2140   |
| Term 2  | Algorithmic Complexity and Machine Learning [30]  | Groups and Rings [30]   | Mathematical Analysis [30]        | Problem Solving Methods [30]  |
| 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<br>MSO3110 Advanced Algebra [30]<br>MSO3120 Real and Complex Analysis [30] |   | Options<br>Term 1<br>MSO3225 Functional Analysis [15]<br>MSO3310 Multivariate Statistics [15]<br>Term 2<br>MSO3170 Combinatorics [15]<br>MSO3220 Differential Equations [15]<br>MSO3510 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:<br>MSO1110<br>MSO1120<br>MSO1130<br>MSO1140   |          | Students must pass all four level 4 modules to progress |
| Level 5 (2)  |          |   |
| COMPULSORY   | OPTIONAL | PROGRESSION REQUIREMENTS                                |

|  |   |   |
|--|---|---|
| Students must take all of the following:<br>CSD2101<br>MSO2110<br>MSO2120<br>MSO2140 |   | Students must pass all four level 5 modules to progress |
| Level 6 (3)  |   |   |
| COMPULSORY   | OPTIONAL  | PROGRESSION REQUIREMENTS                                |
| Students must take all of the following:<br>MSO3130<br>MSO3140                       | Students must choose <b>one</b> of the following*:<br>CSD3340<br>CSD3939<br><br>Students must choose <b>one</b> of the following*:<br>MSO3110<br>MSO3120<br><br>Students must choose <b>30 credits</b> worth of modules from*:<br>MSO3110 (30 credit)<br>MSO3120 (30 credit)<br>MSO3225 (15 credit)<br>MSO3310 (15 credit)<br>MSO3170 (15 credit)<br>MSO3220 (15 credit)<br>MSO3510 (15 credit) |   |

\* 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 TKS 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

#### 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 *BSc 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 outcomes

| 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 <u>to</u> solve given problems                             |
| A5                          | the correct use of mathematical language to express both theoretical concepts and logical argument         |                  |   |
| A6                          | the use of computers both as an aid and as a tool to study problems in mathematics                         |                  |   |
| 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             |
|                             |  | D5               | learn effectively   |

| Programme outcomes                      |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| A1                                      | A2 | A3 | A4 | A5 | A6 | A7 | B1 | B2 | B3 | B4 | B5 | B6 | C1 | C2 | C3 | C4 | C5 | C6 | D1 | D2 | D3 | D4 | D5 | D6 | D7 |
| Highest level achieved by all graduates |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 6                                       | 6  | 6  | 6  | 6  | 6  | 6  | 6  | 6  | 6  | 6  | 6  | 6  | 6  | 6  | 6  | 6  | 6  | 6  | 6  | 6  | 6  | 6  | 6  | 6  | 6  |

| Module Title                                | Module Code by Level | Programme outcomes |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |   |   |   |   |   |   |  |
|---|----------------------|--------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|--|
|   |                      | A1                 | A2 | A3 | A4 | A5 | A6 | B1 | B2 | B3 | B4 | C1 | C2 | C3 | C4 | D1 | D2 | D3 | D4 | D5 |   |   |   |   |   |   |  |
| Vectors and Matrices                        | MSO1110              | X                  |    |    |    |    |    |    |    | X  |    |    |    |    |    |    |    |    |    |    |   |   |   |   | X |   |  |
| Calculus and Differential Equations         | MSO1120              | X                  |    | X  |    |    |    |    | X  |    |    |    |    |    | X  |    |    |    |    |    |   |   |   |   |   | X |  |
| Logic and Structures                        | MSO1130              | X                  |    |    |    | X  |    |    | X  | X  |    |    |    |    |    |    |    |    |    |    |   |   |   |   | X | X |  |
| Data and Information                        | MSO1140              | 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 |  |
| Mathematical Analysis                       | MSO2120              | 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 |  |
| Real and Complex Analysis                   | MSO3120              | X                  |    |    | X  |    |    |    | X  |    | X  | X  |    |    | X  |    |    |    |    |    |   |   |   |   | X | X |  |
| Communicating Mathematics                   | MSO3130              |                    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | X  |    | 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 | X |  |