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. This specification provides a source of information for students and prospective students seeking an understanding of the nature of the programme and may be used by the College for review purposes and sent to external examiners. More detailed information on the learning outcomes, content and teaching, learning and assessment methods of each module can be found in the course handbook. The accuracy of the information contained in this document is reviewed by the College and may be checked by the Quality Assurance Agency.

1. Awarding Institution: Imperial College London
2. Teaching Institution: Imperial College London
3. External Accreditation by Professional / Statutory Body: N/A
4. Name of Final Award: MSc in Mathematics and Finance
5. Programme Title: MSc in Mathematics and Finance
6. Name of Department / Division: Mathematics
7. Name of Faculty: Faculty of Natural Sciences
8. UCAS Code (or other coding system if relevant): N/A
9. Relevant QAA Subject Benchmarking Group(s) and/or other external/internal reference points Mathematics, Statistics and Operational Research
10. Level(s) of programme within the Framework for Higher Education Qualifications (FHEQ):

| Master’s (MSc)                  | Level 7 |

11. Mode of Study: Full-time (1 year) or part-time (2 years)

12. Language of Study: English

13. Date of production / revision of this programme specification: November 2009

14. Educational aims/objectives of the programme

The programme aims/objectives are 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 mathematical finance together with a range of more specialised options in Mathematics and Finance.
- Introduce students to a wide range of applications of Mathematics.

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• 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 research and employment in investment banking and related areas.
• Provide further breadth and depth of Mathematics beyond BSc, at a level at or beyond the 4th year of an MSc.

15. Programme Learning Outcomes - the programme provides opportunities for postgraduate students to develop and demonstrate knowledge and understanding, qualities, skills and other attributes in the following areas. The programme outcomes are referenced (B) to the Benchmark Statement for Engineering.

1. Knowledge and Understanding

A. Knowledge and Understanding of
1. The fundamentals of Mathematics as a 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.
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.

Students should already have acquired A1 to A4 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; problem 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 compulsory extended project. Assessment of knowledge and understanding is through a combination of written examinations, assessed coursework/tests, enhanced coursework, written projects and presentations.

Skills and other Attributes

B. Intellectual Skills - able to:

1) Assimilate and understand a large body of complex concepts and their inter-relationships.
2) Understand of the role of logical mathematical argument and deductive reasoning, together with formal processes of mathematical proof.
3) Use structured mathematical analytical approach in problem solving, appreciating the importance of assumptions made and consequences of their violation.
4) Use Mathematics to describe and model financial contracts, including appropriate solution methods, and interpretation of results.
5) Carry out extended investigative mathematical work as an individual project.

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 or through a formal ‘office hours’ system. Assessment of the lecture material is primarily through unseen written examinations, but for some courses coursework and assignments form part of the assessment. B5 is acquired through the compulsory individual research project.

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C. Practical Skills able to:

1. Program in C++ and other languages
2. Carry out investigative project work as an individual.

C++ is taught through lectures and projects. There is a compulsory major research project. The outcomes of the project are written up in a thesis.

D. Transferable Skills

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, in 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

Acquisition of D1 is partly through the methods and strategies outlined in B above.

Acquisition of D2, D3, D4 comes through coursework, and through the project.

Acquisition of D5 is through guided preparation of the project dissertation and presentation.

Acquisition of D6 is developed progressively through coursework, through the course as students take control of their own learning, through private study, project work, 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 associated work will depend on their particular option choice and they need to balance this with the demands of the extended project which continues from May until the end of the academic session in September.

16. The following reference points were used in creating this programme specification

Subject benchmarking information for Mathematics, Statistics and Operational Research (QAA)

17. Programme structure and features, curriculum units (modules), ECTS assignment and award requirements

The programme is offered as a full-time 1-year course or a 2-year part-time course to the MSc degree. The programme is organised into components, with students taking 9 units in the year, or 4/5 units in each year for part-time students. The project is outside the course unit system, but counts towards the overall result. The programme is in total worth 90 ECTS, with the lecture components taken together worth 72 ECTS and the project 18 ECTS.

Written examinations are held in January and April of each year. There are resit examinations the following year, where necessary. There is a compulsory extended project, normally undertaken in

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collaboration with an industry partner. 7 of the 9 lecture courses, including C++ course, are compulsory, while the remaining 2 are chosen from options offered by the Department of Mathematics.

To gain a degree, students must pass (overall mark $\geq 50\%$) 7 out of the 9 courses offered and achieve an average mark of at least 50% with a minimum mark of 40% on all courses offered. They must also pass the project.

18. Support provided to students to assist learning (including collaborative students, where appropriate).

- In attracting 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 Postgraduate Tutor, and in May a Project Supervisor will be allocated 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 a Mathematics Learning Centre, which provides a good working environment for private study, collaborative work, and has a collection of workstations.

Other facilities include:

- Every student is provided with software for scientific computing and data analysis.
- Dedicated computing, printing and copying facilities with extended daily access, providing email and on-line facilities.
- A room is allocated for the exclusive use of MSc Mathematics and Finance 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.
19. **Criteria for admission:**

The minimum qualifications for admission are a BSc degree of class 2i or higher in Mathematics or a related subject from a UK university, or an equivalent overseas qualification.

20. **Processes used to select students:**

Students complete an on-line application form.

21. **Processes used to select students:**

Students complete an on-line application form.

**Methods for evaluating and improving the quality and standards of teaching and learning:**

- 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.
- Quality & Academic Review Committee
- Graduate School of Engineering and Physical Sciences.
- Imperial College Senate

**Mechanisms for gaining student feedback on the quality of teaching & their learning experience:**

- A Class Representative is elected by the students. The representative has regular meetings with staff.
- Departmental Staff – Student Committee.
- Departmental Postgraduate Committee.
- Individual Course questionnaires.
- Personal Tutors, Postgraduate Tutor.

**Staff development priorities for this programme include:**

- Very active research programme in Mathematics.
- During their probation, lecturers attend a series of College organised workshops on teaching and learning.
- Probationary lecturers are assigned a mentor.
• Staff are appraised, approximately biennially.
• Staff 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.

Mechanisms for recognising and rewarding excellence in teaching and in pastoral care:

Staff are encouraged to reflect on their teaching, in order to introduce enhancements and develop innovative teaching methods. Each year College awards are presented to academic staff for outstanding contributions to teaching, pastoral care or research supervision. A special award for Teaching Innovation, available each year, is presented to a member of staff who has demonstrated an original and innovative approach to teaching. Nominations for these awards come from across the College and students are invited both to nominate staff and to sit on the deciding panels.

22. Regulation of Assessment

a) Assessment Rules and Degree Classification:

1. All courses have a written examination, and several have assessed coursework, counting typically 20% of the total credit. Each course is marked out of 100 including all components.
2. The pass mark in each course is 50.
3. Each student must take the 7 compulsory courses and 2 electives.
4. To pass the taught component of the program, a student must (a) achieve a mark of 40% on all 9 courses offered (b) achieve a passing mark of 50% on at least 7 courses, and (c) achieve an overall average mark greater than or equal to 50%.
5. Project theses are marked out of 100; the pass mark is 50%.
6. To be awarded the MSc degree, a student must pass the two parts of the course listed as (4),(5) above.
7. To be awarded the MSc with Distinction, [Merit] a student must
   • Pass all 9 courses offered, at the first attempt.
   • Achieve an overall average of 70%, [60%] or more in the taught course component.
   • Achieve a mark of 70%, [60%] or more for the project thesis.

b) Processes for dealing with mitigating circumstances:

A candidate for a Master’s degree who is prevented owing to illness or the death of a near relative or other cause judged sufficient by the Graduate Schools from completing at the normal time the examination or Part of the examination for which he/she has entered may, at the discretion of the Examiners, enter the examination in those elements in which he/she was not able to be examined on the next occasion when the examination is held in order to complete the examination,

Applications, which must be accompanied by a medical certificate or other statement of the grounds on which the application is made, shall be submitted to the Academic Registrar who will submit them to the Board of Examiners.

c) Processes for determining degree classification for borderline candidates:

Candidates should only be considered for promotion to pass, merit or distinction if their aggregate mark is within 2.5% of the relevant borderline. Nevertheless, candidates whom the Board deems to have exceptional circumstances may be considered for promotion even if their aggregate mark is more than 2.5% from the borderline. In such cases the necessary extra marks should be credited to bring the candidate’s aggregate mark into the higher range.

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d) Role of external examiners:

The primary duty of external examiners is to ensure that the degrees awarded by the College are consistent with that of the national university system. The external examiner is nominated by the Mathematics Board of Examiners and approved by the Graduate School of Engineering and Physical Sciences. Visiting examiners normally serve for a period of 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 meetings of the Board of Examiners;
- complete a written report to the College.

23. Indicators of Quality and Standards

- Favourable comments by External Examiners, and by External Assessors in the Periodic Review of Master’s Programmes in the Department of Mathematics.
- High proportion of students achieving a Pass, Merit or Distinction.
- A high proportion of MSc graduates 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 2011 with a rating of ‘good’ – the next such review is expected in 2015.
- 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:-

<table>
<thead>
<tr>
<th>Category</th>
<th>Score</th>
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<tbody>
<tr>
<td>Curriculum Design Content and Organisation</td>
<td>4</td>
</tr>
<tr>
<td>Teaching Learning and Assessment</td>
<td>3</td>
</tr>
<tr>
<td>Student Support and Guidance</td>
<td>4</td>
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<tr>
<td>Student Progression and Achievement</td>
<td>4</td>
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<tr>
<td>Learning Resources</td>
<td>4</td>
</tr>
<tr>
<td>Quality Management and Enhancement</td>
<td>3</td>
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</tbody>
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24. Key sources of information about the programme can be found in

- Postgraduate prospectus [http://www.imperial.ac.uk/study/pg/](http://www.imperial.ac.uk/study/pg/)
- The Departmental website [http://www3.imperial.ac.uk/mathematics/](http://www3.imperial.ac.uk/mathematics/)