Imperial College London

Programme Specification (Master's Level)

MSc Pure Mathematics

This document provides a definitive record of the main features of the programme and the learning outcomes that a typical student may reasonably be expected to achieve and demonstrate if s/he takes full advantage of the learning opportunities provided. This programme specification is intended as a reference point for prospective students, current students, external examiners and academic and support staff involved in delivering the programme and enabling student development and achievement.

Programme Information				
Programme Title	Pure Mathematics			
Award(s)	MSc			
Programme Code	G1U3 (1YFT)	G1U324 (2YPT)		
Awarding Institution	Imperial College London			
Teaching Institution	Imperial College London			
Faculty	Faculty of Natural Sciences			
Department	Department of Mathematics			
Main Location of Study	South Kensington Campus			
Mode and Period of Study	1 academic year, full-time			
	2 academic years, part-time			
Cohort Entry Points	Annually in October			
Relevant QAA Benchmark Statement(s) and/or other external reference points	Mathematics, Statistics and Operational Research			
Total Credits	ECTS:	90	CATS:	180
FHEQ Level	Level 7			
EHEA Level	2nd cycle			
Specification Details				
Student cohorts covered by specification	2018/19 entry			
Person responsible for the specification	Prof Alexei Skorobogatov, MSc Pure Mathematics Programme Director			
Date of introduction of programme				
Date of programme specification/revision	May 2018			

Programme Overview

The MSc in Pure Mathematics will provide you with the opportunity to learn a core of advanced pure Mathematics together with a range of more specialized options, and to undertake an independent project. These will equip you with a range of mathematical skills in problem-solving, project work and presentation, enabling you to take a role in a variety of situations in employment and research.

The full time MSc consists of a twelve-month programme in which students take eight taught courses and work on a written project under the direction of a supervisor. Students may attend lectures in up to 8 courses; they may only enter the examination in 7 of these.

The Pure Mathematics section is consistently rated one of the top in the country for research. The taught courses cover a range of topics in analysis, geometry and topology, number theory, algebra and combinatorics that reflect the research interests of the Pure Mathematics section. In addition to attending the taught courses, you will also undertake independent work on a written project. Students choose their MSc project supervisor and topic in late November and they start work on it early in the second term. More information on the structure and regulations of the program and details of assessment can be found in the Course Handbook, which is available on the current MSc students page.

Our MSc graduates find employment in the fields of Education, Research, Actuarial Analysis, Risk Analysis, Investment Banking, Management Consultancy.

Learning Outcomes

The Imperial Graduate Attributes are a set of core competencies which we expect students to achieve through completion of any Imperial College degree programme. The Graduate Attributes are available at: www.imperial.ac.uk/students/academic-support/graduate-attributes

Knowledge and Understanding of:

- The fundamentals of Mathematics as a rigorous living discipline in its own right.
- The application of Mathematics as a language to a wide range of situations relevant to research.
- The importance of precision of argument.
- Problem-solving strategies and methods
- A selection of subjects which students study in greater depth, according to their interests, leading to current developments at the frontiers of the subject.
- A particular research topic agreed with a Supervisor, on which the student writes an original account in his or her own words.

Intellectual Skills

- Ability to assimilate and understand a large body of complex concepts and their inter-relationships.
- Ability to understand mathematical argument and deductive reasoning. Students will learn to use the formal processes of mathematical proof in the development of mathematical theories.
- Ability to use a structured mathematical/analytical approach to problem solving, and an understanding of the importance of assumptions made and consequences of their violation.
- Ability to use mathematics to describe and model applications, including approximate solution methods, and to interpret results. Ability to carry out extended investigative mathematical work as an individual.

Practical Skills

- Ability to carry out investigative project work as an individual.
- Proficiency in the use of symbolic and numerical software as part of practical computation.

Transferable Skills

- Ability to 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.
- Ability to carry out an independent investigation using textbooks and other available literature, searching databases and interacting with colleagues and staff as necessary to extract important information.
- Ability to effectively communicate information in a clear and concise manner orally, on paper and using IT.
- Ability to use analytical skills, paying attention to detail and using technical language correctly, to manipulate precise and intricate ideas, to construct logical arguments.
- Development of IT skills for communication and analysis.
- Ability to work independently, use initiative, organize oneself to meet deadlines, plan and execute an extended project.
- Ability to work and interact constructively with others

In this programme these skills are developed to a particularly high level. Students need to plan their pattern of work very carefully since their programme of lectures and enhanced coursework will depend on their particular option choice. Students need to balance this with the demands of the extended project which continues from January until the end of the academic session in September.

Entry Requirements	
Academic Requirement	Normally a 2:1 UK Bachelor's Degree with Honours in Mathematics, Applied Mathematics or a related subject, (or a comparable qualification recognised by the College).
Non-academic Requirements	None
English Language Requirement	Standard requirement IELTS score of 6.5 overall (minimum 6.0 in all elements)

The programme's competency standards document can be found at:
http://www.imperial.ac.uk/media/imperial-college/faculty-of-natural-sciences/department-of-mathematics/public/study/admissions/pg/msc/DASILVA.pdf

Learning & Teaching Strategy	
Scheduled Learning & Teaching Methods	• Tutorials • Lectures • Problem sheets • Office hours
E-learning & Blended Learning Methods	• Computing

Project and Placement Learning Methods	• Independent research project
Assessment Strategy	
Assessment Methods	• Written examination • Coursework • Dissertation • Oral presentation
Academic Feedback Policy	
Any assessed coursework done as part of a module will be marked promptly and returned to the student. Students are encouraged to discuss any difficulties with the module lecturer. There is access to lecturers informally and through a formal 'office hours' system. MSc student meetings are also held in December and February. Indicative feedback from the Programme Director or module leader is given after the May-June examinations. Students will meet their supervisor at least weekly to discuss their progress. They should choose modules to complement their project, and discuss their work on these with their supervisor.	
Re-sit Policy	
The College's Policy on Re-sits is available at: http://www.imperial.ac.uk/student-records-and-data/for-current-students/undergraduate-and-taught-postgraduate/exams-assessments-and-regulations/	
Mitigating Circumstances Policy	
The College's Policy on Mitigating Circumstances is available at: http://www.imperial.ac.uk/student-records-and-data/for-current-students/undergraduate-and-taught-postgraduate/exams-assessments-and-regulations/	
Programme Structure	

Full-time	Pre-session	Term One	Term Two	Term Three	Term Four
Core Modules	0	at least 3		0	0
Elective Modules	0	4 (typical)		0	0
Projects	0	0	0	0	1
Part-time (Year One)	Pre-session	Term One	Term Two	Term Three	Term Four
Core Modules	0	2 (typical)		0	0
Elective Modules	0	2 (typical)		0	0
Projects	0	0	0	0	1
Part-time (Year Two)	Pre-	Term	Term	Term	Term

	session	One	Two	Three	Four
Core Modules	0	1 (typical)		0	0
Elective Modules	0	2 (typical)		0	0
Projects	0	0	0	0	1

Assessment Dates & Deadlines	
Written Examinations	May-June
Coursework Assessments	Continuous
Project Deadlines	Mid-September
Practical Assessments	Mid-September

Assessment Structure

Marking Scheme

The raw marks from each assessment will be weighted and combined to produce a raw module mark; the raw module mark will then be converted to a 0-100 scale.

Due to the nature of Mathematics as an academic discipline it is often necessary for these module marks to be scaled in order that they map appropriately onto the British undergraduate degree classification system. In accordance with paragraph 18.4 of the Regulations for the Examination of BSc, MSci, BEng, MEng, MBBS Degrees, this process is conducted in consultation with the relevant External Examiner, applied consistently to all students in the cohort and reported at the final meeting of the Board of Examiners. Further details regarding the Department's approach to scaling (known colloquially as PTEM) may be found in the programme handbook.

Sufficient conditions for a **Pass** mark are:

- Earn at least 50% in 6 courses, with no mark below 40% and with an average score of at least 50% over 7 courses,
- Earn at least 50% in the project.

Sufficient conditions for a **Merit** mark are:

- A pass mark in all 7 papers with an average mark of 60% or above,
- A score of 60% or above on the project.

Sufficient conditions for a **Distinction** mark are:

- A pass mark in all 7 papers with an average mark of 70% or above,
- A score of 70% or above on the project.

Candidates should only be considered for promotion to pass, merit or distinction if their aggregate mark is within 2.5 per cent of the relevant borderline The aggregate mark is by definition 0.7(avg. mark on 7 papers) + 0.3(project mark).

Module Weightings	
Module	% Module Weighting
3 x modules from elective group (A)	10% each
4 x modules from elective group (B)	10% each
Research Project	30%

Indicative Module List											
Code	Title	Core/ Elective	L&T Hours	Ind. Study Hours	Place-ment Hours	Total Hours	% Written Exam	% Course-work	% Practical	FHEQ Level	ECTS
M5P32	Elliptic Curves	Elective (A)	30	195	0	225	90%	10%	0%	7	9
M5P33	Algebraic Geometry	Elective (A)	30	195	0	225	90%	10%	0%	7	9
M5P41	Analytic Methods in Partial Differential Equations	Elective (A)	30	195	0	225	90%	10%	0%	7	9
M5P46	Lie Algebras	Elective (A)	30	195	0	225	90%	10%	0%	7	9
M5P51	Riemannian Geometry	Elective (A)	30	195	0	225	90%	10%	0%	7	9
M5P52	Manifolds	Elective (A)	30	195	0	225	90%	10%	0%	7	9
M5P54	Differential Topology	Elective (A)	30	195	0	225	90%	10%	0%	7	9
M5P55	Commutative Algebra	Elective (A)	30	195	0	225	90%	10%	0%	7	9
M5P57	Complex Manifolds	Elective (A)	30	195	0	225	90%	10%	0%	7	9
M5P58	Modular Forms	Elective (A)	30	195	0	225	100%	0%	0%	7	9
M5P63	Algebra 4	Elective (A)	30	195	0	225	90%	10%	0%	7	9
M5P61	Infinite Groups	Elective (A)	30	195	0	225	90%	10%	0%	7	9
M5P67	Stochastic Calculus with Applications to non-Linear Filtering	Elective (A)	30	195	0	225	90%	10%	0%	7	9

Indicative Module List											
Code	Title	Core/ Elective	L&T Hours	Ind. Study Hours	Place-ment Hours	Total Hours	% Written Exam	% Course-work	% Practical	FHEQ Level	ECTS
	Research Project	Core	0	675	0	675	0%	90%	10%	7	27
M5P5	Geometry of Curves and Surfaces	Elective (B)	30	195	0	225	90%	10%	0%	7	9
M5P6	Probability	Elective (B)	30	195	0	225	100%	0%	0%	7	9
M5P7	Functional Analysis	Elective (B)	30	195	0	225	90%	10%	0%	7	9
M5P8	Algebra 3	Elective (B)	30	195	0	225	90%	10%	0%	7	9
M5P10	Group Theory	Elective (B)	30	195	0	225	90%	10%	0%	7	9
M5P11	Galois Theory	Elective (B)	30	195	0	225	90%	10%	0%	7	9
M5P12	Group Representation Theory	Elective (B)	30	195	0	225	90%	10%	0%	7	9
M5P14	Number Theory	Elective (B)	30	195	0	225	90%	10%	0%	7	9
M5P15	Algebraic Number Theory	Elective (B)	30	195	0	225	90%	10%	0%	7	9
M5P17	Algebraic Combinatorics	Elective (B)	30	195	0	225	90%	10%	0%	7	9
M5P18	Fourier Analysis and Theory of Distributions	Elective (B)	30	195	0	225	90%	10%	0%	7	9
M5P19	Measure and Integration	Elective (B)	30	195	0	225	90%	10%	0%	7	9
M5P20	Geometry I: Algebraic Curves	Elective (B)	30	195	0	225	90%	10%	0%	7	9

Indicative Module List											
Code	Title	Core/ Elective	L&T Hours	Ind. Study Hours	Place-ment Hours	Total Hours	% Written Exam	% Course-work	% Practical	FHEQ Level	ECTS
M5P21	Geometry II: Algebraic Topology	Elective (B)	30	195	0	225	90%	10%	0%	7	9
M5P60	Geometric Complex Analysis	Elective (B)	30	195	0	225	90%	10%	0%	7	9
M5P65	Mathematical Logic	Elective (B)	30	195	0	225	90%	10%	0%	7	9
M5P70	Markov Processes	Elective (B)	30	195	0	225	90%	10%	0%	7	9
M5P72	Modular Representation Theory	Elective (B)	30	195	0	225	90%	10%	0%	7	9

Supporting Information
The Programme Handbook is available at: http://www.imperial.ac.uk/natural-sciences/departments/mathematics/study/students/msc/
The Module Handbook is available at: http://www.imperial.ac.uk/natural-sciences/departments/mathematics/study/students/msc/
The College's entry requirements for postgraduate programmes can be found at: www.imperial.ac.uk/study/pg/apply/requirements
The College's Quality & Enhancement Framework is available at: www.imperial.ac.uk/registry/proceduresandregulations/qualityassurance
The College's Academic and Examination Regulations can be found at: https://www.imperial.ac.uk/about/governance/academic-governance/regulations
Imperial College is an independent corporation whose legal status derives from a Royal Charter granted under Letters Patent in 1907. In 2007 a Supplemental Charter and Statutes was granted by HM Queen Elizabeth II. This Supplemental Charter, which came into force on the date of the College's Centenary, 8th July 2007, established the College as a University with the name and style of "The Imperial College of Science, Technology and Medicine". http://www.imperial.ac.uk/admin-services/secretariat/college-governance/charters/charter-and-statutes/
Imperial College London is regulated by the Office for Students (OfS) https://www.officeforstudents.org.uk/