PLEASE NOTE**. This specification provides a concise summary of the main features of the programme and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. More detailed information on the learning outcomes, content and teaching, learning and assessment methods of each module can be found in the course documents "MSc in Applied Mathematics" and relevant parts of "Undergraduate Courses" or on-line at http://www.ma.imperial.ac.uk/msc. The accuracy of the information contained in these documents is reviewed by the Imperial College London and may be checked by the Quality Assurance Agency.**

1. Awarding Institution / Body	Imperial College London
2. Teaching Institution	Imperial College London
3. External Accreditation by:	Not applicable
4. Final Award	MSc in Applied Mathematics
5. Programme Titles	Applied Mathematics
6. UCAS Code (or other coding system if relevant)	Not applicable
7. Relevant QAA Subject Benchmarking Group(s)	Mathematics, Statistics and Operational Research
8. Date of production/revision	October 2008

9. Educational Aims of the Programme

The programmes aim to:

- Provide high quality education in Mathematics within an environment committed to excellence in both teaching and research.
- Attract well-qualified students and to provide intellectual challenge in a structure containing an appropriate amount of flexibility, so that students can develop their specialist interests.
- Teach and provide the opportunities to learn a core of advanced (Pure or Applied) mathematics, together with a range of more specialised options in Mathematics.
- Introduce students to a wide range of applications of Mathematics.
- Equip students with a range of mathematical skills – in problem-solving, project work and presentation – to enable them to take prominent roles in a wide spectrum of employment and research.
- Provide further breadth and depth of Mathematics beyond BSc, at a level comparable with the 4th year of an MSci.

10. Programme Outcomes - *the programmes provide opportunities for students to develop and demonstrate knowledge and understanding, qualities, skills and other attributes in the following areas.*

Knowledge and understanding

A. Knowledge and understanding of:	**Teaching/learning methods and strategies**
1. The fundamentals of Mathematics as a rigorous living discipline in its own right. 2. The development of the application of Mathematics as a language in a wide range of situations relevant to research and industry. 3. The importance of precision of argument. 4. Problem-solving strategies and methods (including basic computational skills). 5. A selection of subjects which students study in greater depth, according to their interests, leading to current developments at the frontiers of the subject. 6. A particular research topic agreed with a Supervisor, on which the student writes an original account in his or her own words.	Students should already have acquired A1 to A6 through their undergraduate course, in which they should normally have obtained a degree class of 2i or higher or equivalent in Mathematics or a related subject. Lectures are an integral part of course delivery in this programme, supported by an office hour system; problems classes where appropriate are integrated with the lectures. Students engage in private study in which they work through set problem sheets and individual assignments as well as assimilating lecture content. In the second half of the year (second year for part-time students) students acquire A6 through a major research project. Assessment of knowledge and understanding is through a combination of unseen written examinations, assessed coursework/tests, enhanced courseworks, written projects and presentations.

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Skills and other attributes

B. Intellectual (thinking) skills

1) Ability to assimilate and understand a large body of complex concepts and their inter-relationships.
2) Knowledge and understanding of the role of logical mathematical argument and deductive reasoning, together with formal processes of mathematical proof and development of mathematical theories.
3) Use of a structured mathematical analytical approach to problem solving, including the importance of assumptions made and consequences of their violation.
4) In the Applied Mathematics MSc, use of Mathematics to describe and model in applications, including appropriate solution method, and interpretation of results.
5) Carry out extended investigative mathematical work as an individual.

Teaching/learning methods and strategies

All lecture courses are accompanied by problem sheets, which students work through privately, and supported by group tutorials/problems classes; these are integrated within the timetabled lecture periods. There is access to lecturers informally and through a formal 'office hours' system.

Assessment of the lecture material is primarily by examinations, some with assessed courseworks and assignments.
B5 is acquired through the compulsory individual research project.

C. Practical skills – able to:

1. Carry out investigative project work as an individual.
2. Use symbolic and numerical software as part of practical computation (for the Applied Mathematics MSc).

Teaching/learning methods and strategies

There is a compulsory major research project.
Projects are assessed through production of a hard copy thesis and a compulsory oral presentation.
Students should have acquired C2 in their undergraduate course. There is an opportunity for more advanced computation (e.g. in Matlab) in optional courses in Numerical Analysis, as well as in the project.

D. Transferable skills – able to:

1. 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.
2. Carry out an independent investigation using textbooks and other available literature, searching databases and interacting with colleagues and staff to extract important information.
3. Communicate effectively by listening carefully and presenting complex information in a clear and concise manner orally, on paper and using IT.
4. Use analytical skills, paying attention to detail and using technical language correctly, to manipulate precise and intricate ideas, to construct logical arguments.
5. Use IT skills for communication and analysis.
6. Work independently, use their initiative, organize themselves to meet deadlines, plan and execute an extended project.
7. Work and interact constructively with others.

Teaching/learning methods and strategies

Acquisition of D1 is partly through the methods and strategies outlined in B above.
Acquisition of D2, D3 and D4 comes through courseworks, and through the project.
Acquisition of D5 is through guided preparation of the project dissertation and presentation.
Acquisition of D6 is developed progressively through courseworks, through the course as students take control of their own learning, through private study, project work and classes and finally the research project.
Acquisition of D7 is mainly through the compulsory project, where the student should interact with the supervisor to obtain an understanding of the research problem.
In this course 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 courseworks will depend on their particular option choice and they need to balance this with the demands of the extended project which continues from January until the end of the academic session in September.

The following reference points were used in creating the Programme Specification:

- Subject benchmarking information for Mathematics, Statistics and Operational Research (QAA)
- All course information being subject to approval by Quality and Academic Review Committee of Imperial College London.

11. Programme structures and features, curriculum units (modules), credit and award requirements

Each degree programme is offered as a full-time 1-year course or a 2-year part-time course and leads to the MSc degree. The programme is organised into components of value ½ a course unit, with students taking 4 units in the year, or 2 units in each year for part-time students. The project is outside the course unit system, but counts towards the overall result.
Written examinations are normally held in May/June of each year. There are resit examinations the following year, where necessary.
There is a compulsory extended project. The 8 lectured courses which make up the programme must usually be taken from the Imperial College London taught course MSc programme in Applied Mathematics, (these modules are equivalent to those given as part of the fourth year of the Mathematics MSci). Courses offered as part of other MSc courses in other Departments, and in Colleges of the University of London may also be taken, with the approval of the MSc Course Organiser.

MSc

Students follow 8 lectured half-unit courses from the list made up of dedicated MSc courses in the Department, 'with Advanced Study' final year BSc options (having enhanced coursework), and some selected courses from Colleges of the University of London.

They also carry out a supervised individual research project.

Students must pass at least 3 units as well as the project, to gain a degree. Also their average mark over the examinations on the 8 half unit courses must exceed the pass mark

12. Support for students and their learning:

- In order to attract the ablest PG students the Department runs a PG Open Day, and advertises in magazines such as Prospects as well as maintaining detailed course descriptions on its website, which are updated as appropriate.
- Before successful students arrive they receive academic and other advice about their induction into the Department.
- On arrival students receive an overall course document together with timetables. They also receive a Freshers' Handbook and other general information about safety, libraries, computing facilities, etc.
- The Department's staff form our major resource. Most Academic Staff are involved in teaching/learning/project support, which have strong research input. The Academic Staff also provide Service Teaching in Mathematics throughout the College.
- Each student has a Course Advisor to assist with personal and academic problems (normally for the duration of the degree course) allocated by the MSc Course Organizer, and in January they should also choose a Project Supervisor who will assist and guide them in the compulsory research project.
- In all lecture courses, classes are held regularly during the timetabled lecture periods.
- All courses are normally included within the 'office-hour' system, where lecturers arrange periods for individual student/lecturer consultations.
- In addition to the main College Library there is an extensive Departmental Library, which has an excellent supply of books and materials and provides a good working environment for private study. There is a reference section containing copies of all recommended course texts and docking ports for lap-top computers, together with an attached computer suite.
- Although there are no direct connections to specific employers, many of the academic staff involved in the course, particularly those in fluid mechanics, possess links with industry. In addition there is a programme of research seminars, to which MSc students are invited, which contain frequent contributions from industrial researchers.

Other facilities include:

- Dedicated computing, printing and copying facilities with extended daily access, providing email and on-line facilities.
- Departmental licensing of software to enable relatively inexpensive student purchase.
- A room is allocated for the use of Pure and Applied MSc students.
- A staff-student committee meets regularly during the session. There are student representatives on it representing the Undergraduate and Postgraduate programmes. The Departmental Postgraduate Committee also has a postgraduate student representative.
- Open access to the Postgraduate Tutor and the Course Organiser.
- MathSoc – a society for all members of the Department for academic and non-academic events.
- PLUS – a group for those (students and staff) interested in 'non-standard' problem-solving.
- Careers advice within the Department as well as a College Careers Service.
- Access to student counsellors on the South Kensington site and a Health Centre.
- Access to a Union advisor.
- Access to College Teaching and Learning Support Services.

13. Criteria for admission

The minimum qualifications for admission are a degree of class 2i or higher, or equivalent, in Mathematics or a related subject, such as Engineering or Physics.

14. Methods for evaluating and improving the quality and standards of teaching and learning

Mechanisms for review and evaluation of teaching, learning, assessment, the curriculum and outcome standards

- Individual course review initiated through the Graduate School of the Faculty of Engineering and Physical Sciences.
- Annual course review through the Board of Examiners of the Course.
- Departmental Staff-Student committee.
- Questionnaires.
- Peer review of Lecturer/Course Teaching – approximately biennial.
- Biennial appraisal of individual staff by Section Heads.
- External Examiner Reports.
- Periodic review of departmental teaching by external review panel – members invited by the Rector and from another university, a research institute and industry. This is organised through the College Science Studies and other Committees.
- Review by the Quality Assurance Agency.

Committees with responsibility for monitoring and evaluating quality and standards

- Departmental Staff – Student Committee.
- Departmental Staff Meeting.
- Departmental Postgraduate Committee.
- Departmental Management Committee.

- Board of Examiners.
- Imperial College London, Science Studies Committee.
- Imperial College London Quality Assurance Committee.
- Graduate School of Engineering and Physical Sciences.
- Imperial College London

Mechanisms for gaining student feedback on the quality of teaching and their learning experience

- Departmental Staff – Student Committee.
- Departmental Undergraduate Course Committee.
- Departmental Postgraduate Committee.
- Individual Course questionnaires.
- Personal Tutors, Senior Tutor, Applied MSc Course Organizer, Director of Undergraduate Studies, Postgraduate Tutor.

Staff development priorities include:

- Very active research programme in Mathematics.
- During probation, lecturers attend a series of College organised workshops on teaching and learning.
- Probationary lecturers are assigned a mentor.
- Teaching staff members are appraised, approximately biennially.
- Staff members have available to them College courses and occasional seminars on teaching and learning.
- Graduate Teaching Assistants attend a Workshop on demonstrating, and are informally ‘apprenticed’ to academic staff for their teaching assignments.

15. Regulation of assessment

Assessment rules & degree classification

- Within the Department the total raw mark from each course assessment is RESCALED so that overall performances can be compared.
- For each half-unit course – with only very few exceptions for courses involving extra computational assignments - rescaled marks are then awarded on a notional 0-100 scale with the fixed points at 0, 50 (Pass), 70 (Distinction), 100.
- Assessed coursework typically contributes in total to no more than 10% of each of the course raw mark totals.
- Details of assessment are contained within the Course documents.
- To obtain a Pass Mark students have to register for, and take the examination in, eight courses, they must earn a pass mark in six course papers, and score an average of at least 50 over eight course papers with no mark below 30, and earn a pass mark in the project. (A part-time candidate must register for, and take the examination in four courses in each part; they must earn a pass mark in 3 course papers in each, and score an average of at least 50 over eight course papers Part with no mark below 30. They must also pass the project.)
- A Merit Mark will be awarded to students who earn a pass mark in all eight course papers with an average mark of 60 or above, and who score 60 or above on the project.
- A Distinction Mark will be awarded to students who earn a merit, and who score 70 or above in at least 4 course papers and also score 70 or above on the project.

Role of External Examiners (Visiting Examiners)

The visiting examiners (from other universities in the UK) are nominated by the Mathematics Board of Examiners and approved by the Graduate School of Engineering and Physical Sciences. Visiting examiners normally serve for 3 years. The role of visiting examiner is that of moderator. In order to do this they:

- approve examination papers;
- see all examination scripts/assignments/enhanced coursework and research project dissertations;
- attend the Board of Examiners;
- complete a report to the College.

16. Indicators of quality and standards

- Favourable comments by External Examiners.
- High proportion of students achieving a Pass or a Distinction.
- We gather data on the subsequent careers of MSc graduates. A high proportion of these go on to employment or further postgraduate training.
- Independent External review invited by the College through its Quality Assurance procedures. This was last carried out in 2004.
- Independent review of the quality of the educational provision of the Mathematics Department by the Quality Assurance Agency subject review process in 2000 achieving an excellent grading of 22 out of a maximum 24 points, awarded as follows:-

Curriculum Design Content and Organisation	4
Teaching Learning and Assessment	3
Student Support and Guidance	4
Student Progression and Achievement	4
Learning Resources	4
Quality Management and Enhancement	3

Please note. This specification provides a concise summary of the main features of the programme and learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if she/he takes full advantage of the learning opportunities that are provided. The accuracy of the information contained in this document is reviewed by the College and may be checked by the Quality Assurance Agency for Higher Education (QAA).

Key sources of information about this course can be found in:

- Postgraduate Prospectus, Imperial College (available on-line www.ic.ac.uk)

QAA Subject Review Report
(Mathematics, Statistics and Operational Research), 2000 Imperial College of Science, Technology and Medicine (www.qaa.ac.uk).

This document can be found on the web at http://www.ma.ic.ac.uk/applied/MScProgSpecsApplied2005.pdf