Programme Information		
Programme Title	Programme Code	HECoS Code
Applied Mathematics Applied Mathematics (Scientific Computing & Machine Learning)	G1U2 / G1U224 G1U201 / G1U202	For Registry Use Only

Award	Length of Study	Mode of Study	Entry Point(s)	Total Credits	
				ECTS	CATS
MSc - G1U2 / G1U201	1 Calendar Year (12 months)	Full-Time	Annually in October	90	180
MSc - G1U224 / G1U202	2 Calendar Years (24 months)	Part-Time	Annually in October	90	180
PG Diploma – G1U2D	N/A	N/A	*	60	120
PG Certificate – G1U2C	N/A	N/A	*	30	60
*The PG Certificate and PG Diploma are exit awards and are not available for entry. You must apply to and join the MSc. Exit awards do not include the stream in the title.					

Ownership			
Awarding Institution	Imperial College London	Faculty	Faculty of Natural Sciences
Teaching Institution	Imperial College London	Department	Mathematics
Associateship	Diploma of Imperial College (DIC)	Main Location(s) of Study	South Kensington Campus
External Reference			
Relevant QAA Benchmark Statement(s) and/or other external reference points		Mathematics, Statistics and Operational Research	
FHEQ Level		Level 7	
EHEA Level		2nd Cycle	
External Accreditor(s) (if applicable)			
External Accreditor 1:	N/A		
Accreditation received:	N/A	Accreditation renewal:	N/A
Collaborative Provision			
Collaborative partner	Collaboration type	Agreement effective date	Agreement expiry date
N/A	N/A	N/A	N/A

Specification Details	
Programme Lead	Dr Dante Kalise
Student cohorts covered by specification	2024-25 entry
Date of introduction of programme	October 21
Date of programme specification/revision	April 2024

Programme Overview

This course will provide you with outstanding training in many different aspects of Applied Mathematics.

We offer a great variety of modules with depth of instruction, small classes and a substantial research project. The very broad choice of modules and research projects available covers all areas of applied mathematics and mathematical physics, reflecting the very broad research interests of members of the Applied Mathematics and Mathematical Physics section of the Department of Mathematics. Particular strengths include fluid dynamics, mathematical modelling, numerical analysis and scientific computation, mathematical physics, mathematical biology, applied analysis of PDEs and stochastic differential equations, asymptotic and perturbation methods, data, networks and complexity science. In addition, we offer a programme stream on Scientific Computing & Machine Learning (SCML) for students wishing to develop a core expertise at the interface between modern computational mathematics and data-driven modelling.

You will be able to choose 8 modules from the list of Applied Mathematics modules (typically 20-25 modules), 4 in the autumn term and 4 in the spring term; there are no other restrictions and there are no mandatory core modules (except the research project). However, students are encouraged to balance coursework and exam based modules, with a nominal limit of 2 coursework-based modules per term (exceptions can be discussed with the Course Director).This will allow you to design your own learning plan in line with your unique background, interests and the field in which your wish to do your research project. Students can register in the SCML stream until before the end of autumn term, when project allocation happens. They must comply with the same ECTS requirements of the programme, with the constraint that they are required to complete at least 4 modules from a subset of 9 aligned modules. Entry to the SCML stream can be limited based on aligned project availability.

A list of projects is published early on in the year. With this list as a starting point for further discussion, and with guidance from your personal tutor, you will engage with potential supervisors to agree on a topic for your individual research project. You will begin to work on your project during the spring term, alongside your course work, and then full-time over the summer. Students taking part in the SCML stream must develop a project on a topic related to Scientific Computing and/or mathematical aspects of Machine Learning. Projects and supervisors that are suitable for the SCML stream will be made available early in the year. Individual project proposals are welcome subject to course director approval. It may be possible for projects to be carried out partly or wholly at an external organisation and requests will be considered on a case by case basis.

The skill set obtained during the Applied Mathematics MSc programme is well suited for continuing to PhD level research in applied mathematics. It is also highly transferable, which opens opportunities for a career in industry or

Learning Outcomes

Students who have fulfilled all the requirements of the programme will be awarded a MSc. On successful completion of the programme, our aim is that you will have achieved the following Learning Outcomes (divided into three groups):

1) Outcomes from modules element
   a) Explore the role of logical mathematical argument and deductive reasoning, and apply them through formal processes of mathematical proof and development of mathematical theories.
   b) Operate symbolic and numerical software as apart of practical computation
   c) Manipulate precise and intricate ideas and construct logical arguments using appropriate terminology.
   d) Communicate effectively using a variety of modes and media including written, oral and digital forms.

2) Advanced outcomes from modules element
   a) Exercise deep conceptual understanding of one or more branches of applied mathematics
   b) Use mathematics as a language in a wide range of situations relevant to research and industry
   c) Demonstrate independent learning of mathematical constructions and methods
   d) Solve problems using appropriate mathematical and research toolboxes, including modelling, analytical and computational skills.
   e) Assimilate a large body of complex concepts and their inter-relationships.
   f) Solve open-ended problems and problems with well-defined solutions by formulating problems in precise terms, identifying key issues and trying different approaches in order to make progress.

3) Outcomes from research-project element
   a) Demonstrate critical thinking and creativity and innovatively apply mathematical skills to tackle complex research problems
   b) Design a research project with set hypotheses and objectives within the context of a wide body of scientific literature that you have reviewed.
   c) Communicate your expertise in relation to a particular research topic, both orally and in writing.

Students not eligible for a MSc degree, may be awarded exit awards (see "Progression and Classification"). Our aim is that a student awarded a (i) PG Certificate based on 4 modules would achieve the outcomes in group 1; (ii) PG Certificate based on the project element would achieve the outcomes in groups 3; (iii) PG Diploma based on 8 modules would achieve the outcomes in groups 1 and 2; (iv) PG Diploma based on 4 modules and the project element would achieve the outcomes in groups 1 and 3.

The Imperial Graduate Attributes are a set of core competencies which we expect students to achieve through completion of any Imperial degree programme. The Graduate Attributes are available at: www.imperial.ac.uk/about/education/our-graduates/

Entry Requirements	
Academic Requirement	Normally a 2.1 Honours degree in mathematics, applied mathematics or a related subject, such as engineering or physics. For further information on entry requirements, please go to PG: www.imperial.ac.uk/study/apply/postgraduate-taught/entry- requirements/accepted-qualifications/
Non-academic Requirements	N/A
English Language Requirement	Standard requirement (PG) Please check for other Accepted English Qualifications
Admissions Test/Interview	N/A

The programme's competency standards documents are available from the department.

Learning & Teaching Approach

Learning and Teaching Delivery Methods

Modules (autumn and spring terms) will be delivered by lectures, problem classes, office hours, problem sheets for independent work, and assessed coursework problem sets and mini-projects.

The project element (spring and summer terms) will involve independent research and literature review and individual student/supervisor meetings.

Individual guidance and support will be provided through meetings with personal tutors.

Overall Workload

Your overall workload consists of face-to-face sessions and independent learning. While your actual contact hours may vary according to the optional modules you choose to study, the following gives an indication of how much time you will need to allocate to different activities at each level of the programme. At Imperial, each ECTS credit taken equates to an expected total study time of 25 hours. Therefore, the indicative total study time is 2250

hours over the entire MSc programme (including the summer), this being composed of roughly 1500 hours associated with modules and 750 hours with the research project. As these are indicative study times, you may need to make reasonable adjustments to these suggested times to account for your individual learning style.

You will spend around 300 hours in lectures, problem classes and tutorials over the entire MSc programme. The remaining time is for self-study (including project work) and meetings with your project supervisor.

Assessment Strategy

Assessment Methods

Formative assessment of modules: Coursework, mini-projects and quizzes (from 10% to 100% of module mark depending on module).

Summative assessment of modules: Written or oral examination (from 0% to 90% of module mark depending on module).

Summative assessment of research project:

- Oral presentations (10% of research-project mark)
- Dissertation (90% of research-project mark)

Academic Feedback Policy

Any assessed coursework done as part of a module will be marked and returned to the student within two weeks. Students are encouraged to discuss difficulties with the module lecturer.

There is access to lecturers informally and through a formal 'office hours' system. Meetings with personal tutors are held twice a term. Another feedback channel is through the student representatives, which also take part in staff-student committee meetings.

On the project, students will meet their supervisor, typically weekly, to discuss their progress. They should choose modules to complement their project, and discuss their work on these with their supervisor.

Students will submit an early report to their project supervisor (shortly following the May-June examinations), formulated as an extended project proposal, which may include a literature review, description of the problem to be addresses and its background, and preliminary results if available. The project supervisors will meet with the students shortly afterwards to provide the student with feedback on their progress.

The students will also receive comments on their project report and oral presentations.

Re-sit Policy

Imperial's Policy on Re-sits is available at: www.imperial.ac.uk/about/governance/academic-governance/academic-policy/exams-and-assessment/

Mitigating Circumstances Policy

Imperial's Policy on Mitigating Circumstances is available at: www.imperial.ac.uk/about/governance/academic-governance/academic-policy/exams-and-assessment/

Additional Programme Costs

No additional costs are anticipated.

Important notice: The Programme Specifications are the result of a large curriculum and pedagogy reform implemented by the Department and supported by the Learning and Teaching Strategy of Imperial College London. The modules, structure and assessments presented in this Programme Specification are correct at time of publication but might change as a result of student and staff feedback and the introduction of new or innovative approaches to teaching and learning. You will be consulted and notified in a timely manner of any changes to this document.

Programme Structure[1]

FHEQ Level 7

MSc Applied Mathematics
Full-time students choose 4 modules in term 1 and 4 modules in term 2. Work on the individual research project should begin during term 2, with the majority of the work carried out during term 3 and the summer. Part-time students choose 4 modules in Year 1 and 4 modules in Year 2 (2 modules per term). They normally spread the work on the project over both years.

MSc Applied Mathematics (Scientific Computing & Machine Learning)
Students in this stream must comply with the same ECTS requirement of the programme, with the restriction that at least 4 of their modules must be chosen from Group A.

Code	Module Title	Core/ Elective	Group	Term	Credits
MATH70001	Fluid Dynamics 1	Elective	-	Autumn	7.5
MATH70002	Fluid Dynamics 2	Elective	-	Spring	7.5
MATH70003	Introduction to Geophysical Fluid Dynamics (not running 2024-25)	Elective	-	Spring	7.5
MATH70051	Vortex Dynamics	Elective	-	Spring	7.5
MATH70052	Hydrodynamic Stability	Elective	-	Spring	7.5
MATH70004	Asymptotic Methods	Elective	-	Autumn	7.5
MATH70005	Optimisation	Elective	A	Autumn	7.5
MATH70006	Applied Complex Analysis	Elective	-	Autumn	7.5
MATH70007	Dynamics of Learning and Iterated Games	Elective	-	Autumn	7.5
MATH70008	Dynamical Systems	Elective	-	Autumn	7.5
MATH70009	Bifurcation Theory	Elective	-	Spring	7.5
MATH70053	Random Dynamical Systems and Ergodic Theory (Seminar Course)	Elective	-	Spring	7.5
MATH70010	Geometric Mechanics	Elective	-	Spring	7.5
MATH70011	Classical Dynamics	Elective	-	Autumn	7.5
MATH70012	Mathematical Finance: An Introduction to Option Pricing	Elective	-	Autumn	7.5
MATH70014	Mathematical Biology	Elective	-	Autumn	7.5
MATH70015	Quantum Mechanics 1	Elective	-	Autumn	7.5
MATH70016	Special Relativity and Electromagnetism	Elective	-	Autumn	7.5

[1]In some cases, students may also take modules from the Department's MSc Pure Mathematics (www.imperial.ac.uk/mathematics/postgraduate/msc/msc-in-pure-mathematics/modules/) and in exceptional cases certain modules from other Master's courses in the department and college, with approval of the involved programme.. In any case, no more than 15 ECTS points (divided between at most two modules) can be taken from outside the list therein.

.MATH70017	Tensor Calculus and General Relativity	Elective	-	Spring	7.5
MATH70018	Quantum Mechanics 2	Elective	-	Spring	7.5
MATH70054	Introduction to Stochastic Differential Equations and Diffusion Processes	Elective	A	Autumn	7.5
MATH70019	Theory of Partial Differential Equations	Elective	-	Autumn	7.5
MATH70020	Function Spaces and Applications	Elective	-	Autumn	7.5
MATH70021	Advanced Topics in Partial Differential Equations	Elective	-	Spring	7.5
MATH70022	Finite Elements: Numerical Analysis and Implementation	Elective	A	Spring	7.5
MATH70023	Computational Dynamical Systems	Elective	A	Autumn	7.5
MATH70024	Computational Linear Algebra	Elective	A	Autumn	7.5
MATH70025	Computational Partial Differential Equations	Elective	A	Spring	7.5
MATH70026	Methods for Data Science	Elective	A	Spring	7.5
MATH70027	Scientific Computation	Elective	A	Autumn	7.5
MATH70031	Markov Processes	Elective	-	Autumn	7.5
MATH70130	Stochastic Differential Equations in Financial Modelling	Elective	-	Autumn	7.5
MATH70134	Mathematical Foundations of Machine Learning	Elective	A	Spring	7.5
MATH70135	Analytic Methods in Partial Differential Equations	Elective	-	Spring	7.5
MATH70137	Mathematical Biology 2: Systems Biology	Elective	-	Spring	7.5
MATH70142	The Mathematics of Business and Economics	Elective	-	Spring	7.5
MATH70138	Rough Paths and Applications to Machine Learning	Elective	-	Spring	7.5
MATH70139	Spatial Statistics	Elective	-	Spring	7.5
MATH70140	Geometric Complex Analysis	Elective	-	Spring	7.5
MATH70141	Introduction to Game Theory	Elective	-	Autumn	7.5
MATH70143	Dynamics, Symmetry and Integrability	Elective	-	Spring	7.5
TBC MATH146	Advanced Dynamical Systems	Elective	-	Spring	7.5
MATH70147	Statistical Mechanics	Elective	-	Autumn	7.5
MATH70087	Applied Mathematics Research Project	Core	-	Summer	30
				Credit Total	90

Core modules are those which serve a fundamental role within the curriculum, and for which achievement of the credits for that module is essential for the achievement of the target award. Core modules must therefore be taken and passed in order to achieve that named award. **Compulsory** modules are those which are designated as necessary to be taken as part of the programme syllabus. Compulsory modules can be compensated. **Elective** modules are those which are in the same subject area as the field of study and are offered to students in order to offer an

element of choice in the curriculum and from which students are able to select. Elective modules can be compensated.

Progression and Classification

Award and Classification for Postgraduate Students

Award of a MSc Degree
To qualify for the award of the Applied Mathematics MSc degree you must have:

1. accumulated credit to the value of no fewer than 90 credits at level7;
2. and no more than 15 credits as a Compensated Pass;

Exit Degrees:

Award of a Postgraduate Certificate (PG Cert)
To qualify for the award of a postgraduate certificate you must have a minimum of 30 credits at Level 7. This may be composed of the project element (worth 30 ECTS), or 30 ECTS worth of modules.

Award of a Postgraduate Diploma (PG Dip)
To qualify for the award of a postgraduate diploma you must have passed modules to the value of no fewer than 60 credits at Level 7 and no more than 10 credits as a Compensated Pass. The 60 credits may include the project element (worth 30 ECTS) and 30 ECTS worth of elective modules, or 60 ECTS worth of elective modules.

Classification of Postgraduate Taught Awards

The university sets the class of Degree that may be awarded as follows:

1. Distinction: 70.00% or above
2. Merit: 60.00% or above but less than 70.00%.
3. Pass: 50.00% or above but less than 60.00%.

For a Masters, your classification will be determined through the Programme Overall Weighted Average and the designated dissertation or final major project module meeting the threshold for the relevant classification band.

Your degree algorithm provides an appropriate and reliable summary of your performance against the programme learning outcomes. It reflects the design, delivery, and structure of your programme without unduly over-emphasising particular aspects.

Programme Specific Regulations

N/A

Supporting Information
The Programme Handbook is available at: www.imperial.ac.uk/mathematics/postgraduate/msc/msc-in-applied-mathematics/current-students/
The Module Handbook is available at: www.imperial.ac.uk/mathematics/postgraduate/msc/msc-in-applied-mathematics/modules/
Imperial's entry requirements for postgraduate programmes can be found at: www.imperial.ac.uk/study/pg/apply/requirements
Imperial's Quality & Enhancement Framework is available at: www.imperial.ac.uk/registry/proceduresandregulations/qualityassurance
Imperial's Academic and Examination Regulations can be found at: www.imperial.ac.uk/about/governance/academic-governance/regulations
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This document provides a definitive record of the main features of the programme and the learning outcomes that you may reasonably be expected to achieve and demonstrate if you take full advantage of the learning opportunities provided. This programme specification is primarily intended as a reference point for prospective and current students, academic and support staff involved in delivering the programme and enabling student development and achievement, for its assessment by internal and external examiners, and in subsequent monitoring and review.