

### 4.3. Programme structure

The programme MSc Applied Mathematics is a single-stage, 90 ECTS programme. ECTS denotes European Credit Transfer and Accumulation System and is a measurement of the student workload. It is used within TU Dublin to denote the learning credits associated with any module. A total of 5 ECTS is equivalent to a student study workload of 100 hours. These hours are a combination of contact with lecturers which may be asynchronous online, synchronous online or face-to-face (through lectures, tutorials, practical sessions, laboratory sessions and group study sessions) and self-directed study.

The 10 ECTS modules of this programme have a significantly greater requirement for autonomous learning. In addition to preparing for lectures, undertaking solutions to example sheets, reflecting upon the lecture material, refining and deepening understanding and consolidating individual learning, the additional self-directed learning hours for these modules allow for substantial independent learning on specific topics. In particular, learning will be student-driven for aspects of some topics. The self-directed topics may vary annually and be specified by the lecturer. The independent learning will be assessed. A substantial emphasis on laboratory work and application focussed exercises may be contained within a module.

The timetable for the programme is designed to provide flexibility to the students and classes are delivered two evenings, two nights per week and are through a blended-learning approach with a mix of synchronous/asynchronous online and pre-planned in-person on-campus lectures, tutorials and software laboratories.

For online delivery the recording of synchronous sessions will be made available for later viewing by students, however attendance at synchronous sessions is expected from students. For some modules a flipped classroom approach may be used, with pre-recorded material viewed in conjunction with synchronous classes. The in-person on-campus lectures, tutorials and laboratory classes are delivered in blocks across the semester and may be supported by asynchronous online material. Interaction outside of 'class-time' is also possible via other routes, e.g. discussion boards.

#### List of modules for TU276 MSc Applied Mathematics

Module	Title	ECTS Credits	Semester
MATH9956	Introduction to Mathematical & Statistical Case Studies	10	1
MATH9973	Numerical Methods and Machine Learning for Differential Equations	5	1
MATH9974	Biomathematics	10	1
MATH9975	Software Laboratory	5	1
MATH9954	Mathematical and Statistical Modelling with Case Studies	10	2
MATH9977	Computational Statistics	5	2
MATH9952	Modern Regression Modelling	10	2
ENTR1003	Global Citizenship in the Workplace	5	2
MATH9976	Research Skills	5	3
MATH9955	Project	25	3

Students enter the programme in September and study the programme over a period of three semesters. Semester 1 consists of four core modules, Semester 2 of two core and two optional

modules and, in Semester 3, students undertake the Project. In preparation for the Project the Research Skills module commences towards the end of Semester 2 and is completed early in Semester 3 (assessment is in Semester 3).

### Schedule of delivery for TU276 MSc Applied Mathematics

Semester	Online (Synchronous/asynchronous)	In-person*
	Two evenings a week	One evening a week in blocks <i>e.g., Week 1, Week 4, Week 7, Week 10</i>
<b>Semester 1 (Sept – Jan)</b>	<ul style="list-style-type: none"> <li>Numerical Methods and Machine Learning for Differential Equations</li> <li>Biomathematics</li> </ul>	<ul style="list-style-type: none"> <li>Introduction to Mathematical &amp; Statistical Case Studies</li> <li>Software Laboratory</li> </ul>
<b>Semester 2 (Jan – May)</b>	<ul style="list-style-type: none"> <li>Modern Regression Modelling</li> <li>Computational Statistics</li> </ul>	<ul style="list-style-type: none"> <li>Mathematical and Statistical Modelling with Case Studies</li> <li>Global Citizenship in the Workplace</li> <li>Research Skills (<i>weeks 9 &amp; 12 only</i>)</li> </ul>
<b>Semester 3 (Sept – Jan)</b>	<ul style="list-style-type: none"> <li>Project (alternative times may be agreed with project supervisor for individual meetings)</li> <li>Research Skills (<i>weeks 1 &amp; 2</i>)</li> </ul>	

\* In-person may be supported by asynchronous online

### Description of module workload and assessment

Module	Title	Lecture (hrs)	Tutorial/ Lab (hrs)	Self-study (hrs)	Total (hrs)	Assessment
Semester 1						
MATH9956	Introduction to Mathematical & Statistical Case Studies	34	5	161	200	CA (100%)
MATH9973	Numerical Methods and Machine Learning for Differential Equations	29	10	61	100	2hr Exam (60%) CA (40%)
MATH9974	Biomathematics	34	5	161	200	3hr Exam (60%) CA (40%)
MATH9975	Software Laboratory	–	12	88	100	CA (100%)
Semester 2						
MATH9954	Mathematical and Statistical Modelling with Case Studies	34	5	161	200	CA (100%)
ENTR1003	Global Citizenship in the Workplace	30	-	70	100	CA (100%)
MATH9952	Modern Regression Modelling	34	5	161	200	3hr Exam (50%) CA (50%)
MATH9977	Computational Statistics	29	10	61	100	CA (100%)
Semester 2						
MATH9976	Research Skills	–	12	88	100	CA (100%)
MATH9955	Project	–	13	487	500	CA (100%)

#### 4.3.1. Project

As part of the MSc Applied Mathematics, students are required to undertake a substantial project. The project is associated with a workload of 25 ECTS and students embark upon the project module upon successful completion of modules in Semester 1 and Semester 2. In exceptional circumstances students may request permission to proceed to the project having successfully completed at least 55 ECTS.

The project is a guided learning project but requires a substantial degree of self-directed learning in association with an allocated supervisor. An important part of the project is developing the ability to interact, communicate and exchange ideas with other students. Projects may be undertaken in parallel with other learners and involve group supervision. However, projects must be solely a student's own work and must not be written in conjunction with any other individual. Students are required to include a declaration that the project represents their own individual work and that where other work is utilised to provide necessary background it has been clearly referenced. Projects will be assessed on the original work of the student.

#### 4.3.1.1. Project Assignment and Approval

Students will decide upon a provisional project topic early in their Research Skills module and as part of the module submit a project proposal and outline workplan. This workplan and a detailed timeline including targets and objectives which will be regularly monitored and updated will form an important part of the ongoing work of the project. The proposal and outline workplan, which include the title of the project, must be approved by the Programme Coordinator. This will take place prior to the end of the semester preceding the start of the project so that preparatory reading and study may be undertaken prior to starting the project with an allocated supervisor. The project will be based upon a topic closely related to modules on the programme and will often include an extensive literature review of a specific module topic.

#### 4.3.1.2. Role of the supervisor and monitoring

The responsibility for the successful completion of the project module lies with the individual student. The project supervisor will be allocated by the Programme Coordinator prior to the commencement of the project appropriate to the project outline developed as part of the preliminary Research Skills module.

The project supervisor will provide academic input and supervision of a project to students, guiding their academic learning of a topic as stipulated in the contact hours given in the module syllabus. Students will be required to submit regular progress reports to their supervisor. The Year Tutor will arrange meetings of project students where students will communicate their progress, discuss ideas, and exchange insights with their peers. A student's contribution to this group element will contribute to his/her final project module mark. Concerns about an individual student's progress or engagement with a project will be notified to the Programme Coordinator by the supervisor or Year Tutor. It is the responsibility of the student to submit the final project within the deadlines and requirements of the module and the candidate assumes responsibility for the quality and content of all elements of their submission. If students have any concerns about their progress or supervision, they should speak in the first instance to their supervisor and then, if necessary, contact the Year Tutor immediately.

The project supervisor will primarily assist with the learning and understanding of the academic content of the topic but will also give guidance in terms of the presentation of the project in a formal academic style. However, formatting, referencing and typesetting requirements for the project will be described (together with an introduction to Latex or other appropriate typesetting software) during the Research Skills module. Supervisors are not responsible for correcting large numbers of typographical or formatting errors or rewriting English. Students must proof-read all their work adequately for errors and to ensure that the use of English is acceptable and adequately communicates an understanding before sharing it with their supervisor. Assistance in academic writing is available from the Academic Writing Centre (<http://www.tudublin.ie/awc/>).

#### 4.3.1.3. Assessment

Projects are required to be submitted by 5pm on Wednesday of week 14 of the academic calendar. In extraordinary circumstances students may apply for an extension to this deadline. Requests for extensions must be accompanied by documentary evidence of extenuating circumstances and are approved by the Programme Coordinator. The granting of an extension may delay examination of the project and the date of graduation. In some cases, additional fees may apply.

The project will be assessed in accordance with the assessment criteria set out in the syllabus based upon students' written work, any interim submissions, feedback on their conduct, contributions to group sessions, and an assessment of their understanding and communication of their work. In normal circumstances students will be required to make a presentation of their work and answer questions in a viva voce examination. Candidates must make themselves available during the normal academic year, following the submission of their project, for this examination. The project supervisor and internal examiner(s) nominated by the Programme Coordinator will be responsible for the assessment of the project in consultation with the external examiner of the programme. The external examiner will be invited to attend student presentations.