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 MSc App Maths Sci (2 Years)
F1MT-TAM PGDIP Postgraduate Diploma Applied Mathematical Sciences (2 Years)
F1MU-ZZZ PGCERT Postgraduate Certificate Applied Mathematical Sciences (2 Years)

ACREDITATION
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
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.
### Research Preparation in English (1)
- **Course Code**: C69RP
- **Course Title**: Research Preparation in English (1)
- **SCQF Cr**: 15
- **SCQF Lvl**: 9

### Linear Algebra
- **Course Code**: F18CF
- **Course Title**: Linear Algebra
- **SCQF Cr**: 15
- **SCQF Lvl**: 8

### Research Preparation in English (2)
- **Course Code**: C69RQ
- **Course Title**: Research Preparation in English (2)
- **SCQF Cr**: 15
- **SCQF Lvl**: 9

### Numerical Analysis A
- **Course Code**: F18NA
- **Course Title**: Numerical Analysis A
- **SCQF Cr**: 15
- **SCQF Lvl**: 8

### Ordinary Differential Equations
- **Course Code**: F19MO
- **Course Title**: Ordinary Differential Equations
- **SCQF Cr**: 15
- **SCQF Lvl**: 9

### Optimisation
- **Course Code**: F11MM
- **Course Title**: Optimisation
- **SCQF Cr**: 15
- **SCQF Lvl**: 11

### Modelling and Tools
- **Course Code**: F11MT
- **Course Title**: Modelling and Tools
- **SCQF Cr**: 15
- **SCQF Lvl**: 11

### Dynamical Systems
- **Course Code**: F11AS
- **Course Title**: Dynamical Systems
- **SCQF Cr**: 15
- **SCQF Lvl**: 11

### Masters Project and Dissertation
- **Course Code**: F11GM
- **Course Title**: Masters Project and Dissertation
- **SCQF Cr**: 60
- **SCQF Lvl**: 11

### Applied Mathematics A
- **Course Code**: F18AA
- **Course Title**: Applied Mathematics A
- **SCQF Cr**: 15
- **SCQF Lvl**: 8

### Multivariable Calculus and Real Analysis A
- **Course Code**: F18CD
- **Course Title**: Multivariable Calculus and Real Analysis A
- **SCQF Cr**: 15
- **SCQF Lvl**: 8

### Vector Analysis
- **Course Code**: F19MV
- **Course Title**: Vector Analysis
- **SCQF Cr**: 15
- **SCQF Lvl**: 9

### Probability and Statistics A
- **Course Code**: F78PA
- **Course Title**: Probability and Statistics A
- **SCQF Cr**: 15
- **SCQF Lvl**: 8

### Multivariable Calculus and Real Analysis B
- **Course Code**: F18CE
- **Course Title**: Multivariable Calculus and Real Analysis B
- **SCQF Cr**: 15
- **SCQF Lvl**: 8

### Applied Mathematics B
- **Course Code**: F19AB
- **Course Title**: Applied Mathematics B
- **SCQF Cr**: 15
- **SCQF Lvl**: 9

### Complex Analysis
- **Course Code**: F19MC
- **Course Title**: Complex Analysis
- **SCQF Cr**: 15
- **SCQF Lvl**: 9

### Numerical Analysis B
- **Course Code**: F19NB
- **Course Title**: Numerical Analysis B
- **SCQF Cr**: 15
- **SCQF Lvl**: 9

### Probability and Statistics B
- **Course Code**: F78PB
- **Course Title**: Probability and Statistics B
- **SCQF Cr**: 15
- **SCQF Lvl**: 8

### Applied Mathematics E
- **Course Code**: F11AE
- **Course Title**: Applied Mathematics E
- **SCQF Cr**: 15
- **SCQF Lvl**: 11

### Mathematical Ecology
- **Course Code**: F11AM
- **Course Title**: Mathematical Ecology
- **SCQF Cr**: 15
- **SCQF Lvl**: 11

### Functional Analysis
- **Course Code**: F11FM
- **Course Title**: Functional Analysis
- **SCQF Cr**: 15
- **SCQF Lvl**: 11

### Numerical ODEs
- **Course Code**: F11NC
- **Course Title**: Numerical ODEs
- **SCQF Cr**: 15
- **SCQF Lvl**: 11

### Pure Mathematics E
- **Course Code**: F11PE
- **Course Title**: Pure Mathematics E
- **SCQF Cr**: 15
- **SCQF Lvl**: 11

### Biologically Inspired Computation
- **Course Code**: F21BC
- **Course Title**: Biologically Inspired Computation
- **SCQF Cr**: 15
- **SCQF Lvl**: 11

### Data Mining and Machine Learning
- **Course Code**: F21DL
- **Course Title**: Data Mining and Machine Learning
- **SCQF Cr**: 15
- **SCQF Lvl**: 11

### Software Engineering Foundations
- **Course Code**: F21SF
- **Course Title**: Software Engineering Foundations
- **SCQF Cr**: 15
- **SCQF Lvl**: 11
Stage 1

There are five mandatory courses in Stage 1 (F18CF, F18NA, F19MO, C69RP, C69RQ). All other courses in Stage 1 are optional. Students may choose any courses leading to a minimum of 120 credits. Guidance is provided to students on selection of courses. 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. Students may be permitted to substitute other mathematics courses for the MANDATORY courses if they have covered the material before. This can only be done with the approval of the Programme Director. Some course combinations may be ruled out by the timetable. The Research Preparation Courses C69RP1 and C69RQ2 are mandatory. Again, 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. Again, such a decision will be based on the student's prior learning and qualifications.

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

Three mandatory courses (F11MT, F11MM, F11AS) and with five further optional courses totalling 120 credits.

Students cannot do both F21BC and F21DL. They can only do one or the other.

Subject to meeting the requirements below, students may proceed to the Dissertation Stage of the programme.

| Mandatory Credits | 120 |
| Total Credits | 300 |

AWARDS, CREDITS AND CRITERIA (PG)

<table>
<thead>
<tr>
<th>Awards, Credits and Levels</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>Award Requirements</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>Masters (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.</td>
</tr>
<tr>
<td>Diploma</td>
<td>8</td>
<td>40</td>
<td>D</td>
<td>Weighted Average &gt;=40% over 8 courses in Stage 2 at grades A-E, with the majority of the courses at grade D or above.</td>
</tr>
<tr>
<td>Certificate</td>
<td>4</td>
<td>40</td>
<td>D</td>
<td>Weighted Average &gt;=40% over 4 courses in Stage 2 at grades A-E, with the majority of the courses at grade D or above.</td>
</tr>
</tbody>
</table>

DURATION OF STUDY
### 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

In accordance with University Regulations, to progress to Masters level a minimum of Grade C is required.