F1MS-TAM Master of Science in Applied Mathematical Sciences

PROGRAMME DETAILS
Programme Code: F1MS-TAM
Department: Mathematics
Main Award: MSC - Master of Science
Full Award Title: Master of Science in Applied Mathematical Sciences
Level: Postgraduate Taught

LOCATION OF STUDY
Edinburgh Y Scottish Borders N Orkney N
Dubai N Malaysia N Approved Learning Partner N
Independent Distance Learners N Collaborative Learning Partner N Other N

ASSOCIATED AWARDS
Programme Code Award Title
F1MS-TAM MSC Master of Science in Applied Mathematical Sciences
F1MT-TAM PGDIP Postgraduate Diploma in Applied Mathematical Sciences
F1MU-ZZZ PGCERT Postgraduate Certificate in Applied Mathematical Sciences

ACCREDITATION
N/A

LEARNING OUTCOMES – SUBJECT MASTERY
Understanding, Knowledge and Cognitive Skills

On completion of the programme, students will be able to demonstrate:

Stage 1

-Extensive and detailed knowledge, and critical understanding, of central areas of advanced undergraduate mathematics, including analysis, multivariable calculus, applied and computational mathematics and probability and statistics;

-Extensive and detailed knowledge of the principles of Research Preparation: exploring their research community, adopting a critical perspective, establishing a rationale for doing their research, management and communication skills as part of a research project;

-Knowledge and critical understanding of certain areas in algebra and complex analysis;

-The acquisition of a range of new skills required in applied mathematics, including skills in modelling, analysis and computation; and for those who require it, Research Preparation;

-Awareness and understanding of current issues in applied mathematics, through teaching informed by current developments in industry, government policy and in applied mathematics research;

-Extensive knowledge and critical understanding of many of the principal theories and concepts of contemporary applied mathematics, and of some of the principal theories and concepts of contemporary advanced analysis, computation and
probability and statistics;

- Expertise in applying many of the principal skills, methods and techniques of applied mathematics used in research and industry and some of the principal skills, methods and techniques of advanced analysis, computation and probability and statistics;

- Extensive knowledge and understanding of problems in some or all of the following areas: linear algebra, real analysis, multivariable differential and integral calculus, probability and statistics, ordinary differential equations, applied mathematics and numerical analysis.

**Stage 2**

- Extensive and detailed knowledge, and critical understanding, of central areas in applied mathematics, including at Master's level two or more specialist areas;

- Knowledge and critical understanding of certain areas in the applied mathematics of a range of government, industry and commercial applications;

- The acquisition of a range of new skills required in applied mathematics, including skills in modelling, model and solution analysis, computation and simulation;

- Awareness and understanding of current issues in applied mathematics, through teaching informed by current developments in industry, government policy and in applied mathematics research;

- Extensive knowledge and critical understanding of many of the principal theories and concepts of contemporary applied mathematics, and of some of the principal theories and concepts of contemporary advanced analysis, modelling, model analysis, computation and simulation, probability and statistics;

- Expertise in applying, in a practical context, many of the principal skills and techniques used in applied mathematics;

- Extensive knowledge and understanding of problems in some or all of the following areas: modelling, optimization, continuum mechanics and analysis, computation and simulation, dynamical systems, applied linear algebra and two or more specialist topics in research level applied mathematics.

- The ability to manage, research, assimilate knowledge in, critically assess, analyse, write and complete a high quality lengthy dissertation on a contemporary problem in research level applied mathematics over a period of approximately 10 weeks.
**Scholarship, Enquiry and Research (Research Informed Learning)**

On completion of the programme, students will be able to:

- Demonstrate that they have developed and can apply skills in critical analysis and evaluation of a wide range of theories, concepts, and techniques which arise in the study and practice of applied mathematics including analysis, computation and simulation;

- Demonstrate that they have developed problem solving skills;

- Identify, analyse and solve problems, and discuss issues, at a professional level critically review existing practices and move on to research or professional careers with confidence.

**LEARNING OUTCOMES – PERSONAL ABILITIES**

**Industrial, Commercial and Professional Practice**

On completion of the programme, students will be in a strong position to move on to a research or professional environment, with sound knowledge and awareness of the nature of that environment and the demands it will make. They will also have the necessary background and experience to enable them to be ready and able to communicate on technical and general matters with peers and senior colleagues.

**Autonomy, Accountability and Working With Others**

On completion of the programme students will be able to:

- Plan and organise own learning through self-management and time management;

- Assess issues associated with working as part of a team;

- Communicate effectively at all levels and using a range of media.

**Communication, Numeracy & Information and Communications Technology**

On completion of the programme, students will be able to:

- Demonstrate high levels of modelling, analysis, simulation and problem solving as required by PhD or other research supervisors as well as industry supervisors and/or professionals;

- Adopt a mature and professional attitude to the solution of technical problems;
-Demonstrate use of computer packages such as matlab and related software for solving applied mathematics problems;

-Present, communicate and problem solve.

**APPROACHES TO TEACHING AND LEARNING**

Programme learning outcomes derive from the requirements of the current MSc in Applied Mathematical Sciences. Achievement of them demonstrates skill and mastery of the subject at an advanced level. Teaching on the programme is student-focussed, with students encouraged to take responsibility for their own learning and development.

The full-time MSc/Diploma course is offered in a traditional campus-based model. The material is organised within courses. All material is presented in a manner appropriate to postgraduate study. Some lecture courses may be given jointly with final-year Honours undergraduate students.

The Department uses a wide range of L&T approaches and techniques to achieve this, from traditional lectures and discussions to demanding tutorial and computer lab work. Lecturers use a range of tools from chalk/OHs to extensive use of web-based materials. Approaches to teaching and learning are continually reviewed and developed with the aim of matching them to the abilities and experiences of our students with regard to the subject area. Specific details about teaching and learning methods are provided in the appropriate course descriptors.

**EDUCATIONAL AIMS OF THE PROGRAMME**

The principal aims of the programme are to:

**Stage 1**

-Provide intensive and high-quality education in an advanced undergraduate context in a wide range of subjects in mathematical analysis, applied mathematics, computational mathematics and probability and statistics;

-Develop detailed knowledge and understanding in these key areas;

-Cultivate skills and enable students to develop original and creative solutions to problems in these key areas;

-Develop English Language skills contextualized through Research Preparation in the discipline to a level appropriate to prepare them for postgraduate taught study in Stage 2;

-Provide a challenging period of study which enables students to test themselves against standards requiring intensive
work and strong commitment in a demanding environment to prepare them for postgraduate taught study;

-Enable students to develop detailed knowledge and critical understanding, and acquire a range of new skills, in central areas of applied mathematics;

-Provide tutorial and discussion opportunities of a style and at a level appropriate to prepare them for postgraduate taught study;

-Enable students to communicate and work effectively with peers and academic staff, demonstrating appropriate levels of autonomy, initiative and responsibility.

Stage 2

-Provide intensive and high-quality education in a postgraduate context in a wide range of subjects in mathematical analysis, applied mathematics, computational mathematics and probability and statistics;

-Develop detailed knowledge and understanding in these key areas;

-Cultivate skills and enable students to develop original and creative solutions to problems in these key areas;

-Provide a challenging period of study which enables students to test themselves against standards requiring intensive work and strong commitment in a demanding postgraduate environment;

-Enable students to develop detailed knowledge and critical understanding, and acquire a range of new skills, in central areas of applied mathematics;

-Provide tutorial and discussion opportunities of a style and at a level appropriate for postgraduate taught study;

-Enable students to communicate and work effectively with peers and academic staff, demonstrating appropriate levels of autonomy, initiative and responsibility;

-Provide students at Master's level with the opportunity to plan and execute a significant investigation and write a dissertation requiring detailed and critical understanding in an area of study related to applied mathematics, and demonstrating originality.

ASSESSMENT POLICIES

The assessment policy for the programme incorporates a range of assessment types. Continuous assessment during
some courses and summative assessment at the conclusion of courses both contribute to the overall assessment and are used to formally measure achievement in specified learning outcomes.

Understanding, knowledge and subject-specific skills are assessed by coursework assignments and written examinations. Approaches to assessment are continually reviewed. Specific details about methods of assessment are provided in the appropriate course descriptors.

The programme consists of two phases:

Stage 1

A taught phase: From a set of fourteen full courses of which 5 full courses are mandatory (as defined in the programme structure) students choose courses leading to 120 credits. Assessment of the taught phase is through a variety of methods including coursework and/or examination, students must submit all elements of assessment before being permitted to progress.

Any student will be able to retake the assessment of up to a maximum of 3 courses at the next opportunity, subject to payment of the appropriate fees to the University, and may be required to do so to obtain the necessary credits for completion of their programme or for progression. Students may only resit courses for which their assessment grade is E or F. The method of reassessment for each course is specified in the appropriate course descriptor.

Stage 2

A taught phase: From a set of twenty-two full courses of which 3 full courses are mandatory (as defined in the programme structure) students will normally study eight full courses over two semesters. Assessment of the taught phase is through a variety of methods including coursework and/or examination, students must submit all elements of assessment before being permitted to progress.

A dissertation phase, consisting of a project dissertation report over the summer.

Progression to the dissertation phase is dependent on assessed performance in the taught phase in Stage 2. To progress, students must meet the standard progression requirements for the current MSc in Applied Mathematical Sciences. Students meeting the required standards for Masters in the taught phase will be permitted to progress.

Students meeting the required standards for Postgraduate Diploma and Postgraduate Certificate in the taught phase, but not meeting the Masters standard, will not be permitted to progress to the dissertation phase.

Any student will be able to retake the assessment of up to a maximum of 3 courses at the next opportunity, subject to payment of the appropriate fees to the University, and may be required to do so to obtain the necessary credits for completion of their programme or for progression. Students may only resit courses for which their examination grade is D, E or F. The method of reassessment for each course is specified in the appropriate course descriptor.
### PROGRAMME STRUCTURE

**Mandatory Courses**

<table>
<thead>
<tr>
<th>Stage</th>
<th>Semester</th>
<th>Course Code</th>
<th>Course Title</th>
<th>SCQF Cr</th>
<th>SCQF Lvl</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>C69RP</td>
<td>Research Preparation in English (1)</td>
<td>15</td>
<td>9</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>C69RQ</td>
<td>Research Preparation in English (2)</td>
<td>15</td>
<td>9</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>F11MM</td>
<td>Optimisation</td>
<td>15</td>
<td>11</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>F11MT</td>
<td>Modelling and Tools</td>
<td>15</td>
<td>11</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>F11GM</td>
<td>Masters Project and Dissertation</td>
<td>60</td>
<td>11</td>
</tr>
</tbody>
</table>

**Optional Courses**

<table>
<thead>
<tr>
<th>Stage</th>
<th>Semester</th>
<th>Course Code</th>
<th>Course Title</th>
<th>SCQF Cr</th>
<th>SCQF Lvl</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>1</td>
<td>F11AE</td>
<td>Applied Mathematics E</td>
<td>15</td>
<td>11</td>
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<tr>
<td>2</td>
<td>1</td>
<td>F11AM</td>
<td>Mathematical Ecology</td>
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<td>11</td>
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<tr>
<td>2</td>
<td>1</td>
<td>F11FM</td>
<td>Functional Analysis</td>
<td>15</td>
<td>11</td>
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<tr>
<td>2</td>
<td>1</td>
<td>F11MS</td>
<td>Modelling and Simulation in the Life Sciences</td>
<td>15</td>
<td>11</td>
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<tr>
<td>2</td>
<td>1</td>
<td>F11NC</td>
<td>Numerical ODEs</td>
<td>15</td>
<td>11</td>
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<tr>
<td>2</td>
<td>1</td>
<td>F71SM</td>
<td>Statistical Methods</td>
<td>15</td>
<td>11</td>
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<tr>
<td>2</td>
<td>2</td>
<td>F11AL</td>
<td>Applied Linear Algebra</td>
<td>15</td>
<td>11</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>F11AN</td>
<td>Mathematical Biology and Medicine</td>
<td>15</td>
<td>11</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>F11DA</td>
<td>Data Assimilation with Applications to Climate Change</td>
<td>15</td>
<td>11</td>
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<tr>
<td>2</td>
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<td>F11MP</td>
<td>Partial Differential Equations</td>
<td>15</td>
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<tr>
<td>2</td>
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<td>F11ND</td>
<td>Numerical Analysis (PDEs)</td>
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<tr>
<td>2</td>
<td>2</td>
<td>F11SS</td>
<td>Stochastic Simulation</td>
<td>15</td>
<td>11</td>
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<tr>
<td>2</td>
<td>2</td>
<td>F79BI</td>
<td>Bayesian Inference &amp; Computational Methods</td>
<td>15</td>
<td>9</td>
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</tbody>
</table>

**COMPOSITION NOTES (PG)**

Stage 1

There are two mandatory courses in Stage 1 (C69RP, C69RQ). Students should also choose 3 electives each semester from level 8 or 9 Maths (F1) or Stats (F7) subjects. Guidance is provided to students on selection of courses and course choice must be approved by the programme director. The exact courses students will study will depend on the level of: 1) Mathematics and selection of mathematics courses they have studied at University level to date; 2) English Language ability the students have on entry. Entry to higher SCQF level courses is dependent on previous qualifications. This can only be done with the approval of the Programme Director. The Research Preparation Courses C69RP and C69RQ are
F1MS-TAM Master of Science in Applied Mathematical Sciences

mandatory. With the approval of the Programme Director, a student may be permitted to replace the Research Preparation courses by other mathematics course options available on the programme. Such a decision will be based on the student's prior learning and qualifications.

Some choices of courses may not be available to students in some years because of timetabling constraints.

Progression to Stage 2 will require the following. Students will be required to achieve grade D or better in their 6 mathematics courses, and achieve at least 65% overall in these 6 courses. In addition they would have to achieve at least grade C in both of their Research Preparation courses. For those students taking 7 or 8 mathematics courses in Stage 1, they would have to achieve grade D or better in all mathematics courses, and achieve at least a 65% average in their best 6 courses. If they take one Research Preparation course, they must achieve at least a grade C. If students fail to achieve these requirements they will have the opportunity to resit courses in the Resit Diet in August, in accordance with University Regulations.

Exit at Stage 1

Students opting to leave during or after Stage 1 or not allowed to progress to Stage 2 can graduate with the exit award of the Mathematics Graduate Certificate, if they satisfy the award requirements of the Mathematics Graduate Certificate programme.

Stage 2

Stage 2 follows the same rules as the F147 - the MSc in Applied Mathematical Sciences.

<table>
<thead>
<tr>
<th></th>
<th>60</th>
<th>90</th>
<th>90</th>
<th>60</th>
<th>300</th>
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<tbody>
<tr>
<td>Mandatory</td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Optional</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elective</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Dissertation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>300</td>
</tr>
</tbody>
</table>

**AWARDS, CREDITS AND CRITERIA(PG)**

**Awards, Credits and Levels**

<table>
<thead>
<tr>
<th></th>
<th>Overall Credits</th>
<th>Specific Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Masters Degree</td>
<td>300</td>
<td>300 SCQF credits including a minimum of 150 credit at Level 11</td>
</tr>
<tr>
<td>Postgraduate Diploma</td>
<td>240</td>
<td>240 SCQF credits including a minimum of 120 credit at Level 11</td>
</tr>
<tr>
<td>Postgraduate Certificate</td>
<td>180</td>
<td>180 SCQF credits including a minimum of 60 credit at Level 11</td>
</tr>
</tbody>
</table>

**Award Requirements**

<table>
<thead>
<tr>
<th></th>
<th>Total Course Passes</th>
<th>Overall Mark</th>
<th>Overall Grade</th>
<th>Basis of Overall Mark/Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master (Distinction)</td>
<td>8+Dissertation</td>
<td>70</td>
<td>A</td>
<td>Weighted Average &gt;=70% over 8 courses in Stage 2 at grades A-C, with the majority of the courses at grade A, plus a dissertation at grade A.</td>
</tr>
<tr>
<td>Master</td>
<td>8+Dissertation</td>
<td>50</td>
<td>C</td>
<td>Weighted Average &gt;=50% over 8 courses in Stage 2 at grades A-D, with the majority of the courses at grade C or above, plus a dissertation at grade C or above.</td>
</tr>
<tr>
<td>Diploma (Distinction)</td>
<td>8</td>
<td>70</td>
<td>A</td>
<td>Weighted Average &gt;=70% over 8 courses in Stage 2 at grades A-C, with the majority of the courses at grade A, plus a dissertation at grade A.</td>
</tr>
</tbody>
</table>
F1MS-TAM Master of Science in Applied Mathematical Sciences

| Diploma | 8 | 40 | D | Weighted Average >=40% over 8 courses in Stage 2 at grades A-E, with the majority of the courses at grade D or above. |
| Certificate | 4 | 40 | D | Weighted Average >=40% over 4 courses in Stage 2 at grades A-E, with the majority of the courses at grade D or above. |

### DURATION OF STUDY

<table>
<thead>
<tr>
<th>IN MONTHS</th>
<th>Full-time</th>
<th>Part-time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diploma</td>
<td>21</td>
<td>45</td>
</tr>
<tr>
<td>Certificate</td>
<td>16</td>
<td>40</td>
</tr>
<tr>
<td>Masters</td>
<td>12</td>
<td>24</td>
</tr>
</tbody>
</table>

### RE-ASSESSMENT (PG)

1. A student who has been awarded a Grade E or F in a course may be re-assessed in that course. A student who has been awarded a Grade D in a course may be re-assessed in that course in order to proceed to or be eligible to receive the award of Masters.
2. At each stage, a student shall be permitted only one re-assessment opportunity in a maximum of three taught courses. The opportunity for re-assessment in four or more taught courses shall be at the discretion of the Progression Board.
3. Any further re-assessment opportunities in a course will require the approval of the Postgraduate Studies Committee.
4. A student may be permitted, at the discretion of the Progression Board, to be re-assessed in the dissertation, project or other supervised research component of the course of study.

### PROGRESSION TO DISSERTATION/PROJECT

Note that Stage 1 contributes to the accumulation of credits only and does not contribute to the MSc qualification. In Stage 2, and thus overall, the progression and award requirements match those for the current MSc in Applied Mathematical Sciences.