Welcome to the Department of Mathematics at Imperial College London!

The Department has a very strong reputation, both nationally and internationally, for the high quality of its degrees and Research. You are now part of that process – on a daily basis you will be interacting with researchers in the forefront of a wide range of mathematical disciplines, as well as with other good mathematicians of your age. To maintain the standard of the programme, however, it is necessary to set high standards for you to achieve.

The programme is challenging and adjustment from school to university mathematics is not easy. Although many of the topics you meet in the First Year may be familiar, do not fall into the trap of thinking “I already know this” and so failing to take on board new ideas. You need to develop a deeper insight into even the simplest concepts and should acquire a feel for rigorous mathematical argument. We will also require you to be able to perform the basic mathematical tasks quickly and clearly, without formula sheets or calculators. Try to avoid leaving gaps in your knowledge – the Second and Third Year material requires a firm foundation. If, for example, you decide “I can pass the First Year without understanding much about complex numbers”, you will find some of the later modules very difficult indeed. In order to progress from one year to the next, it is necessary to pass all programme elements.

This booklet contains much information and advice about the various mathematics courses. This is your personal copy – keep it safe, you may want to refer to it during your years here, although most of what is contains can be found on Maths Central pages of Blackboard. Some of the details about the Second, Third and Fourth Years may change in future but the big picture should remain as described here.

Above all, you should enjoy mathematics, both doing it yourself and learning about it from others. If you never come away from a lecture thinking “wow, that’s a really cool result” or “that makes perfect sense – it all fits together beautifully” you will be missing out on a large part of the experience. We hope and trust you have a successful and rewarding time here.

A Rigorous Mathematical Argument

You’re not being rational. Oh get real. π

Professor David Evans Director of Undergraduate Studies October 2016
CONTENTS

WELCOME ........................................................................................................................................ 1

CONTENTS .......................................................................................................................................... 2

OVERVIEW ........................................................................................................................................... 6
THE DEPARTMENT OF MATHEMATICS ................................................................................................. 6
THE PURPOSE, OBJECTIVE AND RELEVANCE OF THE UNDERGRADUATE DEGREES ....................... 7
DEGREE PROGRAMME REQUIREMENTS .............................................................................................. 9
DEGREE CHANGES .............................................................................................................................. 10

YEAR PROGRAMMES ............................................................................................................................ 11
MATHEMATICS PROGRAMME DIAGRAM ............................................................................................. 11
FIRST YEAR PROGRAMME .................................................................................................................... 11
First Year Programme Diagram ........................................................................................................... 12
First Year Syllabus Details .................................................................................................................... 13
Imperial Horizons (First Year) .............................................................................................................. 17
SECOND, THIRD AND FOURTH YEAR PROGRAMMES ........................................................................ 17
Second Year Programme ..................................................................................................................... 18
Imperial Horizons (Second Year) .......................................................................................................... 19
Third and Fourth Year Programmes .................................................................................................... 19

ASSESSMENT ......................................................................................................................................... 24
FORMS OF ASSESSMENT ..................................................................................................................... 24
Assessed Coursework and Progress Tests ............................................................................................ 24
Assignments and Projects ..................................................................................................................... 24
SUBMITTING ASSESSED WORK .......................................................................................................... 24
MISSED ASSESSED WORK AND EXTENSIONS .................................................................................. 25
Deadlines .................................................................................................................................................. 25
COLLECTION OF MARKED ASSESSED COURSEWORK AND PROGRESS TESTS .................. 26
May/June Examinations and September Examinations ...................................................................... 27

FIRST YEAR ASSESSMENT .................................................................................................................... 28
Diagnostic Test ....................................................................................................................................... 28
Assessed Coursework and Progress Tests ........................................................................................... 28
Mathematical Computation .................................................................................................................. 28
January Tests .......................................................................................................................................... 28
May/June Examinations and September Examinations ...................................................................... 29
M1R Individual Poster Project .............................................................................................................. 29

SECOND, THIRD AND FOURTH YEAR ASSESSMENT ......................................................................... 29
Second Year Assessment ...................................................................................................................... 29
Third and Fourth Year Assessment ..................................................................................................... 30
Fourth Year Mastery Material ............................................................................................................... 30

EXAMINATION PROCEDURES ........................................................................................................... 31
HONOURS MARKS, YEAR TOTALS AND YEAR WEIGHTINGS ................................................................ 31
HOW EXAMINATION MARKS ARE DETERMINED ............................................................................. 32
<table>
<thead>
<tr>
<th>Appendix</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appendix V</td>
<td>Advice about Revision and Examinations</td>
<td>69</td>
</tr>
<tr>
<td>Appendix VI</td>
<td>Sample Coversheet for Assessed Coursework/Assignments</td>
<td>73</td>
</tr>
<tr>
<td>Appendix VII</td>
<td>Illness and Personal Issue Form</td>
<td>75</td>
</tr>
<tr>
<td>Appendix VIII</td>
<td>Mitigating Circumstances Form</td>
<td>77</td>
</tr>
<tr>
<td>Appendix IX</td>
<td>Degree Change Form</td>
<td>81</td>
</tr>
<tr>
<td>Appendix X</td>
<td>References Request Form</td>
<td>83</td>
</tr>
<tr>
<td>Appendix XI</td>
<td>Undergraduate Letter Request Form</td>
<td>85</td>
</tr>
<tr>
<td>Appendix XII</td>
<td>Huxley Building Guide</td>
<td>87</td>
</tr>
<tr>
<td>Appendix XIII</td>
<td>Campus Map</td>
<td>88</td>
</tr>
</tbody>
</table>
OVERVIEW

THE DEPARTMENT OF MATHEMATICS

The principal aims of the Department of Mathematics are to train professional mathematicians, to pursue the study of scientific and technological problems by mathematical methods and to provide mathematical skills that will be useful to those who wish to take up scientific and other jobs or to undertake research in the various branches of the subject. A further important function of the Department is to provide a large body of instruction in mathematics for those students who require it as ancillary to some other course of study in the various other departments in the College. The Department is large, with over 650 undergraduates, about 330 postgraduates and over 70 academic staff. The range of modules available is both wide and deep.

The Department is in the Faculty of Natural Sciences in the College. We have a large degree of autonomy but in some respects we are constrained by Faculty or College regulations.

We are also guided by College Principles and expect our students to work with us and develop a maturity of outlook, including responsibility for and control of their own learning.

Further information about College Principles can be found online at:
http://www.imperial.ac.uk/students/student-support/our-principles/

THE PURPOSE, OBJECTIVES AND RELEVANCE OF THE UNDERGRADUATE DEGREE PROGRAMME

What is mathematics?

The general perception is that ‘mathematics is using numbers’. This is imprecise and incomplete. A better description might be that ‘mathematics is the science of patterns’ although important features are abstraction (looking at basic ideas and constructs) and precision of calculation and of argument.

The degree programmes within the Department of Mathematics have been structured in order to make the study of mathematics an enriching and enjoyable experience. While the First Year is underweighted for Honours in comparison with later years, the compulsory and option material is progressive throughout the programme so that a solid understanding needs to be developed and maintained.

Learning needs to be ‘active’ rather than ‘passive’. Mathematics is not a spectator sport. The very lifeblood of mathematics is contained in doing problems and this often involves trying to break down a difficult task into a sequence of more straightforward ones. Ideally, learning should be aimed to be ‘deep’, involving strong understanding of the structure and interrelationship of knowledge, rather than ‘shallow’, where the emphasis is on pure memory work.
The overall objectives of the undergraduate degree programme are:

- to present a wide range of mathematical ideas, to encourage enthusiasm for the subject as a discipline that is of value in its own right and, at the same time, to develop students' critical and intellectual abilities

- to provide a good knowledge of basic mathematics and a more advanced knowledge of selected parts of the subject for those students who wish to pursue mathematics, or other scientific or engineering disciplines, to research level

- to provide mathematical and communication skills that will be useful to those who wish to take up scientific or other jobs.

The compulsory parts of the degree programme aim to give an appropriate balance between 'mathematics for its own sake' and 'mathematics for applications'.

The subject requires considerable effort and perseverance over an extended period for success to be achieved. However, that success stays for a lifetime - it is worthwhile in its own right and is rightly valued by employers. The skills developed as part of mathematics degrees, including experience in computation and communication, are extremely relevant to the needs of society, rendering graduates eminently suited to successful technical, managerial and other careers.

The undergraduate teaching in the Department was deemed to be 'excellent' in a Quality Assurance Review by the Quality Assurance Agency (QAA). The College has extensive Qualitative Assurance procedures of its own concerning the content, delivery and assessment of programmes including the regular invited External Review. Programme Specifications for the BSc/MSci degree programmes detailed here have been constructed in accord with the Quality Assurance Agency Subject Benchmarking for Mathematics, Statistics and Operational Research.

Further information about quality assurance can be viewed online at: https://www.imperial.ac.uk/about/governance/academic-governance/senate-subcommittees/

Further information about programme specifications can be viewed online at: http://www.imperial.ac.uk/natural-sciences/departments/mathematics/study/students/undergraduate/programme-information/

**UNDERGRADUATE DEGREE COURSES**

<table>
<thead>
<tr>
<th>Degrees on Offer</th>
<th>BSc 3 Year</th>
<th>MSci 4 Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
<td>G100</td>
<td>G103</td>
</tr>
<tr>
<td>Mathematics with Mathematical Computation</td>
<td>G102</td>
<td>-</td>
</tr>
<tr>
<td>Mathematics (Pure Mathematics)</td>
<td>G125</td>
<td>-</td>
</tr>
<tr>
<td>Mathematics with Applied Mathematics/Mathematical Physics</td>
<td>G1F3</td>
<td>-</td>
</tr>
<tr>
<td>Mathematics with Statistics</td>
<td>G1G3</td>
<td>-</td>
</tr>
<tr>
<td>Mathematics with Statistics for Finance</td>
<td>G1GH</td>
<td>-</td>
</tr>
<tr>
<td>Mathematics, Optimisation and Statistics</td>
<td>GG31</td>
<td>-</td>
</tr>
<tr>
<td>Mathematics with Education</td>
<td>G1EB</td>
<td>G1EM</td>
</tr>
<tr>
<td>Mathematics with a Year in Europe</td>
<td>-</td>
<td>G104</td>
</tr>
<tr>
<td>(Joint with various European Institutions)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The Department offers eight BSc Honours degrees and three MSci Honours degrees. The first two years of the BSc and MSci degrees are essentially the same so there is some opportunity for transfer between these degrees on academic grounds.

The overall objectives within the various degree programmes are to give excellence in chosen areas of study, to impart basic knowledge of other areas, to give basic competence in certain marketable skills and to instil and maintain enthusiasm. In order to achieve this aim the undergraduate degree programme remains under continuous consideration with respect to overall structure, individual module content and teaching methods.

**BSc Degrees:** Every graduating student qualifies for a BSc G100 Mathematics degree. Alternatively, they may opt for a specialist degree – G102, G125, G1F3, G1G3, G1GH or GG31 [see below for further information]. Students may also apply for a G1EB degree.

**MSci Degrees:** The MSci is essentially an undergraduate ‘Masters’ degree with a final year at the level of a taught postgraduate MSc programme. On successful completion, a degree title on the lines of ‘Master in Science (incorporating Bachelor’s level study)’ is awarded. The department offers 3 MSci degrees – G103, G104, G1EM.

**G103:** The primary criterion for eligibility to remain on G103 is to achieve a year total of at least 600 in Second Year. Students who score 600+ in Second Year, 580+ in Third Year and pass all their Third Year modules, have the automatic right to continue on to the Fourth Year of the MSci degree. Anyone scoring less than 580 in their Third Year, or who fails a module, does not have this right and may be graduated with a BSc at the Department’s discretion (which is exercised only rarely).

Those who score less than 600 in their Second Year may be allowed to remain on G103 at the Senior Tutor’s discretion but will have conditions set for their Third Year performance that take precedence over the rule above.

For further information on year totals, please see pages 31-33.

**G104:** Students registered for G104 Mathematics with a Year in Europe spend their Third Year (of four) studying mathematics modules/project material at another European institution. At the end of Second Year, students must be in a position to take advantage of the Third Year of the course, both mathematically and linguistically [see Appendix I].

**Note:** Whilst G104 students must pass the language examinations at the end of First and Second Year in order to stay on G104, language examination results do not directly contribute to their mathematics degree Honours mark.

**GIEB & G1EM:** The department offers joint Mathematics with Education degrees at both BSc & MSc level. Students spend the 1st term of their final year taking Education modules while the 2nd term consists of regular Mathematics modules. Students on these codings spend time teaching Mathematics in schools, and graduate both with a BSc/MSci degree and also with Qualified Teaching Status. Qualifying students (those registered as “Home/UK” students) on these codings receive a government bursary (currently £9000) for their final year.

**Note:** Some modules are also attended by students on the Joint Mathematics and Computer Science degree.
The First Year course of study is common to all the degree codings. Some commonality continues into Second Year studies, but the overall programme design is such that the modules, from which individual choices are expected to be made in the later Third (and possibly Fourth) Year of study, mainly fall into the various subject groups: Pure Mathematics, Applied Mathematics, Mathematical Physics, Numerical Analysis, Statistics and Mathematical Methods. Students may choose freely from the overall set of modules available to them (subject to Departmental approval). There is considerable flexibility so that individual students may remain broad in their interest or become more specialised. A final choice of degree registration among G100, G102, G125, G1F3, G1G3, G1GH and GG31 is not necessary until the commencement of Final Year studies.

**DEGREE PROGRAMME REQUIREMENTS**

Every graduating student qualifies for a BSc G100 Mathematics degree. To qualify for a degree a student must satisfy the overall College requirements. To qualify for the BSc specialist degrees, G102, G125, G1F3, G1G3, G1GH or GG31, a suitable number of lecture modules must eventually be passed from subsets of the general list below. G1EB students will have specialist Education modules they must complete, please see information below.

A student who does not satisfy the requirements for a specialist degree, but who does satisfy the overall requirements, will be awarded a BSc degree in G100 Mathematics. Very occasionally, circumstances may require the Department to graduate an MSci student with a BSc.

As part of the continuing review of the undergraduate programme of study, amendments to this list can be expected, including changes in module numbering. **Not all of the individual modules listed below are offered every session.**

<table>
<thead>
<tr>
<th>Code</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>G102</td>
<td>4 from <strong>Mathematics with Mathematical Computation</strong></td>
</tr>
<tr>
<td></td>
<td>M3N3, M3N4, M3N7, M3N9, M3N10, M3SC, M3R, M3C.</td>
</tr>
<tr>
<td>G125</td>
<td>6 from <strong>Mathematics (Pure Mathematics)</strong></td>
</tr>
<tr>
<td></td>
<td>M2PM5, M3P5, M3P6, M3P7, M3P8, M3P10, M3P11, M3P12, M3P14, M3P15, M3P16, M3P17, M3P18, M3P19, M3P20, M3P21, M3P22, M3P23, M3PA50, M3R.</td>
</tr>
<tr>
<td>G1F3</td>
<td>6 from <strong>Mathematics with Applied Mathematics/Mathematical Physics</strong></td>
</tr>
<tr>
<td></td>
<td>M2AM, M3A2, M3A4, M3A6, M3A7, M3A10, M3PA16, M3A21, M3F22, M3A25, M3A28, M3A29, M3A49, M3PA34, M3M3, M3M6, M3M7, M3M9, M3PA23, M3PA24, M3PA46, M3PA48, M3SC, M3R.</td>
</tr>
<tr>
<td>G1G3</td>
<td>6 from <strong>Mathematics with Statistics</strong></td>
</tr>
<tr>
<td></td>
<td>M2S2, M3S1, M3S2, M3S4, M3S7, M3S8, M3S9, M3S10, M3S11, M3S12, M3S14, M3S15, M3S16, M3S17, M3R.</td>
</tr>
<tr>
<td>G1GH</td>
<td>6 from <strong>Mathematics with Statistics for Finance</strong></td>
</tr>
<tr>
<td></td>
<td>M2S2, M3F22, M3S1, M3S2, M3S4, M3S7, M3S8, M3S9, M3S10, M3S11, M3S12, M3S14, M3S15, M3S16, M3S17, M3SC, M3R.</td>
</tr>
<tr>
<td>GG31</td>
<td>6 from <strong>Mathematics, Optimisation and Statistics</strong></td>
</tr>
<tr>
<td></td>
<td>M2S2, M3S1, M3S2, M3S4, M3S7, M3S8, M3S9, M3S10, M3S11, M3S12, M3S14, M3S15, M3S16, M3S17, M3P17, M3P22, M3N3, M3SC, M3R.</td>
</tr>
<tr>
<td>G1EB</td>
<td><strong>Mathematics with Education</strong></td>
</tr>
<tr>
<td></td>
<td>Students have a list of compulsory education modules during the first term of</td>
</tr>
<tr>
<td></td>
<td>their Third Year rather than Mathematics ones. In the second term they are</td>
</tr>
<tr>
<td></td>
<td>welcome to choose from any of the Mathematics modules available. Students will</td>
</tr>
<tr>
<td></td>
<td>also be taking part in work in schools.</td>
</tr>
</tbody>
</table>
MSci Courses
G103/G104/G1EM

Mathematics/Mathematics with a Year in Europe/ Mathematics with Education
A substantial Fourth Year project is compulsory. Almost all 4th Year examinations are 2.5 hour long.

Students are normally required to maintain a good level of performance in Mathematics (at Upper Second Class level or better) in order to remain on this coding in their Third and Fourth Year.

G104
Mathematics with a Year in Europe
A four year course with the Third Year spent studying at a host institution elsewhere in Europe.

At the end of Second Year, students must be in a position to take advantage of the Third Year of the course, both mathematically and linguistically.

On the rare occasion that a G104 student performs very poorly in their year away they may, at the discretion of the Senior Tutor, be transferred to the BSc G100 Mathematics degree or the BSc G101 Mathematics with a Year in Europe degree and take M3 subjects in their Final Year.

G1EM
Mathematics with Education
For the Maths with Education MSci, the project is only half length the M4R length, and takes place only in second term of the Fourth Year. During the first term of the Fourth Year students take Education modules rather than Mathematics ones. Students will also be taking part in work in schools.

Note: The Department of Mathematics has the discretion to modify the normal requirements in special cases.
All degrees are subject to the College Academic Regulations and can be viewed online at: http://www.imperial.ac.uk/about/governance/academic-governance/regulations/

DEGREE CHANGES

Students are able to change between mathematics degrees within certain constraints mentioned elsewhere in this document. By default, students who do not meet the requirements for a speciality degree (G102, G1F3, G1G3, G125, GG31 or G1GH) will graduate on the G100 code. We do not encourage students who would prefer the speciality degree but who believe they will not qualify for the speciality degree to transfer to G100 of their own accord, as the Department does have the discretion to modify the normal requirements in special cases.

International students on a Tier-4 visa are advised to consult the International Student Support Office prior to making ANY degree change as you may be required to apply for a new visa (outside of the UK).

To request a degree change, students must complete a Degree Change form [see Appendix IX]. The form must be printed and completed as we require a handwritten signature in order to process the request. Students interested in the G1EB or G1EM programmes must apply to be accepted in year 2 and 3 respectively.

DEADLINE FOR DEGREE TRANSFERS EACH ACADEMIC YEAR: 31st of March (G1EB/G1EM may have a different deadline.) Further information about degree changes and a Degree Change Form can be viewed on Blackboard Maths Central in General Information section
https://bb.imperial.ac.uk/webapps/blackboard/content/listContent.jsp?course_id=_7508_1&content_id=_620208_1#reference
# YEAR PROGRAMMES

The academic programme takes place over three terms – Term 1 (also known as Autumn Term), Term 2 (also known as Spring Term) and Term 3 (also known as Summer Term).

<table>
<thead>
<tr>
<th>1st Year (BSc/MSci) - M1</th>
<th>2nd Year (BSc/MSci) - M2</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 compulsory modules</td>
<td>7 compulsory modules</td>
</tr>
<tr>
<td>+ Mathematical Computation</td>
<td>+ 1 option module (except for G1EB who must take M2T)</td>
</tr>
<tr>
<td>+ compulsory M1R Individual Poster Project with oral presentation (in Term 3)</td>
<td>+ compulsory M2R Group Project with oral presentation (in Term 3)</td>
</tr>
<tr>
<td>+ language (if required) for G104</td>
<td>+ language (if required) for G104</td>
</tr>
<tr>
<td>+ English language (if required)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Final Year (BSc) – M3</th>
<th>Third Year (MSci) – M3</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 modules from a wide range of M3 modules, M2 option modules, Centre for Languages, Culture and Communication modules and Business School modules.</td>
<td>≥ Upper Second Required</td>
</tr>
<tr>
<td>G1EB students are enrolled in compulsory Education modules in Term 1 and in Term 2 are able to choose four from the available Mathematics modules.</td>
<td>8 modules from a wide range of M3 modules, M2 option modules, Centre for Culture, Languages and Communication modules and Business School modules</td>
</tr>
<tr>
<td></td>
<td>G1EM students must take M3T as one of the options.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Graduation</th>
<th>Mathematics with a Year in Europe</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Third Year (of four) spent at a partner institution.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Final Year (MSci) – M4</th>
<th>Graduation</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 modules from a wide range of M4 modules, Centre for Culture, Languages and Communication modules and Business School modules + compulsory M4R individual project with oral presentation.</td>
<td></td>
</tr>
<tr>
<td>G1EM students are enrolled in compulsory Education modules in Term 1 and in Term 2 are able to choose three from the available Mathematics modules. Their M4R project length is only half a year.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The programme of study in the First Year is broadly based so that students are given a variety of basic modules, each of which is a prerequisite for developments in later years of the various degree programmes. Certain minor variations are indicated below.

In the First Year, all programme elements are compulsory. There are eight lecture modules in Mathematics which are primarily assessed by an examination in May/June.

For G104 Mathematics with a Year in Europe an appropriate language module is also normally required in addition to the mathematics modules taken. However, students who are especially well prepared in the language for their proposed year of study away may exceptionally have the language module requirements waived.
**Note:** Whilst G104 students must pass the language examinations at the end of First and Second Year in order to stay on G104, language examination results do not directly contribute to their mathematics degree Honours mark.

For students who fail the English language test given at the beginning of Term 1, English language classes are timetabled in addition to the Mathematics modules. Attendance is compulsory. Good working knowledge of English is seen as vital to success on the programme.

Students must also take M1C Mathematical Computation, currently using Matlab and Python, assessed by coursework during Term 1 and Term 2. Following the May/June examinations in Term 3, students participate in the M1R Individual Poster Project. M1C Mathematical Computation and the M1R Individual Poster Project must be passed in order to progress into the Second Year.

<table>
<thead>
<tr>
<th>Module Codes</th>
<th>Module Titles</th>
<th>No. of Lectures/Classes (Approx.)</th>
<th>Terms</th>
<th>Honours Marks</th>
<th>ECTS Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>M1F</td>
<td>Foundations of Analysis</td>
<td>30 / 10</td>
<td>1</td>
<td>100</td>
<td>6.5</td>
</tr>
<tr>
<td>M1GLA</td>
<td>Geometry and Linear Algebra</td>
<td>30 / 10</td>
<td>1</td>
<td>100</td>
<td>6.5</td>
</tr>
<tr>
<td>M1M1</td>
<td>Mathematical Methods 1</td>
<td>30 / 10</td>
<td>1</td>
<td>100</td>
<td>6.5</td>
</tr>
<tr>
<td>M1S</td>
<td>Probability and Statistics 1</td>
<td>30 / 10</td>
<td>1</td>
<td>100</td>
<td>6.5</td>
</tr>
<tr>
<td>M1A1</td>
<td>Mechanics</td>
<td>30 / 10</td>
<td>2</td>
<td>100</td>
<td>6.5</td>
</tr>
<tr>
<td>M1M2</td>
<td>Mathematical Methods 2</td>
<td>30 / 10</td>
<td>2</td>
<td>100</td>
<td>6.5</td>
</tr>
<tr>
<td>M1P1</td>
<td>Analysis 1</td>
<td>30 / 10</td>
<td>2</td>
<td>100</td>
<td>6.5</td>
</tr>
<tr>
<td>M1P2</td>
<td>Algebra 1</td>
<td>30 / 10</td>
<td>2</td>
<td>100</td>
<td>6.5</td>
</tr>
<tr>
<td>M1C</td>
<td>Mathematical Computation</td>
<td>22 / 20</td>
<td>1 + 2</td>
<td>50</td>
<td>4</td>
</tr>
<tr>
<td>M1R</td>
<td>Individual Poster Project</td>
<td>6 / 6</td>
<td>3</td>
<td>50</td>
<td>4.5</td>
</tr>
</tbody>
</table>

| Language     | G104 students normally take an appropriate language module in addition to the mathematics modules taken. | Depends on module taken | 1 + 2 | 0 | 6 |

**First Year Syllabus Details**

**M1F** FOUNDATIONS OF ANALYSIS

Professor K. Buzzard

(Term 1)

*An introductory module involving basic material, which will be widely used later.*

Number systems. Integers, rational numbers, real numbers, decimal expansions for rational and real numbers. Inequalities, complex numbers. Induction; examples and applications. Sets, functions, countability, logic. Permutations and combinations. The Binomial Theorem. Equivalence relations and arithmetic modulo n. Euclid’s algorithm.
M1GLA GEOMETRY AND LINEAR ALGEBRA

Professor M. Liebeck
(Term 1)

This module details how Euclidean geometry can be developed in the framework of vector algebra, and how results in algebra can be illuminated by geometrical interpretation.

2 dimensional geometry: Vectors, lines, triangles, Cauchy-Schwarz inequality.
Matrices and linear equations: Gaussian elimination, matrix algebra, inverses, determinants of 2x2 and 3x3 matrices.
Eigenvalues and eigenvectors, diagonalisation of matrices and applications.
Conics and quadrics: Matrix methods, orthogonal matrices and diagonalisation of symmetric matrices.
3 dimensional geometry: Lines, planes, vector product, relations with distances, areas and volumes.
Vector spaces: Axioms, examples, linear independence and span, bases and dimension, subspaces.

M1M1 MATHEMATICAL METHODS 1

Dr C. Ford
(Term 1)

The module supplies a firm grounding to A-level topics such as differentiation, integration, complex numbers and series expansions.

Functions: Polynomial, rational, trigonometric, exponential, logarithmic and hyperbolic functions; even and odd functions. Inverse functions.
Limits: basic properties and evaluation; continuity and discontinuous functions.
Differentiation: definition as limit; differentiability; logarithmic and implicit differentiation; higher derivatives; Leibniz’s formula; stationary points and points of inflexion; curve sketching; parametric representation, polar co-ordinates.
Power Series: Mean Value theorem; Taylor’s theorem with remainder; infinite power series; Radius of convergence; the ratio test; Taylor and Maclaurin series; de L’Hôpital’s rule.
Integration: definition as Riemann limit; indefinite & definite integrals; the fundamental theorem of calculus; integration by substitution and by parts; partial fractions; Existence of improper and infinite integrals. Integrals over areas and volumes.
Complex Numbers: definition; the complex plane; standard and polar representation; de Moivre’s Theorem; exp(z) and log(z).
First order differential equations; separable, homogeneous, linear. Linear higher order equations with constant co-efficients.

M1S PROBABILITY AND STATISTICS 1

Professor E.J. McCoy
(Term 1)

Sample spaces and events. Probability: definition, axioms, interpretations. Conditional probability, theorem of total probability, Bayes theorem.
Counting techniques: combinatorics.
Discrete random variables and distributions, generating functions, expectation, variance and covariance.
Continuous random variables and distributions. Univariate transformations. Joint distributions, marginal and conditional distributions. Expectations (and other calculation techniques) for sums of random variables.
The central limit theorem.
M1A1 MECHANICS
Dr O. Schnitzer
(Term 2)
This introductory module on Applied Mathematics is centred on Newtonian mechanics. It includes far-reaching ideas on energy, linear and angular momentum, simple oscillatory systems, motion under central forces such as planetary motion, and rigid-body dynamics.


M1M2 MATHEMATICAL METHODS 2
Professor M. Barahona
(Term 2)
This module continues and extends the techniques introduced in M1M1, with further differential equations and partial differentiation. There are brief introductions to difference equations, curve fitting and scaling, together with a variety of applications of integration.

First and second order differential equations.
Homogeneous and inhomogeneous linear differential equations.
Partial differentiation: Definitions, implicit partial differentiation, total differential, change of variables.
Functions of two variables: Taylor’s theorem, stationary points and their classification, contours. Vector calculus: Definitions and physical meaning of grad, div, curl.
Applications of partial differentiation: Optimisation and Lagrange multipliers.
Applications of integration – area under curves, arc length, surface area and volume of revolution; double integrals – geometry, mass, moments of inertia; simple triple integrals.
M1P1 ANALYSIS 1
Professor R. Thomas  
(Term 2)

*A rigorous treatment of the concept of a limit, as applied to sequences, series and functions.*

Real and complex sequences. Convergence, divergence and divergence to infinity. 
Limits and continuity of real and complex functions. Left and right limits and continuity. Maxima and minima of real valued continuous functions on a closed interval. Inverse Function Theorem for strictly monotonic real functions on an interval. 
An introduction to differentiability: definitions, examples, left and right derivative.

M1P2 ALGEBRA 1
Professor D. Evans  
(Term 2)

Vector spaces: Linear maps, rank-nullity theorem, connections with linear equations and matrices. *Introductions to three topics in abstract algebra: The theory of vector spaces and linear transformations, the theory of groups and the theory of rings.*

Groups: Axioms, examples. Cyclic groups, dihedral groups, symmetric groups. Lagrange’s theorem and applications. 
Rings: Polynomial rings, rings of the form \( \mathbb{Z}[\sqrt{d}] \). Euclid’s algorithm for certain rings. Uniqueness of factorisation for these rings. Applications in number theory.

M1C MATHEMATICAL COMPUTATION
Dr P.J. Ramsden  
(Term 1) Matlab  
(Term 2) Python

In M1C, you learn computational principles, and how to use them to solve mathematical problems. In the first term, you’ll be using Matlab (a specialised mathematical computing environment), and in the second you’ll use Python (a general-purpose programming language). 

You’ll discover how to make a range of mathematical diagrams, including plots in two and three dimensions. You’ll learn how to write loops (which perform the same tasks over and over again) and how to get your programs to behave differently in different sets of circumstances. You’ll write your own customised functions to perform specialised tasks. You’ll learn to handle data one piece at a time, and also in the form of large unified structures. The mathematical themes you’ll meet will include sequences and series, iterative methods, differential equations, chaos, fractals, linear algebra, number theory and computational complexity.
M1R INDIVIDUAL POSTER PROJECT

Supervised by Various Academic Staff
Coordinator: Professor E. McCoy
(Term 3)

Following the May/June examinations, all students must produce a poster based on a subject suggested by one of the compulsory special seminar series. In the last week of term, students will be required to present their poster and explain it orally. Modules on LaTeX and presentation skills will be offered to assist students.

Imperial Horizons (First Year)

The College has created the ‘Imperial Horizons’ programme to broaden students’ education and enhance their career prospects. This programme is open to all undergraduate students. The programme allows students to take not-for-credit modules in topics such as psychology, business, languages, sound technology, etc., in addition to their core mathematics modules. Students will need to register for their desired options separately through the Horizons Programme at the start of the year.

The Department of Mathematics always endeavours to avoid timetabling Mathematics modules during the times allocated for Horizons modules. First Year Horizons classes take place on Tuesdays from 16.00 to 18.00.

Note that modules on this programme do not contribute to degree Honours marks but they do have an ECTS value of 6.

Further information about the ‘Imperial Horizons’ programme can be viewed online at: http://www.imperial.ac.uk/horizons/course-options/first-year-undergraduates/

SECOND, THIRD AND FOURTH YEAR PROGRAMMES

In the Second, Third and Fourth Year programmes, as with the First Year programme, with very few exceptions, each module listed below has nominally 30 lectures or their equivalent, together with support classes.

The following information is taken from the 2016-2017 Second, Third and Fourth Year Guides to Optional Modules and should be regarded as a rough guide only.

Second, Third and Fourth Year Guides to Optional Modules can be viewed on Blackboard Maths Central in Course Information section: https://bb.imperial.ac.uk/webapps/blackboard/content/listContentEditable.jsp?content_id=620210_1&course_id=7508_1#Handbook

or at: http://www.imperial.ac.uk/natural-sciences/departments/mathematics/study/students/undergraduate/programme-information/
Second Year Programme

The Second Year programme extends and enhances major themes that feature in the First Year programme of study. The limited option available at Second Year level should be regarded as an opportunity to familiarise yourself with areas of special interests.

The Second Year programme contains ten examined mathematics modules. Seven of the modules are compulsory and students may choose one module from the remaining three course options. (G1EB students do not have the optional choice and must instead take the M2T Communicating Mathematics module which is not available to other students until the Third Year.) One of the M2 option modules can feature as part of Third Year choice if not taken in the Second Year.

For G104 Mathematics with a Year in Europe an appropriate language module is also normally required in addition to the mathematics modules taken. However, students who are especially well prepared in the language for their proposed year of study away may exceptionally have the language module requirements waived.

Note: Whilst G104 students must pass the language examinations at the end of First and Second Year in order to stay on G104, language examination results do not directly contribute to their mathematics degree Honours mark.

Following the May/June examinations, in Term 3, students participate in the M2R Group Project, which involves written, oral and collaborative elements.

Students registered on the specialist degrees should select their options carefully to ensure they meet their degree requirements. Students registered on BSc G100 Mathematics and MSci G103 Mathematics have a free choice and G103 students will be expected to plan their Third and Fourth Year programme of options jointly as they progress into the Third Year.

<table>
<thead>
<tr>
<th>Module Codes</th>
<th>Module Titles</th>
<th>Terms</th>
<th>Honours Marks</th>
<th>ECTS Values</th>
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<td>M2AA2</td>
<td>Multivariable Calculus</td>
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<td>M2AA3</td>
<td>Introduction to Numerical Analysis</td>
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<td>100</td>
<td>7</td>
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<tr>
<td>M2PM1</td>
<td>Real Analysis</td>
<td>1</td>
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<td>7</td>
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<td>M2PM2</td>
<td>Algebra 2</td>
<td>1</td>
<td>100</td>
<td>7</td>
</tr>
<tr>
<td>M2PM3</td>
<td>Complex Analysis</td>
<td>2</td>
<td>100</td>
<td>7</td>
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<tr>
<td>M2S1</td>
<td>Probability and Statistics 2</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>M2AM</td>
<td>Fluids and Dynamics</td>
<td>2</td>
<td>100</td>
<td>7</td>
</tr>
<tr>
<td>M2PM5</td>
<td>Metric Spaces and Topology</td>
<td>2</td>
<td>100</td>
<td>7</td>
</tr>
<tr>
<td>M2S2</td>
<td>Statistical Modelling 1</td>
<td>2</td>
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One from (not G1EB)

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<tr>
<td>M2T</td>
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G1EB only

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G104 only

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<th>Terms</th>
<th>Honours Marks</th>
<th>ECTS Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Language</td>
<td>G104 students normally take an appropriate language module in addition to the mathematics modules</td>
<td>1 + 2</td>
<td>0</td>
<td>6</td>
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</table>
Imperial Horizons (Second Year)

This programme is open to all Second Year undergraduate students. Students must register for their desired options through the Horizons Programme.

The Department of Mathematics always endeavours to avoid timetabling Mathematics modules during the times allocated for Horizons modules. Second Year Horizons classes take place on Mondays from 16.00 to 18.00.

Note that modules on this programme do not contribute to degree Honours marks but they do have an ECTS value of 6.

Further information about the ‘Imperial Horizons’ programme can be viewed online at: http://www.imperial.ac.uk/horizons/course-options/second-year-undergraduates/

Third and Fourth Year Programmes

In the Third Year, students must take eight modules from a wide variety of selections from within the Department and from certain modules elsewhere. Modules approved for this are listed below, but students may apply for permission to take other modules within the College. M2 option modules not taken in the Second Year are normally also available to Third Year students but only one of these may be taken in the Third Year. Each module has nominally up to 30 lectures or their equivalent.

Students on the G1EB coding take Education modules in the first term. They then take 4 Mathematics modules in the 2nd term.

In the Fourth Year, students choose six modules made available to them in the Department and from certain modules elsewhere and complete a M4R project equivalent to two lecture modules.

Students on the Mathematics with Education G1EM coding take Education modules in the first term. They then take three Mathematics modules in the 2nd term, and produce a half-length M4R project.

The M3 modules below marked * are also available in M4 ‘…with Advanced Study’ form for Fourth Year MSci students. Any offered module is usually, but not always, available in both forms. No student may take both the M3 and M4 forms of a module.

Some modules may require another module as a prerequisite.

Note: Not all of the individual modules listed below are offered every session and the Department may cancel a particular module if, for example, the number of students attending that module does not make it viable. Similarly, some modules are occasionally run as ‘Reading Courses’
### APPLIED MATHEMATICS/MATHEMATICAL PHYSICS/NUMERICAL ANALYSIS

<table>
<thead>
<tr>
<th>Module Codes</th>
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<th>Honours Marks 3rd / 4th</th>
<th>ECTS Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>M2AM</td>
<td>Non-linear Waves</td>
<td>100/ n/a</td>
<td>7</td>
</tr>
</tbody>
</table>

#### FLUIDS
| M3A2*        | Fluid Dynamics 1                                  | 100 / 100               | 8           |
| M3A10*       | Fluid Dynamics 2                                  | 100 / 100               | 8           |
| M3A28*       | Introduction to Geophysical Fluid Dynamics        | 100 / 100               | 8           |
| M4A30        | Hydrodynamic Stability                            | n/a / 100               | 8           |
| M4A32        | Vortex Dynamics                                   | n/a / 100               | 8           |
| M3M7*        | Asymptotic Analysis                               | 100 / 100               | 8           |

#### DYNAMICS
| M3PA48*      | Dynamics of Games                                 | 100 / 100               | 8           |
| M3PA23*      | Dynamical Systems                                 | 100 / 100               | 8           |
| M3PA24*      | Bifurcation Theory                                | 100 / 100               | 8           |
| M4PA36       | Ergodic Theory: Seminar Course                    | n/a / 100               | 8           |
| M4PA38       | Advanced Dynamical Systems: Seminar Course        | n/a / 100               | 8           |
| M3PA16*      | Geometric Mechanics                               | 100 / 100               | 8           |
| M3PA34*      | Dynamics, Symmetry and Integrability              | 100 / 100               | 8           |
| M3PA50*      | Introduction to Riemann Surfaces and Conformal Dynamics | 100 / 100 | 8 |

#### FINANCE
| M3F22*       | Mathematical Finance: Introduction to Option Pricing | 100 / 100 | 8 |

#### BIOLOGY
| M3A49*       | Mathematical Biology                              | 100 / 100               | 8           |
| M4A43        | Inference, Control and Driving in Natural Systems  | n/a / 100               | 8           |

#### MATHEMATICAL PHYSICS
| M3A4*        | Mathematical Physics 1: Quantum Mechanics          | 100 / 100               | 8           |
| M3A6*        | Special Relativity and Electromagnetism            | 100 / 100               | 8           |
| M3A7*        | Tensor Calculus and General Relativity             | 100 / 100               | 8           |
| M3A29*       | Theory of Complex Systems                          | 100 / 100               | 8           |
| M3M3*        | Introduction to Partial Differential Equations     | 100 / 100               | 8           |
| M3M6*        | Methods of Mathematical Physics                    | 100 / 100               | 8           |
| M4M8         | Advanced Topics in Partial Differential Equations  | n/a / 100               | 8           |
| M3M9*        | Applied Functional Analysis                        | 100 / 100               | 8           |
| M4A42        | Applied Stochastic Processes                       | n/a / 100               | 8           |

#### NUMERICAL ANALYSIS/COMPUTATION
<p>| M4A44        | Computational Stochastic Processes                 | n/a / 100               | 8           |
| M4A47        | Finite Elements Numerical Analysis and Implementation | n/a /100              | 8           |
| M3N7*        | Numerical Solution of Ordinary Differential Equations | 100 / 100 | 8 |
| M3N9*        | Computational Linear Algebra                       | 100 / 100               | 8           |
| M3N10*       | Computational Partial Differential Equations 1      | 100 / 100               | 8           |
| M3SC*        | Scientific Computation                             | 100 / 100               | 8           |</p>
<table>
<thead>
<tr>
<th>Module Codes</th>
<th>Module Titles</th>
<th>Honours Marks 3rd / 4th</th>
<th>ECTS Values</th>
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<td>M2PM5</td>
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<td>ANALYSIS</td>
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<tr>
<td>M3P6*</td>
<td>Probability Theory</td>
<td>100 / 100</td>
<td>8</td>
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<tr>
<td>M3P7*</td>
<td>Functional Analysis</td>
<td>100 / 100</td>
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<tr>
<td>M3P18*</td>
<td>Fourier Analysis and Theory of Distributions</td>
<td>100 / 100</td>
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<td>M3P19*</td>
<td>Measure and Integration</td>
<td>100 / 100</td>
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<td>M3P60*</td>
<td>Geometric Complex Analysis</td>
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<td>M4P41</td>
<td>Analytic Methods in Partial Differential Equations</td>
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<td>M4P47</td>
<td>Stochastic Filtering</td>
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<td>Geometry of Curves and Surfaces</td>
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<td>M4P51</td>
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<td>Manifolds</td>
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<td>Differential Topology</td>
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<td>M4PA50*</td>
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<td>M3P11*</td>
<td>Galois Theory</td>
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<td>M3P12*</td>
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<td>M3P17*</td>
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### STATISTICS

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<tr>
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<th>Honours Marks 3rd / 4th</th>
<th>ECTS Values</th>
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<td>M3S2*</td>
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<td>M3S4*</td>
<td>Applied Probability</td>
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<td>M3S8*</td>
<td>Time Series</td>
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<td>M3S9*</td>
<td>Stochastic Simulation</td>
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<td>M3S11*</td>
<td>Games, Risks and Decisions</td>
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<td>Survival Models and Actuarial Applications</td>
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</tbody>
</table>

### PROJECT (Available Only to Final Year BSc students)

<table>
<thead>
<tr>
<th>Module Codes</th>
<th>Module Titles</th>
<th>Honours Marks 3rd / 4th</th>
<th>ECTS Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>M3R</td>
<td>Research Project in Mathematics</td>
<td>100 / n/a</td>
<td>8</td>
</tr>
</tbody>
</table>

### PROJECT (Compulsory for Final Year MSc students)

<table>
<thead>
<tr>
<th>Module Codes</th>
<th>Module Titles</th>
<th>Honours Marks 3rd / 4th</th>
<th>ECTS Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>M4R</td>
<td>Research Project in Mathematics</td>
<td>n/a / 200</td>
<td>16</td>
</tr>
</tbody>
</table>

### OTHER MATHEMATICAL OPTIONS (restrictions apply, see below)

<table>
<thead>
<tr>
<th>Module Codes</th>
<th>Module Titles</th>
<th>Honours Marks 3rd / 4th</th>
<th>ECTS Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>M3E*</td>
<td>Econometric Theory and Methods</td>
<td>100 / 100</td>
<td>8</td>
</tr>
<tr>
<td>M3T*</td>
<td>Communicating Mathematics</td>
<td>100 / 100</td>
<td>8</td>
</tr>
<tr>
<td>M3B*</td>
<td>Mathematics of Business and Economics</td>
<td>100 / 100</td>
<td>8</td>
</tr>
<tr>
<td>M3C*</td>
<td>Introduction to High Performance Computing</td>
<td>100 / 100</td>
<td>8</td>
</tr>
<tr>
<td>M3H*</td>
<td>History of Mathematics</td>
<td>100 / 100</td>
<td>8</td>
</tr>
</tbody>
</table>
CENTRE FOR LANGUAGES, CULTURE AND COMMUNICATION/BUSINESS SCHOOL

In addition to the Department of Mathematics modules, students may attend modules run by the Centre for Languages, Culture and Communication and some by the Business School.

Third Year BSc students (excluding G1EB) are permitted to take two options from this list. MSci students may take one option in each of their Third and Fourth Years for credit. **No more than two of these options may be taken as part of a student's degree.** Students may opt to take additional Imperial Horizons courses (not for credit) as in the First and Second Years.

M3E, M3T, M3B, M3C or M3H may also be taken as alternatives to a Centre for Languages, Culture and Communication/Business School option. However, as a Department of Mathematics module, their ECTS values are 8.

<table>
<thead>
<tr>
<th>Module Codes</th>
<th>Module Titles</th>
<th>Terms</th>
<th>Honours Marks</th>
<th>ECTS Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>HGC31</td>
<td>Lessons from History</td>
<td>1 + 2</td>
<td>100</td>
<td>6</td>
</tr>
<tr>
<td>HGC32</td>
<td>Global Challenges Independent Project</td>
<td>1 + 2</td>
<td>100</td>
<td>6</td>
</tr>
<tr>
<td>HSCS3001</td>
<td>Advanced Creative Writing</td>
<td>1 + 2</td>
<td>100</td>
<td>6</td>
</tr>
<tr>
<td>HSCS3002</td>
<td>Global History of Technology and Industry</td>
<td>1 + 2</td>
<td>100</td>
<td>6</td>
</tr>
<tr>
<td>HSCS3003</td>
<td>Philosophy of Mind</td>
<td>1 + 2</td>
<td>100</td>
<td>6</td>
</tr>
<tr>
<td>HSCS3004</td>
<td>Contemporary Philosophy</td>
<td>1 + 2</td>
<td>100</td>
<td>6</td>
</tr>
<tr>
<td>HSCS3005</td>
<td>Science, Politics and Human Identity</td>
<td>1 + 2</td>
<td>100</td>
<td>6</td>
</tr>
<tr>
<td>HSCS3006</td>
<td>Humanities Project</td>
<td>1 + 2</td>
<td>100</td>
<td>6</td>
</tr>
<tr>
<td>HSCS3007</td>
<td>Conflict, Crime and Justice</td>
<td>1 + 2</td>
<td>100</td>
<td>6</td>
</tr>
<tr>
<td>HSCS3008</td>
<td>Visual Culture, Knowledge and Power</td>
<td>1 + 2</td>
<td>100</td>
<td>6</td>
</tr>
<tr>
<td>HSCS3009</td>
<td>Music and Western Civilization</td>
<td>1 + 2</td>
<td>100</td>
<td>6</td>
</tr>
<tr>
<td>HSCS2007</td>
<td>Music Technology</td>
<td>1 + 2</td>
<td>100</td>
<td>6</td>
</tr>
<tr>
<td>BS0808</td>
<td>Finance and Financial Management</td>
<td>2</td>
<td>100</td>
<td>6</td>
</tr>
<tr>
<td>BS0820</td>
<td>Managing Innovation</td>
<td>1</td>
<td>100</td>
<td>6</td>
</tr>
</tbody>
</table>

**Note:** Centre for Languages, Culture and Communication modules extend throughout Terms 1 and 2 and some modules may be examined in January. Taking the HSCS3006 Humanities Project normally requires permission from the Centre for Languages, Culture and Communication and the Department of Mathematics.

Syllabus and timetabling information can be viewed online at:
**Centre for Languages, Culture and Communication:**

**Business School:**

Subject to the Department's approval, instead of the Centre for Languages, Culture and Communication or Business School options, students may take up to two Mathematical modules given outside the Department, e.g. in the Department of Physics. Students must discuss this with the Director of Undergraduate Studies if they wish to consider such an option.

BSc students are permitted to take at most one of the options M3E, M3C, M3H, M3B, M3T if it is taken in conjunction with an 'External' module from the CLCC, from the Business School list of Options or (at the discretion of the Director of Undergraduate Studies) from another department. In this case, at most one such 'External' module can be taken. If no 'External' modules are taken, BSc students (excluding G1EB) may take up to three of the options M3E, M3C, M3H, M3B, M3T in their final year. Students on degree codes other than G100 should note the special requirements of these programmes and consult with the Director of Undergraduate Studies if they wish to take three of M3E, M3C, M3H, M3B, M3T.
ASSESSMENT

FORMS OF ASSESSMENT

In addition to end-of-year examinations, assessment takes a number of forms during term-time and is designed to motivate and monitor the progress of each student throughout their courses. It is important that students complete this term-time assessed work individually and submit it on time. Naturally, a student who does not do this work will require a correspondingly better examination performance (if an examination is available) in order to achieve a Pass or higher grade.

Assessed Coursework and Progress Tests

For many modules, particular pieces of work are set as assessed coursework or progress tests and they contribute up to 10% of the overall assessment of the module concerned. Some Module Lecturers may choose to use a combination of assessed coursework and progress tests whilst others may choose to only set assessed coursework or only set progress tests.

The exact nature and frequency of these forms of assessment is decided by individual Module Lecturers and the timing is staggered as far as possible so that, for different modules, the submission dates for assessed coursework and the sitting dates for progress tests are not all clustered together. Assessed coursework is not normally set with a submission deadline after the end of the current term.

Marked assessed coursework and progress test scripts are returned to students to provide useful feedback. This should normally take no longer than ten days. For advice about improving your mark in assessed coursework, see Appendix III.

Assignments and Projects

Some modules have assignments that contribute more substantially to overall module assessment (over 10%).

Some modules are wholly project based and have no end-of-year examination. For some of these modules, oral presentations about the project(s) may form part of the overall assessment for the module. For advice on how to write a project report and how to prepare and give an oral presentation, see Appendix IV.

Assignment and project scripts normally need to be retained by the Department as External Examiners have the right to see them. Students should keep a copy of all assignments and project work submitted. For modules where assignments are worth over 10%, if work is returned to students, they will be asked to return the marked work to the Department to be examined by the External Examiners.

SUBMITTING ASSESSED WORK

Please Note: When submitting assignments or projects (as opposed to assessed coursework), please follow separate instructions if provided by the Module Lecturer, Project Supervisor or the Undergraduate Maths Student Office.

Read Tips on Assessed Coursework Presentation [see Appendix III].

Most assessed work is submitted via the Undergraduate Maths Student Office although some staff members may ask you to hand your work directly to them. If submitting via the Office, you will need to place your work in the correct pigeon hole in the corridor opposite the Office.
Please note that these are not the pigeon holes inside the Office on the side – these are for collecting your work.

The corridor pigeonholes are in three sections. These three sections are arranged by TID number for First Year students and alphabetically for all other years. Please place your work in the relevant section and slot, according to your TID/first letter of your surname, beneath the sign specific to your coursework.

**Plagiarism is a serious offence and all assistance MUST be referenced.** Each piece of work MUST be accompanied by a signed declaration, *‘This is my own unaided work unless stated otherwise’*. This is printed on the coversheets available for assessed coursework and assignments, which can be found outside the Undergraduate Maths Student Office.

- Pink for 1st Year Maths & JMC1 Students [see Appendix VI – example]
- Blue for 2nd Year Maths & JMC2 Students
- Yellow for 3rd Year Maths & JMC3 Students
- Mauve for 4th Year Maths & JMC4 Students
- Green for Erasmus/Other Students

**MISSED ASSESSED WORK & EXTENSIONS**

If you know in advance that you will be unable to meet an assessed coursework deadline, sit a progress test, or submit an assignment or project, you should speak with your Year Tutor about receiving an extension. You should also inform the Project Supervisor/lecturer, but note that only the Year Tutor can grant such an extension. **Extension requests must be supported by medical evidence.**

*Note: Extensions will not automatically be given.*

If, due to illness or a serious personal matter, you miss an assessed coursework deadline or progress test, please inform your Year Tutor by completing an orange Illness/Personal Issue form [see Appendix VII]. These are only available from outside the Undergraduate Maths Student Office. If the reason you provide is accepted, you will receive a pro-rata mark for the missed work - but only if you submit an Illness/Personal Issue form.

**Deadlines**

If you want to submit assessed work before the deadline date, please hand your work directly to the Undergraduate Maths Student Office Assistant.

Unless you are instructed otherwise by your Module Lecturer or Project Supervisor, the deadlines for the submission of assessed work are as follows:

- M1 modules - 12 noon
- M2 modules - 14.00
- M3, M4, M5 modules - 16.00
- Projects - 16.00
Time/date deadlines will be strictly adhered to by the Office.

Note: College has strict guidelines on late work. Late work is normally not accepted and will not be marked for credit. In the case of approved extensions, late work will not be accepted if solutions have already been distributed.

Further information on College regulations regarding penalties for the late submission of assessed work can be found on Blackboard Maths Central in Course Information section under Coursework.  
https://bb.imperial.ac.uk/webapps/blackboard/content/listContentEditable.jsp?content_id=620210_1&course_id=7508_1&mode=reset#coursework

COLLECTION OF MARKED ASSESSED COURSEWORK AND PROGRESS TESTS

If a particular piece of assessed work or progress test has been marked and is available, you will find it listed on Blackboard Maths Central in Course Information section under each Year’s information under Coursework Information and Collection.  
https://bb.imperial.ac.uk/webapps/blackboard/content/listContentEditable.jsp?content_id=620210_1&course_id=7508_1&mode=reset#assessed

If your work is not listed, it could be that it is not yet marked or that the work is being returned to you in class.

Some work (i.e. assignments and projects) is not returned to students and you might receive a feedback form instead.

First Year assessed work will be returned by Personal Tutors (except at the end of term).

Marked assessed coursework, progress tests and feedback forms for M1 (at the end of term), M2, M3 and M4 modules will be returned via the pigeonholes in the Undergraduate Maths Student Office.

The pigeonholes are in four sections:

- First Year Students (used at the end of term)
- Second Year Students
- Third Year Students
- Fourth Year Students & Erasmus/Other Students & MSc (Pure/Applied) Students.

For First and Second Years the sections are arranged by TID number, for Third, Fourth and Other, the sections are arranged alphabetically by surname.

If your work should be in the pigeonholes but you cannot find it, it could be because another student has misfiled the paperwork after having looked through the scripts. Please check the surrounding pigeonholes before making enquiries in the Undergraduate Maths Student Office.
May/June Examinations and September Examinations

A small number of modules are assessed by project but most modules are primarily assessed by examinations that take place in May/June, Term 3. There is a separate examination for most modules in the programme, normally two hours in duration and consisting of four questions.

Examined work in each module is given an Honours mark as well as a Pass/Fail rating.

It is very important to prepare properly during the year for the examinations. Indeed you should realise that most extreme examination anxiety is caused by lack of preparation and so you need to work hard during the year with the May/June examinations in mind. For further advice about revision and examinations, see Appendix V.

Students who do not obtain Passes in examinations at the first attempt will be expected to attend resit examinations. September resits are available to First and Second Year students followed by resit opportunities the following May/June. Third and Fourth Year students have resit opportunities the following May/June (NOT normally in September).

Two resit attempts are normally available to students. However, First Year students who fail six or more of the 10 First Year course elements (eight lecture modules, M1C and M1R), will normally be instructed to terminate their studies and withdraw from the College.

**Note:** Resits may not be offered for modules assessed solely by project/coursework.

Resit examinations are for Pass credit only – a maximum mark of 30 will be credited. Once a Pass is achieved, no further attempts are permitted.

Students who have not achieved the required Passes by the beginning of the new academic year are required by College to spend a year out of attendance. During this time they are not considered College students. This may create a number of issues and hold visa implications.
FIRST YEAR ASSESSMENT

Students are required to pass all programme elements in order to progress into the Second Year.

Diagnostic Test

An initial diagnostic test is normally taken at the beginning of Term 1. This does not count for academic credit.

Assessed Coursework and Progress Tests

For each of the eight modules, particular pieces of work are set as progress tests. These are marked and returned to students as part of the overall assessment for these modules.

The Term 1 modules of M1F, M1GLA, M1M1 and M1S have combined weekly progress tests [5 HONOURS MARKS per module].

The Term 2 modules of M1A1, M1M2, M1P1 and M1P2 have regular progress tests, assessed coursework or a combination of both [10 HONOURS MARKS per module].

Mathematical Computation

The assessment of M1C consists of several marked projects each term. Computational ‘driving tests’ must be passed in order for the project marks to be registered and for the entire year to be passed. More than one attempt at the ‘driving tests’ is permitted. This module counts in the assessment of Honours, currently for the equivalent of half of one of the lectured modules:

- Term 1: Matlab computational projects [25 HONOURS MARKS]
- Term 2: Python computational projects [25 HONOURS MARKS]

January Tests

There is one written test in January for each of the Term 1 modules of M1F, M1GLA, M1M1 and M1S. Formal examination rules and regulations apply except that marked scripts are returned to the students. Also, pro-rata marks may be awarded if, due to illness or a serious personal matter, a student misses a test and subsequently submits an Illness/Personal Issue form along with documentary evidence supporting their case.

The results of these tests count towards the coursework element of these modules [5 HONOURS MARKS per module].
May/June Examinations and September Resit Examinations

There is one written examination in each of M1F, M1GLA, M1M1, M1S, M1A1, M1M2, M1P1 and M1P2 [90 HONOURS MARKS each].

September resits are available followed by resit opportunities the following May/June. **Resit examinations are for Pass credit only – only a maximum mark of 30 will be credited.** Once a Pass is achieved in a module, no further attempts are permitted.

Two resit attempts are normally available to students. However, First Year students who fail six or more of the 10 First Year course elements (eight lecture modules, M1C and M1R), will normally be instructed to terminate their studies and withdraw from the College.

*Note:* *Resits may not be offered for modules assessed solely by project/coursework.*

M1R Individual Poster Project

Following the May/June examinations, all students must produce a poster based on a subject suggested by one of the compulsory special seminar series. In the last week of Term 3, students will be required to present their poster and explain it orally.

Students who do not pass the M1R Individual Poster Project may be required to submit a written project by September for Pass credit only.

The M1R Individual Poster Project must be passed in order to progress into the Second Year. It counts in the assessment of Honours, currently for the equivalent of half of one of the lectured modules [50 HONOURS MARKS].

SECOND, THIRD AND FOURTH YEAR ASSESSMENT

Second Year Assessment

M2AA1, M2AA2, M2AA3, M2AM, M2PM1, M2PM2, M2PM3, M2PM5, M2S1 and M2S2 have a summer exam worth 90 Honours marks each and assessed coursework and progress tests that count for 10 Honours marks.

In Term 3, students participate in the M2R Group Project. The M2R Group Project must be passed in order to progress into the Third Year. It is currently awarded 50 Honours marks. Group oral presentations form part of the assessment.

Students who do not obtain Passes in examinations at the first attempt will be expected to attend resit examinations where appropriate. September resits are available to Second Year students followed by resit opportunities the following May/June. Two resit attempts are normally available to students.

*Note:* *Resits may not be offered for modules assessed solely by project.*

Resit examinations are for Pass credit only – a maximum mark of 30 will be credited. Once a Pass is achieved, no further attempts are permitted.
Third and Fourth Year Assessment

Many but not all M3 and M4 modules have an assessed coursework and/or progress test element, limited in most cases to 10% of the overall module assessment. This will be made clear at the start of each module. Exceptions include:

M3/4S2, M3/4S9, M3/4S16, M4A44 and M3/4S17 have assignments worth approximately 25% of the overall module assessment.


M4PA36 and M4PA38 are examined by project and oral presentation.

The module M4PA48 is examined by coursework, oral exam and an in-class test.

M3R and M4R are examined by project supplemented by an oral presentation.

M3T is assessed by a journal of teaching activity, teacher’s assessment, oral presentation, and an end of module report.

*Note: Students who take modules which are wholly assessed by project will be deemed to be officially registered on the module through the submission of a specified number of pieces of assessed work for that module. Thus, once a certain point is reached in these modules, a student will be committed to completing the module.*

*Due to the amount of work Project-only modules require, students will be allowed to sign up for only one Project-only module per term. If students wish to apply for more, they will need to seek special permission from the Senior Tutor.*

Students who do not obtain Passes in examinations at the first attempt will be expected to attend resit examinations where appropriate. Third Year students have resit opportunities the following May/June (NOT normally in September). Two resit attempts are normally available to students; however, MSc students who fail a module in their Third Year only have at most one resit opportunity to be able to progress to the Fourth Year, and may be graduated with a BSc.

*Note: Resits may not be offered for modules assessed solely by project.*

*Resit examinations are for Pass credit only – a maximum mark of 30 will be credited.* Once a Pass is achieved, no further attempts are permitted.

Fourth Year Mastery Material

All Fourth Year mathematics modules’ final exams will be 2.5 hours in length (unless otherwise specified). The papers will include five questions, the four questions given to 3rd year students on the module, plus a mastery fifth question.
EXAMINATION PROCEDURES

The main Department of Mathematics examinations occur in May/June with resit examinations for Years 1 & 2 taking place over the course of a week in early September.

Examination registration takes place at the beginning of Term 2.

Note: Students who take modules which are wholly assessed by project will be deemed to be officially registered on the module through the submission of a specified number of pieces of assessed work for that module. Thus, once a certain point is reached in these modules, a student will be committed to completing the module.

Examination information, including rules and regulations, candidate instructions, extra time arrangements and registration information, can be viewed on Blackboard Maths Central in Examinations section:
https://bb.imperial.ac.uk/webapps/blackboard/content/listContent.jsp?course_id=_7508_1&content_id=620213_1&mode=reset

Information about resit procedures can be found online at:

HONOURS MARKS, YEAR TOTALS AND YEAR WEIGHTINGS

Within the Department each total module assessment is rescaled so that overall performances may be compared. The normal rescaling on to the scale 0-100 Honours marks is such that 30 then corresponds to the lowest Pass Honours mark, 60 to the lowest Upper Second Class, and 75 corresponds to a clear First Class performance.

Reporting of marks on transcripts is carried out by translation to the common College Scale (on which a Pass is 40, lowest First Class is given as 70).

The maximum First Year Honours mark for all Department of Mathematics degrees is then usually 900, made up as:

\[ 8 \times 100 \]
\[ 1 \times 50 \text{ for M1C Mathematical Computation} \]
\[ 1 \times 50 \text{ for the M1R Individual Poster Project} \]

The total Second Year Honours mark is usually 850, made up as:

\[ 8 \times 100 \]
\[ 1 \times 50 \text{ for the M2R Group Project} \]

The total Honours mark for the Third Year is 800, made up as:

\[ 8 \times 100 \]

The total Fourth Year Honours mark is usually 800, made up as:

\[ 6 \times 100 \]
\[ 1 \times 200 \text{ for the M4R Project} \]
Note: For uniformity, the total Honours marks for each year are scaled out of 1000 and are known as a year total. Students are informed of their year total on Blackboard. Students will also receive a year average (for Year 1) or cumulative or overall average Mathematics mark (Years 2-4) on their College transcripts. This mark will be on the College scale.

All years count for final degree purposes, but the First Year has lower weighting than others. The differences in year weighting reflect the increasing level of mathematical complexity.

For the three-year BSc codings the weighting is 1:3:5 (G100, G102, G125, G1F3, G1G3, G1GH, G1EB and GG31). For the four-year MSci codings the weighting is 1:3:4:5 (G103, G1EM and G104).

HOW EXAMINATION MARKS ARE DETERMINED

Most modules are examined by a two-hour examination in May/June (Fourth Year students’ exams are normally 2.5 hours in length). For First - Third Year modules, there will usually be four questions each of which is marked out of 20. In order to reward complete questions over fragments, bonus marks are added automatically to your mark for a question with 13/20 or above:

<table>
<thead>
<tr>
<th>Mark</th>
<th>Bonus</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>½</td>
</tr>
<tr>
<td>14</td>
<td>1</td>
</tr>
<tr>
<td>15</td>
<td>1½</td>
</tr>
<tr>
<td>16</td>
<td>2</td>
</tr>
<tr>
<td>17</td>
<td>2½</td>
</tr>
<tr>
<td>18</td>
<td>3</td>
</tr>
<tr>
<td>19</td>
<td>3½</td>
</tr>
<tr>
<td>20</td>
<td>4</td>
</tr>
</tbody>
</table>

The maximum raw mark for a paper is therefore 96. If the module has assessed coursework/progress tests then the marks for these are combined with the total mark for the paper in the appropriate proportions to produce a raw mark for the paper.

The raw Pass mark (P), the split Lower/Upper Second Class mark (T), the clear First Class mark (E) and the maximum we can realistically expect any student to get (M) are specified by the individual module examiners. The general guidelines for P, T, E and M are explained below.

For a module with no assessed coursework or progress tests (with a raw mark out of 96): P is typically the equivalent of one question (plus its bonus marks) i.e. about 24. The T mark is a little less than two questions (plus their bonus marks) i.e. about 43. The E mark is roughly the equivalent of three good questions (plus their bonus marks) i.e. about 58. M is somewhere near 96. The difficulty of the examinations is taken into account when setting the precise values.

If assessed coursework and/or progress tests are part of the module then the typical values of P, T, E and M above are adjusted in proportion to the above.

These P, T, E and M marks are considered by the Examination Liaison Panel, which is concerned with ‘levelling the playing field’. Some examinations may be harder than others while others may be less challenging. Where appropriate, P, T, E and M are adjusted further to achieve fairness.

To determine a student’s Mathematics Scale mark for the paper, the raw marks P, T, E and M are mapped to 30, 60, 75 and 100 respectively (with 0 being mapped to 0). The individual raw mark is then mapped to the 0–100 scale by linear interpolation and this becomes the student’s Honours mark for that module. Marks for different modules are then added together.
Fourth Year modules with examinations with five questions will have P, T, E & M marks set by the examiners in a similar and proportionate manner to the above.

**Note:** A small number of Third and Fourth Year modules have a bigger coursework element. This is announced at the beginning of the module. There are variations to this procedure for modules that involve assignments, projects or January tests.

Within the Department we work with this Mathematics Scale of 'Honours marks' throughout, up to and including the final award of degree class. However, for the reporting of individual module results and cumulative and final totals on official transcripts, the Mathematics Scale marks are mapped (piecewise linearly) to the College Scale, which is used across all Imperial departments. The correspondence between these scales for module marks is as follows, where, for example, Third Class corresponds to a mark ≥ 30 and < 45 on the Mathematics Scale but a mark ≥ 40 and < 50 on the College Scale.

<table>
<thead>
<tr>
<th>Class</th>
<th>1</th>
<th>2:1</th>
<th>2:2</th>
<th>3</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mathematics Scale</strong></td>
<td>100</td>
<td>70</td>
<td>60</td>
<td>45</td>
<td>30</td>
</tr>
<tr>
<td><strong>College Scale</strong></td>
<td>100</td>
<td>70</td>
<td>60</td>
<td>50</td>
<td>40</td>
</tr>
</tbody>
</table>

Note that while we view 75 on the Maths scale as a clear 1st class performance for individual modules, we regard an average of 70 across a wide variety of modules as sufficient for a 1st class degree. A module mark of 70 is thus reported as 70 on the College Scale.

**Note:** From 2017-18, the pass mark on the College scale for M4 modules will be 50%, in line with the pass mark for the corresponding MSc (M5) modules.

**QUERYING MARKS**

**Assessed Coursework**

Sometimes students believe they have been marked harshly or incorrectly.

At their Problem Solving Classes, First and Second Year students will have an opportunity to meet the individual markers of their progress tests/assessed coursework and have the rationale behind the attribution of marks explained. This is part of our 'Meet Your Marker' Scheme.

If the mark query relates to assessed coursework, progress tests, assignments or projects, First and Second Year students should first consult the Marker. Any other queries should be addressed to the Personal Tutor (First Years) or the Module Lecturer (First and Second Years). Third and Fourth Year students should consult the Module Lecturer.

In some circumstances it may be appropriate to consult your Year Tutor or the Undergraduate Liaison Officer.
If a mark change is authorised, the Undergraduate Maths Student Office must be notified so the mark can be amended on the Departmental database.

Note that the First Year January Test scripts are returned to students and so count as Progress Tests rather than full Examinations, and have Meet Your Marker sessions.

**Summer Examinations**

If the mark query relates to summer examinations, students should be aware that examinations are double marked and checked very carefully. College regulations do not permit students to view their examination scripts and marks may only be changed if there has been an administrative error.

Information on post examination appeals procedures can be viewed on Blackboard Maths Central in Examinations section:  
https://bb.imperial.ac.uk/webapps/blackboard/content/listContent.jsp?course_id=_7508_1&content_id=_620213_1&mode=reset#examappeals

**MITIGATING CIRCUMSTANCES**

If you wish any mitigating (i.e. special) circumstances to be taken into account when we make decisions about you following this year’s examinations you must complete a Mitigating Circumstances form [see Appendix VIII].

Mitigating Circumstances forms can be can be found outside the Undergraduate Maths Student Office or on Blackboard Maths Central at:  
https://bb.imperial.ac.uk/webapps/blackboard/content/listContent.jsp?course_id=_7508_1&content_id=_620208_1#reference

Please use this form to report all major mitigating circumstances during your time in the Department of Mathematics even if they have already been reported earlier. In this way we will have your complete record when your results are being assessed. Use extra sheets if necessary and please include relevant dates. **In cases of serious long-term illness, it is important to submit a Mitigating Circumstances form for each year where you felt you had been negatively impacted by the illness.**

Allowance is normally considered only in cases of long-term serious illness (not odd bouts of flu), close family bereavements, serious family problems etc. Even when mitigating circumstances are accepted there is no guarantee that the Examination Board will make any allowance for them.

**The completed form should be returned, together with any required documentary evidence, to the Undergraduate Maths Student Office by the specified deadline. No allowance can be made if your form is not submitted in time.**
EXAMINATION ABSENCES

If, for medical or other reasons, you are absent for an examination you must:

- inform the Senior Tutor by email or phone the Undergraduate Liaison Officer on the day of the missed examination
- complete a Mitigating Circumstances form and return it to the Undergraduate Maths Student Office by the specified deadline

*Note: If any allowance is to be made then documentary evidence to support your case will be needed. In the case of illness your doctor needs to see you the same day (or as soon as possible, while you are still ill).*

If your case is accepted by the Examination Board, no attempt at the examination is considered to have been made and, if a first attempt at the examination is made at a later date, it is not treated as a resit. If your case is not accepted by the Examination Board an attempt is normally considered to have been made and a later attempt is regarded as a resit, which is for Pass credit only.

A Mitigating Circumstances form must also be completed if circumstances prohibit you from completing a major piece of assessed work, such as the M1R and M2R projects [see Appendix VIII].

EXAMINATION WITHDRAWALS

You may only withdraw from an examination with the permission of the Senior Tutor. Otherwise, a score of zero will be recorded and the resit paper will have a capped mark of 30.
PLAGIARISM (CHEATING)

Academics trade in original thought and insight. They take great pride in crediting others by meticulously quoting and referencing all sources and aim to instil the same appreciation and respect for academic work and original thought in their students. To credit others is a matter of academic integrity.

All the assessed work and projects that you submit count towards your degree. They are therefore part of the examination process and governed by its rules. Violation of these rules counts as plagiarism and is regarded as an examination offence:

- if you have worked with or consulted other people on assessed work or a project you must acknowledge their input
- if you copy text or diagrams from a book or a journal or the internet or another person this must be acknowledged in the text and there must be a corresponding reference in the bibliography
- assessed work and projects must be your own unaided work
- each piece of work must be accompanied by a signed declaration, ‘This is my own unaided work unless stated otherwise’.

Plagiarism is taken very seriously in the Department of Mathematics and various means are available for detecting it. Appropriate punishments can be severe. If plagiarism is suspected, you will be interviewed by the Senior Tutor and a relevant staff member. If the plagiarism is deemed minor, punishment will be imposed by the Department of Mathematics. Plagiarism deemed major will be referred to the College Registry. This can result in students losing their entire degree.

The source and recipient are normally treated equally – which means that if you share your work, you will be liable for the same punishments as the student who copies your work. Students who share their work are often strong students and thus the punishments can hurt them much more than if already at the bottom of the year group. Thus do NOT pass on your solutions/your code to other people as even though they may say they will not copy, you have already given your work to them, allowing for the possibility.

The severity of plagiarism is judged on the basis of the extent of plagiarism in the piece of academic work concerned; it is not judged on the basis of the weight of that piece in the overall degree. For example, a single sentence copied from an online source without appropriate citation may be deemed minor and penalised with a loss of mark. A typical punishment is the loss of all marks in the academic piece.

By comparison, a major case of plagiarism would involve, for example, significant collaboration without acknowledgement in a single piece of assessed work.

If deemed major, the typical punishment for plagiarism is the loss of all marks in all written work for the entire year. This includes all exams, whether they have already taken place or not. In these cases, a resit for Pass credit only is normally available. Cases of major plagiarism in the Final Year normally lead to a severe reduction of the degree classification.
In addition, a letter is normally placed in the student's file, which will adversely influence any letters of reference. Students who have committed major plagiarism therefore often find it difficult to pursue their academic careers. Cases of major plagiarism could also result in expulsion from College.

College policy and procedures on the issue of plagiarism (cheating) can be viewed online at:

Plagiarism/cheating often takes place when students are stressed/struggling with the work. If this is the case, please make sure that you reach out for support from your lecturer/Personal Tutor/Undergraduate Liaison Officer before you copy someone else’s work and get into trouble. It is better to get a lower mark than to copy someone else’s work.

If you are unsure about what plagiarism is, or how to properly cite your sources, please speak to the Mathematics Librarian or the Senior Tutor.
PROGRESSION & GRADUATION

PROGRESSION

Students are required to pass all programme elements in order to progress into the following year either through the May/June examinations or resits.

MSci G103 Mathematics, G1EM Mathematics with Education and G104 Mathematics with a Year in Europe students must normally maintain high marks (at an Upper Second level or above) in order to remain on the MSci programmes.

Performance at a high level, both mathematically and linguistically, is normally necessary for G104 students for the progression to the year abroad to be permitted.

GRADUATION

It is normally required that students pass all course components in order to graduate. However, the College may condone a narrowly failed module in the Final Year of study. The Department will endeavour to graduate students at the first possible opportunity. Students may not opt to resit failed examinations if the Department has made the decision to graduate them. In general, applications for postponement of consideration for graduation will only be granted by the Department for special cases, such as absence through illness.

The total of Honours marks for examinations, assessed coursework, progress tests, assignments and projects, with the appropriate year weightings, is calculated and recommendations are made to the Examiners’ Meeting (normally held at the end of June) for consideration by the Academic Staff and External Examiners. Degrees are formally decided at this meeting.

Graduating students may be awarded Honours degrees classified as follows: First, Second (upper and lower divisions) and Third, with a good Final Year being viewed favourably by the External Examiners for borderline cases.

Rarely, circumstances may require the Department to graduate an MSci student with a BSc.

Further information on degree classes can be found in the Scheme for the Award of Honours available online at:


Students graduating with MSci G103 Mathematics, G1EM Mathematics with Education or G104 Mathematics with a Year in Europe will receive an MSci degree that incorporates Bachelor’s level study.

G1EB and G1EM receive their Qualified Teacher Status (QTS) on the completion of their programme in addition to their degree from Imperial College London.

Information about Commemoration (Graduation) ceremonies can be found online at:

http://www.imperial.ac.uk/graduation/
PRIZES

Each year prizes, both from the Department of Mathematics and external bodies, are awarded for good examination performances and outstanding M1R, M2R M3R and M4R projects. The Department also nominates students for College and prestigious national awards, in which they are often successful. More information on Prizes can be found at: http://bit.ly/1UpJQ1g

A reception for award winners is usually held on Commemoration (Graduation) Day.

EUROPEAN CREDIT TRANSFER SYSTEM (ECTS)

As part of the compliance with the European ‘Bologna Process’, Department of Mathematics courses and degrees are required to be rated via the European Credit Transfer System (ECTS) – which is based notionally on hour counts for elements in the degree.

First Year mathematics modules have an ECTS value of 6.5 except for M1R which has an ECTS value of 4.5 and M1C which has ECTS value of 4. Each Second Year mathematics module has an ECTS value of 7 with M2R having an ECTS value of 5. Language modules, taken by First and Second Year G104 Mathematics with a Year in Europe students, have an ECTS value of 6. Third and Fourth Year mathematics modules, including M3E, M3C, M3H, M3B, M3T, have an ECTS value of 8 except for M4R which has an ECTS value of 16. Horizons modules and Centre for Languages, Culture and Communication/Business School modules have an ECTS value of 6.

MSci students who wish to increase their ECTS counts from roughly 240 to 270 must undertake additional study over the summer vacations of their Second and Third Years. Contact the Director of Undergraduate Studies for further information.

Further information about the ‘Bologna Process’ and ECTS can be viewed online at: http://www.imperial.ac.uk/study/pg/courses/about-our-masters-qualifications/ects/.

Department of Mathematics ECTS ratings can be viewed within the Programme Specifications online at: http://www.imperial.ac.uk/natural-sciences/departments/mathematics/study/students/undergraduate/programme-information/

PROFESSIONAL ACCREDITATION AND EXEMPTIONS

THE ROYAL COLLEGE OF SCIENCE (ARCS) AND THE INSTITUTE OF MATHEMATICS AND ITS APPLICATIONS (IMA)

Department of Mathematics graduates are eligible for membership of the Royal College of Science (ARCS): http://www.rcsa.org.uk/ and the Institute of Mathematics and its Applications (IMA): http://www ima.org.uk/.
THE ACTUARIAL PROFESSION

Exemptions from some actuarial examinations are available following agreements between The Actuarial Profession http://www.actuaries.org.uk/ and Imperial College London: https://www.actuaries.org.uk/become-actuary

- **CT3** exemption obtained by attaining a 2 :1 grade average in M1S Probability and Statistics 1 and M2S2 Statistical Modelling 1
- **CT4** exemption obtained by attaining a 2 :1 grade in M3S14/M4S14 Survival Models and Actuarial Applications

Further information about actuarial examination exemptions can be viewed on Blackboard Maths Central in General Information section, under Reference, Letters and documents: https://bb.imperial.ac.uk/webapps/blackboard/content/listContent.jsp?course_id=_7508_1&content_id=_620208_1&mode=reset#reference

To request an actuarial examination exemption letter, students must complete an Undergraduate Letter Request form [see Appendix XI]. These can be found at Maths Central on Blackboard or outside the Undergraduate Maths Student Office.

The online form must be printed and completed as we require a handwritten signature in order to process the request.
ACADEMIC STRUCTURE & SUPPORT

DIRECTOR OF UNDERGRADUATE STUDIES

The Director of Undergraduate Studies has overall responsibility for the Undergraduate degree programme and meets with student regularly through Year group meetings. Any questions about the academic programme should be addressed to him.

ACADEMIC ASSISTANCE

The transition from school mathematics to university mathematics is not an easy one, especially because of the need to introduce formal mathematical reasoning. Mathematical topics are put on a firm basis and treated in a more mature way. There is also a change of pace from that experienced in school. All students can expect to be 'stretched' by the experience.

To help students with their understanding of mathematics, the Department provides assistance in a number of ways. For advice on how to best present assessed coursework, see Appendix III. For advice on how to write a project report and how to prepare and give an oral presentation, see Appendix IV. For further advice about revision and examinations, see Appendix V.

LECTURES

The teaching of modules within the Department of Mathematics is carried out by a combination of lectures, tutorials, study groups and problem classes. Students are expected to attend lectures and actively participate by taking notes and responding to questions from the lecturers. Students should note their questions down and raise these at appropriate times, in problems classes and office hours.

Lectures are a fundamental way of delivering and pacing study material. A big difference between school and university is that the material is now much more concentrated - in about 12 lectures per week enough is provided to keep students occupied for (at least) the other 156 hours. The pace in a lecture is such that it is vital to develop a good set of notes from what is presented at the time, annotated later in private study. For a good proportion of the material a full understanding can only be gained at the later stage through contemplation and by doing problems.

What is a 'good' set of notes? There is an element of personal taste, but it is important to write clearly and carefully. It helps in keeping good order to number pages and in later private study to highlight important results using suitable colours. When notes are written down in a lecture it is sensible to leave enough space for later annotations.

Naturally the understanding of a particular lecture is usually vastly improved if sufficient time has been invested in understanding previous lectures.

It is very important to concentrate in a lecture and not to get distracted. Students should not chat to their neighbour(s) or text or surf the Web etc. This is not only bad manners but can be highly distracting to others. Phones should normally be switched off.
Questions may be asked during the lecture and/or at its conclusion. Further points can be raised in tutorial classes or at the Module Lecturer’s ‘office hour’. Sometimes what might appear to be a ‘silly’ question is anything but silly; in any event it is very likely that others are having the same difficulty.

PROBLEM SHEETS

For almost all modules, the lecturers regularly distribute sets of problems and other materials, as appropriate, and it is essential that students should work at these in order to master the ideas in each module and their application. **Skill at solving problems develops over time. It cannot be learned in a rush just before an examination.**

It is important to recognise that strategies for problem solving need to be developed by example and practice. It is not necessarily usual for a suitable strategy for a problem to be immediately apparent at the outset. Quite often some experimentation is required – good starting points are the various pieces of given information and a statement of what is needed for demonstrating the required result(s), together with consideration of, for example, any relevant theory and examples from lecture notes.

Dealing with problems is normally an essential part of learning mathematical theory. It is important in developing appreciation and understanding of the topics in the module and of the lecture material.

It is expected that Module Lecturers will set some straightforward questions to give students confidence and also some more challenging ones to stretch their understanding. It is expected that students will also attempt the more demanding questions in order to give themselves the necessary practice in problem solving and prepare themselves for the examinations.

PROBLEM SOLVING CLASSES

For First Year modules and most modules in Second Year, there is a weekly timetabled class in addition to the lectures. For other modules there is expected to be a class provision as part of the timetabled periods.

**Students should attend Problems Classes regularly in order to raise questions about problems on the sheets they are unsure of. It is important to come to the Problems Classes well prepared, having at least attempted problem sheets or assessed coursework and having identified some of the difficulties and being in a position to discuss them. Students should feel that they can ask questions from previous weeks’ problem sheets or lectures also.**

Problem Solving Classes are designed to help students to master the module material, develop problem solving skills, involve students actively in their study of mathematics, foster an interest in the subject and to generate discussion. They are attended by Module Lecturers and Graduate Teaching Assistants.

These aims can be achieved in a number of ways but these would normally involve discussing solutions to previously marked assessed coursework and progress tests as well as discussing any difficulties with lecture module material. If time permits, solutions to problem sheets and material related to, or extending, lecture material might also be considered.
Regular attendance is essential since it is here that specific expert assistance can be given on lecture notes, problem sheets and connections with other modules. A pace for digestion of the module content is being set here and this is meant to be broadly manageable by the majority of the class.

While regular attendance does not guarantee success, experience has shown that poor performance is usually associated strongly with poor attendance.

Most Lecturers and Graduate Teaching Assistants will spend time addressing individual points/difficulties; on other occasions it may be appropriate for particular groups of students to be addressed as a whole and open orderly discussion is very much to be encouraged.

One or more of the following techniques may be used in any given class:

- present model solutions to problems on the board
- go around the class asking individual students about their difficulties
- explain solutions to small groups of students with common problems

In order that this precious resource is used properly it is necessary that all of the student class members as well as the Tutors are active and engaged with the material.

It is expected that Module Lecturers will provide sufficient problems to keep the class busy. Solutions/hints for problems should be provided, but it is best if these are not given out until sufficient time has elapsed after the issue of the original problem sheet or assessed coursework deadline.

**Meet Your Marker**

At their Problem Solving Classes, First and Second Year students will also have an opportunity to meet the individual markers of their progress tests/assessed coursework and have the rationale behind the attribution of marks explained.

**OFFICE HOURS**

‘Office hours’ are indicated times normally set aside by each Module Lecturer, for students to consult them individually about the module notes and any problems not covered in the class periods. These provide a valuable backup support for students. Module Lecturers are able to respond to individual queries on a one-to-one basis.

**PERSONAL TUTORIALS**

Personal Tutors should provide detailed subject help in the First Year, although this is not their only role (please see more information about Personal Tutors below). Their prime concern should be that of overall academic and other welfare. It is important to maintain regular contact with your Personal Tutor. In the First Year you should meet each week.

Most First Year modules designate a problem sheet question specifically for discussion with your Personal Tutor at these weekly meetings and it is in these meetings that marked First Year assessed coursework and progress test scripts will be returned.
PEER TUTORIAL SUPPORT CLASSES

Fourth Year MSci students run small weekly Peer Tutorial Support Classes for First Year Students. These classes are held in Terms 1 and 2. Term 2 groupings may be based on the January test results. Attendance is compulsory. Students are encouraged to send their tutors questions ahead of time. All students will also be encouraged to solve unseen problems on the board with the help of the other students in the group/the Peer Tutor. This is to help develop problem solving methods to support them throughout their studies.

First and Second year students also benefit from the “Self-Help” drop in sessions run by Fourth Year MSci students once a week. Fourth Year students will be available to help students on a one-to-one basis at these weekly sessions, helping answer questions they have on the course problems or understanding material from lectures.

BLACKBOARD

Blackboard is Imperial College's Virtual Learning Environment (VLE) and provides online academic resources to students. Student assessed work marks (not final year results) are also made available on specifically titled pages.

The Maths Central pages on Blackboard will include pertinent information to all UG students on the study programme, regulations, examinations, etc. Important messages to Year Groups will also be sent through Blackboard.

Blackboard can be used to:

- deliver module materials (including text, images, video and audio)
- deliver quizzes and surveys.
- set and receive assignments.
- communicate with students through online discussions, real-time chat and an interactive whiteboard
- track student progress and manage grades
- provide feedback to students

Note: Not all Department of Mathematics Module Lecturers use Blackboard; many choose to maintain their own websites. You will be notified at the beginning of each module where to access information for that module.
Panopto Lecture Recordings

The Department may record lectures using the Panopto lecture recording system.

The lecture recordings are in place in order to support students’ learning. Students are encouraged to use the recordings to review material they did not understand in lecture, to aid in revision prior to examinations, or to cover material when absent due to illness/other serious personal issue. The lecture recordings are not to replace actual attendance at lectures, and the Department expects students to attend lectures as normal.

Students should understand that due to unforeseen circumstances, there may be times when the technology fails. If students have missed a lecture that has failed to record, they are responsible to gain the missed material themselves from a colleague.

Students can access recorded lectures through the Panopto site on the Imperial College website: https://imperial.cloud.panopto.eu/Panopto/Pages/Default.aspx Students will automatically be given access to all compulsory courses that are being recorded for their year group, but some optional courses may require special permissions.

More information about Panopto and the College’s guidelines on recordings can be viewed here: http://www.imperial.ac.uk/admin-services/ict/self-service/teaching-learning/elearning-services/panopto/students-use/

COMPUTATION

The computation facilities available to students are kept under continuous review and have regular upgrades. Matlab, Python, R and C are currently taught in the Department. Word processing software, email and Web facilities are also provided. The student Departmental machines also provide access to software constructed by the METRIC project [see page 53] which supports the A-level/First Year university interface.

Departmental workstations are located in the Huxley Building in rooms 212, 408, 409 (for Fourth Year students only), 410 and the Maths Learning Centre (level 4, Huxley Building).

CENTRE FOR ACADEMIC ENGLISH

We regard a good understanding of the English language as key to successful learning. For students who fail the English language test given at the beginning of Term 1, English language classes are timetabled. Attendance is compulsory. The Department sees the classes as a vital part of your programme here, supporting your studies in mathematics.

Further English language support (short evening and lunch time classes) is provided by the College and information can be viewed online at: http://www.imperial.ac.uk/academic-english

These classes are available to everyone and are an excellent way to both meet new people and also improve on your communication/grammar/writing skills.
FEEDBACK FOR AND FROM STUDENTS

Feedback for students

Feedback for students is provided by Module Lecturers, Personal Tutors, Graduate Teaching Assistants (in problem solving classes and via the Department’s ‘Meet Your Marker Scheme’), Fourth Year MSci students (in Peer Tutorial Support Classes) and by the return of marked assessed coursework and progress tests. Student assessed work marks are also made available on Blackboard on specifically titled pages.

Feedback from students

Feedback from students is important for the Department, the College and Imperial College Union.

Within the Department, Module Lecturers are keen to receive feedback on the pace and content of their modules. This is best done by a question or comment at the time or immediately after the lecture, but in other cases this can be done through Student Year Representatives or the Student Departmental Representative. Third- and fourth-year modules should also have a module representative who can act as a point of contact between students and lecturer. Constructive comments and suggestions should be made in good time, in order to benefit the current year as well as following years.

To give feedback on your ‘Imperial experience’, there are a number of College-wide surveys which provide regular opportunities for student voices to be heard. All these surveys are anonymous and the more students that take part the more representative and useful the results, so please take the time to give your views.

- The undergraduate Student Online Evaluation Survey (UG SOLE) Lecturer/Module runs at the end of each Term. The Autumn and Spring SOLEs are for all students, the Summer SOLE is only for the First and Second Year projects. This survey is your chance to tell us about the modules you have attended and the lecturers who taught them. There are also separate surveys for your Business School and Centre for Culture, Languages and Communication modules.

- The Student Experience Survey (SES) runs in Term 1. This survey will cover your induction, welfare, pastoral and support services experience. During December students will receive an email via their Imperial College account with links to the survey.

- In their Final Year, students will be invited to take part in the National Student Survey (NSS) and asked to rate a range of elements related to their student experience, such as academic support, learning resources, assessment and feedback. The nationwide survey run by Ipsos MORI, an independent research agency, compiles year on year comparative data for higher education institutions, with its results being made publicly available. Imperial College London results can be found online at the Unistats website: [http://unistats.direct.gov.uk/](http://unistats.direct.gov.uk/)
To see some of the changes made as a result of survey feedback, please go the Imperial College Union's “You Said, We Did” Campaign at: 
https://www.imperialcollegeunion.org/you-said-we-did

Additionally, the Mathematics Department compiles responses to UG SOLE from Module Lecturers and sends these out to students. These are also available on Blackboard Maths Central in General Information section, UG Online Evaluation Survey (SOLE)  
https://bb.imperial.ac.uk/webapps/blackboard/content/listContentEditable.jsp?content_id=_620210_1&course_id=_7508_1#sole

Further information on these surveys and the results from previous surveys can be viewed online at: http://www.imperial.ac.uk/students/academic-support/student-surveys/ug-student-surveys/ug-sole/

For further information on surveys please contact the Registry’s Surveys Team at: surveys.registrysupport@imperial.ac.uk

**STAFF/STUDENT COMMITTEE**

The Department of Mathematics has an active Staff/Student Committee that meets at various times (usually over lunch) throughout each session. Student and Staff Representatives discuss various academic matters to do with the structure and operational running of the courses. There are also matters to discuss and arrange to do with staff/student social interaction.

Information about the Staff/Student Committee and minutes of meetings can be viewed on the Maths Central pages of Blackboard at: http://bit.ly/1QbfSIT

**TEACHING STRATEGY COMMITTEE**

All aspects of degree and course structures and content are kept under review by a Departmental Teaching Strategy Committee, with some student input by the Student Departmental Representative.
PASTORAL CARE

Personal Tutors

Personal Tutors should be the first person to approach if a student is experiencing problems, either academically or personally. First Year students are expected to meet with their Personal Tutors on a weekly basis at their personal tutorial sessions; however, students should not feel that these are the only times they can meet with their Personal Tutor if they have any academic or personal concerns they would like to discuss.

In Second, Third and Fourth Years, meetings with Personal Tutors may be less frequent but students should always feel free to contact their Personal Tutor with any issues. During ‘Meet Your Personal Tutor Weeks’, meeting with your Personal Tutor is compulsory.

It is important that Personal Tutors get to know their students well, so they can intervene early if something goes wrong academically or otherwise. Personal Tutors are experienced academics and they can become very important supporters. Ideally, a personal bond develops as students and their Personal Tutors meet on a regular basis and Personal Tutors witness the student’s academic development as they mature intellectually. Keeping Personal Tutors informed about academic and personal development will also enable them to write convincing, supportive references.

If, for whatever reason, students are unhappy with their Personal Tutors, they should notify their Year Tutor or the Undergraduate Liaison Officer.

Year Tutors

Year Tutors provide assistance both to individual students within their year group as well as to issues which might affect the year group as a whole.

Year Tutors should be contacted by individual students if they have an academic or personal issue they would like to discuss and their Personal Tutor is unavailable. They should also be contacted if a student has missed an assessed work deadline.

Senior Tutor

The Senior Tutor is available to help if Personal Tutors or Year Tutors do not feel qualified to advise a student on a particular matter. They also act as an intermediary between the student and the College where the student is experiencing problems.

Undergraduate Liaison Officer

The Undergraduate Liaison Officer works closely with the Director of Undergraduate Studies, the Senior Tutor and Year Tutors. Students will be able to approach the Undergraduate Liaison Officer in confidence to discuss any concerns they may have and, if necessary, they will be directed to the most appropriate people in the Department and/or College with whom to speak.
ATTENDANCE

It is a College regulation that students are required to attend to the satisfaction of the Head of Department. Missed attendances will be recorded in the student’s file and will enter into considerations of borderline degree classifications.

Students must not miss compulsory meetings or events without prior permission to do so.

Undergraduates are reminded that any absence for more than two weekdays must be reported to their Personal Tutor or Year Tutor.

For absences longer than a week a medical certificate must be provided or special permission obtained from the Year Tutor or Senior Tutor.

POINTS BASED IMMIGRATION SYSTEM

The UK Government’s Points Based Immigration System was developed in order to assess students (and others) for visa eligibility. In addition, the Home Office sets certain rules that UK universities are required to follow.

In particular, the College must by law report:

- any Tier-4 student visa holder who fails to report within ten days of the end of the normal enrolment period
- any Tier-4 student visa holder who misses ten ‘expected interactions’. The term ‘expected interaction’ includes, for example, missing an assessed work deadline or progress test, failing to attend an exam or failing to attend a compulsory meeting, event or appointment with a Personal Tutor.

It has been decided by the College that any approach it takes should apply to all students, not just international students, as part of our Duty of Care. As a result we have been instructed to report to the College Registry any student who falls into the categories above.

The second point above means that you should inform the relevant person in advance if you are going to miss an assessed work deadline or progress test or an appointment. Please email academic members of staff directly if you cannot make an appointment.

Be aware that the UK Government has set a limit of five years on the amount of time that can be spent in the UK on a student visa above degree level (i.e. studying towards a BSc and Masters; there are special allowances for MSci students who want to do an MSc after their MSci). Students who exceed this time limit may be prevented from remaining in the UK to complete their degree. The most likely students affected by this rule are those who have had to resit more than one year of their course. Any concerned students should consult with International Student Support. Further information can be found online at: http://www.imperial.ac.uk/media/imperial-college/administration-and-support-services/international-student-support/public/Resits-and-interruptions.pdf

The booklet “your visa, your responsibilities” also includes good information, please look on: http://www.imperial.ac.uk/study/international-students/visas-and-immigration/tier-4-general-student-visa-responsibilities/
WITHDRAWING FROM THE DEPARTMENT

If, for whatever reason, you are considering withdrawing from your mathematics degree, please speak with your Personal Tutor, Year Tutor, the Senior Tutor or the Undergraduate Liaison Officer beforehand. Depending on the reason for your decision, there may be Departmental and/or College support systems in place, of which you may be unaware, which can assist you. You may find that withdrawing from your degree isn’t the most appropriate course of action to take.

If, however, you have made a determined decision to leave, then the Department simply requires a letter, with a handwritten signature, stating your intention to do so. No explanation is required. You should also speak with a member of staff at the Student Hub to ensure you have no outstanding commitments to the College.

The Department will remove you from our database and notify Registry.

EMPLOYMENT DURING STUDIES

College policy on student employment during studies can be viewed online at: https://workspace.imperial.ac.uk/registry/Public/Procedures%20and%20Regulations/Policies%20and%20Procedures/Student%20Employment%20During%20Studies.pdf

If you are experiencing financial difficulties, you are encouraged to seek financial assistance via the Student Hub: http://www.imperial.ac.uk/fees-and-funding/

If you are an international student on a Tier-4 student visa, you are only allowed to work full-time after the official end of Term 3. Any full-time internship starting before this time would be a serious infringement of your visa conditions.

Further information on working in the UK whilst on a Tier-4 student visa can be viewed online at: http://www.imperial.ac.uk/study/international-students/visas-and-immigration/work-rules-during-your-studies/
DEPARTMENTAL ADMINISTRATION

Contact details for Department of Mathematics staff members can be viewed on Blackboard Maths Central in General Information section, under Contacts: https://bb.imperial.ac.uk/webapps/blackboard/content/listContentEditable.jsp?content_id=_620208_1&course_id=_7508_1&mode=reset#contacts1 or online at: http://www.imperial.ac.uk/natural-sciences/departments/mathematics/about-us/people/

DEPARTMENTAL ACADEMIC STAFF

Staff research interests can be viewed online at: http://www.imperial.ac.uk/natural-sciences/departments/mathematics/research/

There are also Departmental Research Associates, some of whom take on teaching duties, visiting Professors, Senior Research Fellows and Investigators. These are listed at: http://www.imperial.ac.uk/natural-sciences/departments/mathematics/about-us/people/

DEPARTMENTAL ADMINISTRATIVE STAFF

<table>
<thead>
<tr>
<th>Position</th>
<th>Name</th>
<th>Email</th>
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<tbody>
<tr>
<td>Head of Department</td>
<td>Professor R. Craster</td>
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<tr>
<td>PA</td>
<td>Ms A. Rowlands</td>
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<tr>
<td>Deputy Head of Department</td>
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<td>Departmental Operating Officer PA</td>
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<tr>
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<td>Assessment and Information Administrator</td>
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<tr>
<td>Undergraduate and MSc Mathematics and Finance Admissions</td>
<td>Ms S.R. Morgan</td>
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</tr>
</tbody>
</table>
STUDENT REPRESENTATIVES

Students in the Department of Mathematics are represented by a Department Representative as well as Year Level Representatives. These students are newly elected each year at student elections.

Contact details for student representatives can be found on the relevant Undergraduate Student websites and online at: https://www.imperialcollegeunion.org/your-union/your-representatives/a-to-z

IMPORTANT DEPARTMENTAL INFORMATION

All current programme information is available for students on the Maths Central page of Blackboard. If any information is missing, students should contact Inkeri Hibbins.

Academic Year Calendar 2016-2017:
http://www.imperial.ac.uk/admin-services/registry/term-dates/
http://www.imperial.ac.uk/human-resources/procedures/leave/annual-leave/college-closures/

Timetables are available on Maths Central page of Blackboard at: http://bit.ly/1O0ggKY

Past Examination Papers are available on Maths Central page of Blackboard at:
http://bit.ly/1VzyKEd

Health and Safety is available on Maths Central page of Blackboard or at:
http://www.imperial.ac.uk/natural-sciences/departments/mathematics/about-us/safety/

Information and Communication Technologies (ICT): http://www.imperial.ac.uk/admin-services/ict/

Room Bookings: https://www.imperial.ac.uk/natural-sciences/departments/mathematics/about-us/information-for-staff/room-bookings/

Huxley Building Guide [see Appendix XI] is available on Maths Central page of Blackboard
Campus Map [see Appendix XIII]:
https://workspace.imperial.ac.uk/campusinfo/public/sthencampus.pdf
CENTRAL LIBRARY

The Central Library is a major resource which provides access to an extensive collection of textbooks, research monographs and journals. These are available in print or online.

Further information about the Central Library can be viewed online at: http://www.imperial.ac.uk/admin-services/library/

Key Library Staff for the Department of Mathematics:

- Mathematics and Physics Librarian (Ms A. Brew): ann.brew@imperial.ac.uk

FACILITIES FOR STUDENTS

Mathematics Learning Centre (MLC)

The Mathematics Learning Centre (level 4, Huxley Building) is a major space within the Department for individual and group study. Departmental computing workstations and printers and copiers are available for students to use. There are two side rooms in the MLC: MLC1 and MLC2 which can be booked out and used for small group tutorials, careers sessions, Seminars, etc.

The MLC is at times used for teaching, and students are required to vacate the computer stations required for these sessions. During tests/exams for the modules, students may be asked to leave the MLC.

Other Computing Rooms

Departmental workstations are located in the Huxley Building in rooms 212, 408, 409 (for Fourth Year students only), 410 and the Maths Learning Centre (level 4, Huxley Building). 408 is designated as a silent study area.

Maths Common Room (Huxley 212)

Huxley 212, next to the Clore, is a computing/common room for all Mathematics Undergraduate Students. Students may use the room for socialising, working together, having lunch, playing board games, etc. Notices from MathSoc and the Year Reps will be posted in this room.

Students are reminded to be courteous to each other while using all of the rooms and are asked to not leave their personal possessions in the rooms while not in them.

MATHEMATICS EDUCATION TECHNOLOGY – RESEARCH AT IMPERIAL COLLEGE (METRIC)

The METRIC project develops a set of Web-based learning modules consisting of self-test exercises, interactive explorations of concepts and mathematical tools (such as plotters).

The current brief of METRIC is to make its existing materials available flexibly through the College VLE (Blackboard) and to develop new bespoke content aimed at supporting mathematics service teaching, especially in the First Year.
All First Year Mathematics Undergraduates are asked to log on to METRIC over the summer to spend some time preparing prior to the first week.

METRIC also supports delivery of the College’s Mathematics outreach activities, via such initiatives as the West London Further Mathematics Centre, the IMS Summer School, the NAGTY Space Science Summer School, the Royal Institution Mathematics Circle and the AIM Higher Master Classes. METRIC is part of the pan-European LTM project, developing multilingual Mathematics e-learning resources for secondary school students in seven countries.

- METRIC Manager and Lecturer (Dr P.J. Ramsden): p.ramsden@imperial.ac.uk

Further information about METRIC can be viewed online at: http://wwwf.imperial.ac.uk/metric/metric_public/

POSTGRADUATE COURSES AND RESEARCH

Postgraduate work in mathematics is divided between advanced courses, which normally extend over about one year and lead to the degree of MSc, and research studies that normally extend over a period of up to about three years and lead either to the degree of MPhil or more usually to that of PhD. An important aspect of the structure of the Department is that it consists of several sections: Applied Mathematics and Mathematical Physics, Pure Mathematics, Statistics, Mathematics and Finance. The sections have their own thriving research activities and also give a valuable framework for teaching activities at all levels.

The Department offers the following postgraduate courses and research programmes:

**Taught Masters programmes (MSc):**

- Applied Mathematics (Programme Director: Dr R. Barnett)
- Pure Mathematics (Programme Director: Professor A. Skorobogatov)
- Statistics (Programme Director: Dr E. Cohen)
- Mathematics and Finance (Programme Director: Dr A. Jacquier)

**MRes/PhD programme:**


Centres for Doctoral Training (CDT) which offer MRes/PhDs:

- **CDT in the Mathematics of Planet Earth** (Contact: Professor D. Crisan)
- **CDT in London School of Geometry and Number Theory** (Contact: Professor A. Corti)
- **CDT in Fluid Dynamics across Scales** (Contact: Professor D. Papageorgiou)
- **CDT in Financial Computing & Analytics** (Contact: Professor R. Cont)

Further information on post graduate study can be found online at: http://www.imperial.ac.uk/natural-sciences/departments/mathematics/study/students/
REFERENCES

The Department of Mathematics is able to provide references for students.

- all references must be for a specifically named postgraduate course or job; the Department is not prepared to write open references
- each member of staff may only provide you with up to five references per academic year
- you must provide a statement explaining why you are applying for the courses or posts listed and attach a current CV and any relevant referee forms to your application
- references can take up to three weeks to prepare so please plan ahead; references cannot be provided at very short notice
- referees may ask to see you before they provide a reference
- if you are applying to a number of postgraduate programmes, if possible, please try to ask for all references at the same time
- if your reference is being posted, you will receive an email (to your university email address if you are a current student) informing you when it has been sent. References will be posted 2nd class
- if your reference is for collection, you will receive an email (to your university email address if you are a current student) informing you of your reference's availability and from where and when it can be collected
- if you want someone else to collect your reference(s) for you, you must send the Undergraduate Maths Student Office (maths-student-office@imperial.ac.uk) an email from your university email account authorising the release of your reference(s) to the person named. The person collecting your reference(s) must bring their own picture ID with them for identification purposes

The person you ask to be your referee should be someone who knows you well enough to give a fair assessment of you. Normally your Personal Tutor will be the main person to write references for you but you may also approach a Project Supervisor or your Year Tutor. The Senior Tutor may also be approached.

Remember that we cannot respond to direct requests for references from third parties; we can only provide a reference for you if you make the initial request.

Please talk to your Personal Tutor for any help with questions, or contact the Undergraduate Liaison Officer.

The Reference Request Form can be printed from the Maths Central pages on Blackboard
https://bb.imperial.ac.uk/webapps/blackboard/content/listContent.jsp?course_id=_7508_1&content_id=_620208_1#reference
LETTERS

The Department of Mathematics is able to provide the following letters to students:

- Statement of Attendance letter
- Tenant Letter
- Confirmation of Degree Letter

If you require some other type of letter, please ask at the Undergraduate Maths Student Office.

To request a letter, students must complete an Undergraduate Letter Request form [see Appendix XI]. These can be found online or outside the Undergraduate Maths Student Office.

The online form must be printed and completed as we require a handwritten signature in order to process the request.

The letter request form can be found on the Maths Central Pages of Balckboard at: http://bit.ly/1UuYOOO or outside the Undergraduate Maths Student Office.

Official transcripts can only be requested from Registry through the Student Hub. The Student Hub can also prepare a number of letters for you, please see their website for more information.

PRINTING CREDIT

At the start of the academic year, the Department will provide students with printing credit. Students who complete the Student Online Evaluation Surveys (SOLE) will receive further credit.

Value loaders and a change machine are situated just inside the Wolfson IT Suite on level 1 in the Central Library. Students can also pay online via ePay: http://www.imperial.ac.uk/admin-services/ict/self-service/computers-printing/printing/buy-credit/

If you experience any problems with the Department issue printing credit, please contact ICT (room 411, Huxley Building).

STUDENT POST

There are student post racks for ‘regular’ post only in the Undergraduate Student Office, opposite the pigeon holes from which to collect marked work from. These racks are cleared at the end of each academic year; please make sure you check the racks for any letters you may be expecting.

Any letters or documents issued by the Department of Mathematics, which aren’t being posted or emailed, can only be collected from the Undergraduate Maths Student Office. Photo ID and signature are required upon collection.
LOCKERS

Student lockers are situated on level 1 in the Huxley Building. Please see the Technical Services Manager (room 131, Huxley Building) if you require a locker.

At the start of the academic year, students should put a padlock on their chosen locker and then register their locker by completing a form found outside room 131. At the end of the academic year, students are required to remove their locks and empty their lockers. If this is not done, locks will be cut off and the locker contents will be disposed of.

CONTACTING STUDENTS

The Department will primarily contact students via email, using their university email address only. Students are required to check their emails regularly.

Important information will be posted on Blackboard on MathsCentral. Students are expected to check MathsCentral regularly.

Important information will also be posted on the Department of Mathematics noticeboards (level 3, Huxley Building) as well as on other noticeboards around the Department. Students are expected to check these noticeboards regularly.
EVENTS AND CAREERS

The Mathematics Society (MathSoc)

The Mathematics Society (MathSoc) plays an important part in the Department and arranges events for students and staff, including parties, outings, special lectures and careers events. Information is emailed to students and more information can also be found on the MathSoc website: https://www.union.ic.ac.uk/rcsu/mathsoc/

The Undergraduate Colloquium

The Undergraduate Colloquium was initiated by students in 2012-2013 as a weekly lecture series where undergraduate students could present their research (e.g. UROP/projects/other independent research) to other undergraduates and members of the Department. The lectures take place during lunch and are advertised via email and on the Maths Central Pages of Blackboard at: http://bit.ly/1KMvy4V.

PLUS!

PLUS! is an interactive problems group that meets at regular intervals throughout Term 1 and Term 2, usually at lunch time. All students are welcome to turn up and leave as and when they wish. Further information can be found at: http://bit.ly/1Oddcco

CAREERS

The Careers Service

The Careers Service arranges talks for students throughout the year including a talk on careers for mathematics graduates, given by a member of the Institute of Mathematics, IMA. Students can also book to see the Careers and Internship Consultants individually for CV and cover letter checks as well as advice on applications and interviews.

For more information about careers, please see the Maths Central pages on Blackboard at: http://bit.ly/1Uv0ozU

and the College Careers Service website: http://www3.imperial.ac.uk/careers

The Mathematics Careers Speed Dating Night

The Mathematics Careers Speed Dating Night is the main careers event for the Department of Mathematics. It is open to all Second, Third and Fourth Year students and takes place one evening in October. Students have the opportunity, in a ‘speed dating fashion’, to meet with a number of potential employers and alumni to talk about employment opportunities and graduate programmes.
COLLEGE SUPPORT AND INFORMATION LINKS

- The Student Hub on level 3 in the Sherfield Building is the main information point for all students, providing information on all student services: http://www.imperial.ac.uk/student-hub/

- College Tutors: http://www.imperial.ac.uk/student-space/here-for-you/college-tutors-and-departmental-support/

- Student Union Representatives: https://www.imperialcollegeunion.org/your-union/your-representatives/a-to-z

- Welfare and Advice: http://www.imperial.ac.uk/students/student-support/

- General Information on Student Support: http://www.imperial.ac.uk/student-space/

- The Disability Advisory Service: http://www.imperial.ac.uk/disability-advisory-service/

- College Registry: http://www.imperial.ac.uk/admin-services/registry/

- The Student Union: http://www.imperialcollegeunion.org/

- International Student Support: http://www.imperial.ac.uk/study/international-students/

- Student Finance (Fees, Funding, Financial Assistance): http://www.imperial.ac.uk/fees-and-funding/

- Accommodation: http://www.imperial.ac.uk/study/campus-life/accommodation/

- Centre for Academic English: http://www.imperial.ac.uk/academic-english

- Imperial Horizons: http://www.imperial.ac.uk/horizons

- The Imperial Success Guide: http://www.imperial.ac.uk/students/success-guide/


- Coping with Examination Stress: http://www.imperialcollegehealthcentre.co.uk/exams-and-stress/
Post Examination Appeals: [http://www.imperial.ac.uk/about/governance/academic-governance/academic-policy/complaints-appeals-and-discipline/](http://www.imperial.ac.uk/about/governance/academic-governance/academic-policy/complaints-appeals-and-discipline/)

College Principles: [http://www.imperial.ac.uk/students/student-support/our-principles/](http://www.imperial.ac.uk/students/student-support/our-principles/)

College Policies, Procedures and Regulations: [http://www.imperial.ac.uk/about/governance/academic-governance/regulations/](http://www.imperial.ac.uk/about/governance/academic-governance/regulations/)

Careers: [http://www.imperial.ac.uk/careers](http://www.imperial.ac.uk/careers)

Student Surveys: [http://www.imperial.ac.uk/students/academic-support/student-surveys/](http://www.imperial.ac.uk/students/academic-support/student-surveys/)

Graduation Information: [http://www.imperial.ac.uk/graduation/](http://www.imperial.ac.uk/graduation/)

Alumni: [http://www.imperial.ac.uk/alumni/](http://www.imperial.ac.uk/alumni/)

Information and Communication Technologies (ICT): [http://www.imperial.ac.uk/admin-services/ict](http://www.imperial.ac.uk/admin-services/ict)

Lost and Found Property: [http://www.imperial.ac.uk/estates-facilities/security/lost-and-found-property/](http://www.imperial.ac.uk/estates-facilities/security/lost-and-found-property/)

ID Card Information: [http://www.imperial.ac.uk/estates-facilities/security/id-cards/](http://www.imperial.ac.uk/estates-facilities/security/id-cards/)
APPENDIX I

G104 MATHEMATICS WITH A YEAR IN EUROPE (MSci)

Co-ordinator for European Exchanges Dr R. Nurnberg: robert.nurnberg@imperial.ac.uk

There is an increasing demand for graduates with experience on a Europe wide level. Employers are increasingly interested in graduates with language skills and these are essential for graduates wishing to work abroad. Recruitment of graduates by Industry will be from all EU members and those having a European perspective are likely to be in great demand.

G104 Mathematics with a Year in Europe is a four year Honours degree programme leading to an MSci qualification. Three years are spent in the Department of Mathematics at Imperial College and one year (the Third Year) at a host institution elsewhere in Europe.

Current Host Institutions for the Year Away from Imperial College

ENSIMAG Grenoble, France
ENS Lyon, France
EPFL Lausanne, Switzerland
Humboldt Berlin, Germany
ETH Zurich, Germany
UAM Madrid, Spain

Suitable arrangements will be anticipated for the year away when a student is first accepted onto the course and more detailed planning will proceed at the completion of the First Year programme. Every effort will be made to send a student to their country of choice but a particular host institution cannot be guaranteed.

Course Structure

G104 students need to have at least a GCSE (or equivalent) in their chosen language prior to starting in the programme. Throughout the programme, students are required to take all core modules in the Department. An appropriate language module is also normally required in addition to the mathematics modules taken. However, students who are especially well prepared in the language for their proposed year of study away may exceptionally have the language module requirements waived. Students are required to register for their language module themselves [see link below].

Note: Whilst G104 students must pass the language examinations at the end of First and Second Year in order to stay on G104, language examination results do not directly contribute to their mathematics degree Honours mark.
Students must be in a position to take advantage of the Third Year of the course (spent away). Mathematically, students are normally required to have attained a good level of performance in Mathematics (at Upper Second Class level or better). Linguistically, students should have passed Level 3 in their chosen language at the Centre for Culture, Languages and Communication (or its equivalent elsewhere).

Further information on the free language modules available at Imperial College London for G104 Mathematics with a Year in Europe students, and any pre-requisites which may be required, can be found online at: http://www.imperial.ac.uk/languages/year-in-europe/

First and Second Years

G104 students follow the same mathematics modules as all other students, but take additional language classes (as necessary).

Third Year (Spent at a Host Institution)

Performance at a high level is normally necessary for the progression to the year abroad to be permitted. In addition, there is a language requirement for the year away.

Students will follow an approved set of modules at the host institution, where they will also be assessed. On their return, the achieved exam results will be converted to the Imperial Maths scale. Details on the applied conversion procedure can be found on the Maths Central Blackboard page under Course Information, G104 information.

Fourth Year

Students will have a free choice of core modules and options from the list currently available - on the same basis as students registered on the MSci G103 Mathematics degree. G104 students may also take the M3T module as an option in this year.

Pass Requirement and Assessment for Honours

Students are normally expected to pass all programme elements in order to progress into successive years.

Performance at a high level both in mathematics and their language modules is normally necessary for the progression to the year abroad to be permitted.

When students return to College for their Final Year of study they are expected to take on a programme of study in line with the MSci G103 Mathematics degree.

The weighting for final Honours purposes of modules/projects first taken in First, Second, Third and Fourth Years is 1:3:4:5.

On the rare occasion that a student performs very poorly in their year away they may, at the discretion of the Senior Tutor, be transferred to the BSc G100 Mathematics degree or the BSc G101 Mathematics with a Year in Europe degree and take M3 subjects in their Final Year. The year weightings for G101 are 1:3:2:5. If there is reason to suspect that through no fault of the student, the mark abroad is out of line with the performance at Imperial, the
Examinations Board will also consider the effect of discounting the Year in Europe entirely in their deliberations with regard to degree classification.

Students who satisfy the degree requirements receive consideration for Honours in the normal way: First Class, Second Class (Upper and Lower Divisions), Third Class.

**Transfer between G104 and Other Degrees**

Students who do not perform well at Second Year may be unable to spend their Third Year overseas and may be transferred to BSc G100 Mathematics.

Students who perform very poorly in their year away may be transferred onto G100 or the G101 BSc Mathematics with Year in Europe degree and take M3 subjects in their Final Year. This is a departmental decision – students may not choose this path.

Students who choose to transfer from MSci G104 Mathematics to a three year BSc degree will only be allowed to do so with the permission of the Department. This permission is not normally possible after undertaking study abroad.

After transfer, the Pass requirement would then be as per the new degree and any language ECTS values acquired before going abroad would be counted as part of the new degree.

Students on a BSc degree may be able to transfer into the MSci G104 Mathematics degree if they can satisfy the Department of their language skills and have good examination results. Normally such transfers will be considered at the end of the First Year of study. Students should make their interest known as early as possible.
APPENDIX II

G1EB/G1EM MATHEMATICS WITH EDUCATION

Students who are considering a teaching career may apply for transfer onto the Mathematics with Education degrees, the three year BSc G1EB or the four year MSci G1EM. In both these degrees half of the final year is spent studying Education modules at Imperial and completing teaching placements. On completion, students obtain a BSc or MSci in Mathematics with Education, along with Qualified Teaching Status (QTS), rendering them immediately able to begin teaching in schools as a Newly Qualified Teacher (NQT).

These degrees offer some advantages over a conventional BSc/MSci + PGCE route into teaching:

a) Teaching education and practice is spread over the programme and mixed with the mathematics.
b) Incorporating the teaching qualification in the BSc saves students a year compared with the First degree + PGCE model.
c) £9K bursaries for those eligible on these degrees are provided by the government to cover the fees for the final year.

Applicants will be interviewed in their Second and Third years respectively, in a manner similar to admission to the M3T module.

Course Structure

All years bar the final one will, except where noted below, follow the syllabus for the BSc & MSci Mathematics degrees (G100 & G103).

**Year 1:** identical to the BSc Mathematics degree (G100).

**Year 2:** as for G100 students, but the M2T *Communicating Mathematics* module (during which students spend regular sessions in a school during the Second Term and are involved in assessed classroom teaching and other activities) is compulsory for G1EB students and takes the place of the optional module. Following the second year exams, G1EB students are required to carry out a full time teaching practice placement of at least 5 weeks, which may be at their M2T School.

**Year 3 (G1EM)** As for G103, save that the M3T module will be compulsory. Following the Third year exams, G1EM students are required to carry out a full time teaching practice placement of at least 5 weeks, which may be at their M2T School.

**Year 3 (G1EB)/Year 4(G1EM):**
The first half of the First Term incorporates the main teaching practice placement interspersed with three weeks of teacher training (at Imperial) to be delivered principally by CCCU (possibly with input from teachers on secondment). This is integrated with the INSPIRE summer school hosted at Imperial during September – see [http://www.imperial.ac.uk/study/pg/courses/inspire/](http://www.imperial.ac.uk/study/pg/courses/inspire/).

Over the course of the year, students complete three courses: Professional Studies, Curriculum Studies 1 and Curriculum Studies 2. These are assessed respectively by means of 4000 word reports and 2000 word reports. The second half of the First term is spent completing the main teaching practice placement.

During the Second Term, students take regular Mathematics courses. For G1EB, 4 Second Term M3 options are selected, while for G1EM, 3 second term M4 options are taken together with a half-length M4R project. A further teaching placement of at least 6 weeks takes place immediately following the final exams.
APPENDIX III
TIPS ON ASSESSED COURSEWORK PRESENTATION

When submitting assessed coursework, the Department of Mathematics does not insist that you follow specific presentation procedures. However, common sense suggests that by submitting work which is legible and clearly laid out, you are ensuring that your marker is able to read and understand your mathematical argument and can then allocate marks accordingly.

Some Markers will deduct marks for poorly presented work (even if they are able to follow your mathematical argument).

Below are some tips on how to make your assessed coursework legible and more coherent. Following these tips will assist your marker and also make the administrative process easier:

- clearly write the module code (e.g. M3A4), your name and CID on each page of your assessed coursework and number each page. If any pages separate from any scripts, this will enable us to work out where they should be
- print your work or write using black or blue ink. Pencil can be too faint to read and red ink is taken to be reserved for the marker
- place a margin all around your work so the marker has space to write comments
- leave space between each line of your work
- read the question, answer what you have been asked and number each answer clearly
- take care with spelling and write in complete and proper sentences
- keep your notation consistent with that used in the question
- be clear in writing. Note that ‘a’ and ‘q’, ‘b’ and ‘6’, ‘s’ and ‘5’, ‘1’ and ‘7’ and ‘4’ and ‘9’ may be easily confused
- be sure to say what you mean and make sure you are using mathematical symbols and terminology correctly
- do not use constants as indeterminates or variables, and vice-versa. g, for example, is usually reserved for gravity (in applied subjects) or a group element (in algebra), so do not use it where \( x \) would look more natural
- you will not gain extra credit for completing your work on one sheet of paper; indeed, if you manage to do this you should check that you have not missed important working out. Similarly, excessively bulky coursework should also be questioned. Some Module Lecturers will penalise students who produce work over a specified number of pages
- use a single staple at the top left-hand corner of your script to avoid the loss of individual pages
- before submitting your work, read through it and rewrite any sections which are messy or unclear.

Note: Plagiarism is a serious offence and all assistance MUST be referenced. Each piece of work MUST be accompanied by a signed declaration, ‘This is my own unaided work unless stated otherwise’. This is printed on the coversheets available for assessed coursework. The best presented work will be a wasted effort if you are found guilty of plagiarism.

Information on what constitutes plagiarism, the penalties that apply and College policy and procedures, can be found on the Maths Central pages of Blackboard.
APPENDIX IV

TIPS ON WRITING A PROJECT REPORT

Your Project Supervisor will give you some idea of what the subject is about and why the topic or problem is important. They will give you a list of references and will probably provide some idea of the background mathematics and, if the project involves solving a problem, the methods you might use to tackle the problem.

Skim through the references to get an overview of the topic. You may find that some of the accounts are easier to read than others - stick with these to begin with. Then make some rough notes - note particularly those things which don't make sense. Remember to write quick references as you take note, this will make it easier when it comes to writing the full project and referencing correctly.

Speak with your Project Supervisor if you have any questions and need to have any points clarified.

If the project is to be an account of a topic, make a summary of the definitions and theorems and note how the theorems can be used to establish other results. If some of the proofs are particularly difficult, can you see any way that the proof process might be motivated? Imagine that you are trying to explain a theorem to a fellow student - is there any way you could help them to understand why the theorem might be true; could you provide some motivation for the proof?

If the project involves solving a problem, what do you know about solutions? Can you be sure that the problem has a solution; if it does, is it unique? How do solutions depend on the problem data?

It is a good idea to see whether there are any obvious reformulations of the problem - some formulations may be 'easier' to solve than others.

Always try to include some kind of check on your calculations - this applies equally to analytical, algebraic and numerical work - it is very easy to make mistakes. If you know of more than one method for solving a problem, it may be worthwhile trying more than one of them as the results obtained by different methods can provide a useful check on your calculations and comparisons of the effort required to compute a solution can be very useful. Adopt a 'fail safe' strategy - if it becomes clear that one approach is taking up too much time, drop that approach.

Writing the report always takes longer than you think; plan the report at a very early stage in the project and write a brief outline of what you hope it will contain. If the project is a 'problem solving' project a schematic outline might be as follows:

- acknowledgements
- abstract (a very brief summary of the report)
- contents
- a statement of the problem
- a discussion of why the problem is important, possibly reformulations of the problem
- the nature of solutions (existence, uniqueness, dependence on problem data, etc.)
- the problem solving technique(s)
application of the technique(s) to the problem
discussion of the results
concluding remarks
references

Discuss your outline with your Project Supervisor, preferably in the first week.

It is assumed that the target readership for the report are people whose mathematical attainment is not significantly different from your own.

The report should be written so that the potential readers will find it well organised and easy to read. Try to put yourself in the reader's place while you are writing the report. Ask yourself, “if I didn't know what was in the report before I picked it up, would my account achieve these objectives?”

A report which is clear, easy to read and clearly laid out makes a good impression on the reader. Many of the points made in 'Tips for Assessed Coursework Presentation' could be usefully applied here [see Appendix III].

The abstract provides the reader with a convenient overview of what the project is about and what to expect as they read it.

Give titles to the chapters, and headings to all sections and sub-sections; choose the section headings so that they will give the reader an indication of the topics dealt with in each of the sections - a glance at the table of contents will help readers to understand the organisation of the text and will allow them to locate any section which interests them.

You should list all the sources you've referred to in preparing your report.

Note: Plagiarism is a serious offence and all assistance MUST be referenced. Each project MUST be accompanied by a signed declaration, ‘This is my own unaided work unless stated otherwise’. The most well-written and best presented work will be a wasted effort if you are found guilty of plagiarism.

TIPS ON PREPARING AND GIVING ORAL PRESENTATIONS

For most of us, giving an oral presentation for the first time is a daunting prospect. To give a successful talk you should be sure that you know and understand what you want to say and that you know how to say it.

- identify the key result in your work
- identify the background knowledge of the listener
- ask if any background material should be explained in some of the time allocated for your presentation? Assuming that your listener has grasped this material; can you explain the key result in the remaining time?

If the answer to any of these questions is 'No', it may be that it isn't possible to do justice to the work in a short presentation. In this case you should consider limiting your talk to outlining one particular aspect of the work you've done. You might find it helpful to discuss the problem with your Project Supervisor.
When giving your oral presentation:

- Try to capture your audience's attention and interest from the start. It helps if you can give a clear brief summary of what you are going to say, at the beginning of your talk.

- Remember that most (if not all) of your listeners will know nothing about the subject so don't try to say too much. If it seems appropriate, recapitulate important results from time to time.

- Avoid giving lengthy mathematical arguments (e.g. proofs) unless they are very relevant to the points you wish to make.

- Key material can be displayed using an overhead projector while you are talking about it. Don't put too much on the screen - a few lines of text and one or two equations at most. Write clearly and check that any overheads can be read easily from a distance.

- Use a pointer if you want to refer to something on the overhead.

- Remember to remove any overhead text/images when you have finished referring to them.

- Keep the notes of your talk at hand but do not read from them; use your notes as a reminder of what you want to say.

- Don't talk too quickly, try to avoid talking in a monotone and check that everyone can hear you clearly.

- Try to make eye contact with your audience.

- Rehear the talk, possibly with one or two friends as an audience; in this way you will get a good idea of how much time you should spend on each section of your talk and you'll get useful feedback.
APPENDIX V

ADVICE ABOUT REVISION AND EXAMINATIONS

Examinations are a necessary feature of your degree. Although they are the fairest way of testing your understanding of the course material and your mathematical ability, examinations can cause a certain level of anxiety. It is therefore important to plan ahead to give yourself the best chance of doing yourself justice in them.

Not surprisingly, doing well in examinations is a lot to do with having the confidence that comes with having a good understanding of the material and having practised lots of problems. Not that you want to be over-confident – a little anxiety can improve motivation and performance. It’s important not to think too negatively about examinations. It is healthier to think of them as an interesting challenge and an opportunity to demonstrate your knowledge and ability.

As stated earlier, it is very important to prepare properly during the year for the examinations. You should realise that most extreme examination anxiety is caused by lack of preparation and so you need to work hard during the year with the May/June examinations in mind:

- keep your lecture notes organised
- it is very important that you sort out any difficulties with a lecture module at the time. Make it a rule to go through your lecture notes and resolve any problems that same week. Don’t leave it until the Easter break as it will be much harder at that stage. Revision should be just that, i.e. revision, not trying to understand material for the first time
- make use of Module Lecturers’ office hours – go armed with any questions. Try to make these specific. It is difficult to know where to begin when a student says “I don’t understand Analysis/Algebra/Statistics/Mechanics/all of these (delete as appropriate)”
- study the comments on your marked assessed work scripts and/or feedback forms. Ask yourself where you went wrong (if you did) and why you lost marks? How could you improve your answers next time?
- do the problem sheets. Examination questions are just as likely to be set on these topics as they are on assessed work topics
- start any assessed work in good time.

Revision

How should you revise? Everyone has their own way of revising but here are some general points to consider:

- Start your revision in good time. Make a realistic revision timetable. Allow times to relax, eat and sleep
• try not to rely on revising for extended periods between examinations; you should aim to complete the majority of your revision before the start of your first examination

• get going by reading through the whole of your notes on a subject fairly quickly to get an overall picture of what the module is about. Try to draw a diagram to show how the different parts of the module relate to each other and how the different theorems link together. Does the material naturally split into different topics?

• little and often is best – give yourself a short break once an hour or every two hours, whichever works best for you

• make a list of all definitions and/or theorems for the module

• try the problem sheets for the module without looking at the solutions, even if you have already done these earlier in the year

• make up question to try for yourself

• revise with friends. Test each other

• whatever you do, don’t learn mathematics and proofs parrot fashion. It does not work. Examination questions are designed to test your understanding so you will often not be asked to regurgitate a piece of bookwork exactly: the question will have a twist to it. Try to understand a proof and then write it out without looking at your notes, using different notation if possible

• it is very important to get sufficient practice at problem sheets and past examination papers when you are revising. This does not mean working through the solutions until you understand them, or learning solutions by heart. You must practice doing questions for yourself without looking at the solutions as, believe it or not, that is what you have to do in the examination. If you can’t do a question straight away avoid heading straight for the solutions – persevere

• you need to get to a stage where you have the material at your fingertips and can work quickly. This takes time to develop and requires hard work throughout the year – it is not something you can acquire at the last minute

• learning mathematics is in some ways like learning a language or a musical instrument. You need to practice until you are ‘fluent’ in a particular topic. Students who excel usually work steadily throughout the year and build up this fluency gradually. You certainly cannot develop it instantly at the end of April or the beginning of May (even if this method worked for you at school)

• students often leave a lot of their revision to the last minute and then stay up revising very late, sometimes most of the night, for several nights in a row before and during the examinations. This is a recipe for disaster. To perform well in a mathematics examination you need to be well rested. Unlike some subjects, in mathematics you need to be able to think very clearly in order to solve problems. You are not in a fit state to do this if you are already exhausted. In addition, students who have had very little sleep are often more prone to becoming ill or collapsing in the examination room
• get plenty of sleep [see above], eat well and get some exercise during the examination and revision periods. Avoid excessive alcohol and caffeine. Don’t go to bed immediately after revising – wind down first

• timing is very important in examinations so in the later stages of your revision you need to practise doing past examination questions in the appropriate time

• Be aware that examination questions may not be similar to those you have seen in the past examination papers or in problem sheets. Any fair test of your ability to apply your knowledge on a topic is allowable

Examinations

• Check the time of the examination. Every year, we get a few students who turn up at 14.00 for a morning examination, thinking the examination is in the afternoon. They get no marks. Invest in a loud alarm clock. Arrive in good time for each examination, making allowances for delayed public transport. Make sure you have everything you need with you, including your ID card

• read the rubric and the questions carefully

• explain your method. Even if you think something is ‘obvious’ you need to state it as we cannot give you marks for things you have not written down

• check your working as you go along; this can save you a lot of time in the long run. Sometimes a very silly mistake early on makes a ‘solution’ much more difficult; try to stop before going too far down a blind alley

• do not spend too long on one question or part of a question if you are clearly getting stuck. Move onto something else and come back to the original problem if there is time. On the other hand, do not give up too easily. As a rough rule spend no more than five minutes thinking about where you may be going wrong. A few moments spent thinking can save you 20 minutes of scribbling in a blind panic

• do not let one bad examination affect those which follow it. It can be a bad idea to discuss a paper you have just taken with others

Finally the following advice if you start to panic in an examination is from our Health Centre:

“First switch off to unwind for a few moments. Focus on your breathing and relax with your eyes closed. Flood your mind with constructive self-talk then slowly open your eyes and calmly bring yourself to face the exam again. Get going again with the paper, calmly, a step at a time. When focusing on your breathing, take a long slow deep breath and allow the air to flow out slowly and smoothly. Sit back comfortably with your arms dangling by your sides. Imagine any tension flowing out through your hands and feet. If the panic continues or gets worse, tell the invigilator.”
# APPENDIX VI – example

(Note this is a pink coloured form)

**DEPARTMENT OF MATHEMATICS**

**1ST YEAR COVER SHEET FOR ASSESSED COURSEWORK / ASSIGNMENTS**

Please fill-in this form using CAPITAL letters

* This information must be printed on each page of your coursework

<table>
<thead>
<tr>
<th>* Surname</th>
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<tbody>
<tr>
<td>* Other Names</td>
<td></td>
</tr>
<tr>
<td>* CID</td>
<td>Degree Code</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>* Module Code</th>
<th>Deadline Date</th>
</tr>
</thead>
</table>

**Lecturer’s Name**

---

**MAKE SURE ALL SOURCES ARE REFERENCED WITHIN YOUR WORK**

This is my own unaided work unless stated otherwise

Signature

______________________________

Today’s Date

______________

Mark out of 20
APPENDIX VII – example (Note this is a Orange coloured form)

DEPARTMENT OF MATHEMATICS

ILLNESS / PERSONAL ISSUE FORM

(Undergraduate Students Only)

Please write clearly using CAPITAL letters
NAME ........................................................................... CID # ............................................................

DEGREE CODE (e.g. G1GH) ........................................ CURRENT YEAR OF STUDY ......................

UNIVERSITY EMAIL ................................................................................................................................

DATES OF ILLNESS / PERSONAL ISSUE:
FROM ........................................................................... TO ................................................................

NATURE OF ILLNESS / PERSONAL ISSUE: ........................................................................................

If you have been indisposed for more than a week, please provide a medical certificate from your doctor or other relevant documentation for your request to be considered.

You should also see your Year Tutor.

ASSESSED COURSEWORK / PROGRESS TEST(S) MISSED

<table>
<thead>
<tr>
<th>Module Code (e.g. M2AA2)</th>
<th>Assessed Coursework Deadline(s) or Progress Test Date(s)</th>
<th>Which Assessed Work Missed (1st, 2nd, 3rd etc.)*</th>
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*Do not count non assessed problem sheets

SIGNATURE* ............................................................... DATE .............................................................

*Handwritten signature required

Completed forms should be submitted via the Undergraduate Maths Student Office (room 649, Huxley)
fax: 020 7594 8517 / email: maths-student-office@imperial.ac.uk
APPENDIX VIII – example  (Note there are three pages to this form)

MITIGATING CIRCUMSTANCES FORM

REQUEST FOR MITIGATION FORM
To be used for examinations and major elements of coursework.

For consideration of mitigating circumstances for an assessment this form must be submitted within 5 working days of the examination or coursework submission date to the person specified by your Department

Personal Details:
Name:
CID:
Department:
Programme of Study:
Year of Study:

Nature of Mitigating Circumstances:
Please tick appropriate box:

<table>
<thead>
<tr>
<th>Own illness</th>
<th>Family illness/bereavement</th>
<th>Accident</th>
<th>Victim of crime</th>
<th>Other unforeseen circumstances</th>
</tr>
</thead>
</table>

Please give details of the nature of your mitigating circumstances including dates:

Please expand or continue on a separate sheet if necessary

Documentation:

Have you attached appropriate documentation to support your case?  YES/ NO

If YES, please indicate what documentation is attached.
Examples of suitable documentation include:

Please tick appropriate box:

- Medical Certificate or doctor’s letter (if from a UK based practitioner, they should be GMC registered)
- Email/letter from Imperial College Health Centre
- Hospital Admission note
- Death Certificate
- Police Crime Number/report
- Letter from counsellor
- Other: Please specify...

Translations should be provided of any documentation not submitted in English.
If NO, please state when you will be able to provide suitable documentation, or explain why this is not possible:

Please note that the more information the Department receives to support your mitigating circumstances, the better able it is to reach an informed decision.
Details of Assessment Missed or Performed with Mitigating Circumstances

<table>
<thead>
<tr>
<th>Course code</th>
<th>Assessment item (e.g. exam / major item of coursework/dissertation)</th>
<th>Date of assessment/ submission deadline</th>
<th>Indicate whether you sat/submitted the assessment (Yes / No)</th>
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☐ Please tick here if all assessments during the academic year have been affected by the circumstances detailed above.

Please note that the information on this form will remain confidential and will only be viewed by the advisory panel which will make a recommendation to the Board of Examiners about your request. Please state below if there is any information contained on this form which you DO NOT wish to be released to the Exam Board. Please bear in mind that the more information that is received by the Board the better able they will be to reach an informed decision.

I wish for the appropriate Board of Examiners to take into account my mitigating circumstances for the assessments listed above. I declare that the information I have given to be true to the best of my knowledge and understand that false claims for mitigation are a serious examinations offence.

Signed (student)…………………………………………………………... Date:……………………

Signed (member of staff - to confirm receipt)………………………………….. Date:……………………

Please note that for minor pieces of assessed work, independent corroborating evidence is not required and the minor coursework mitigating circumstances form should be used. Your Personal Tutor, Senior Tutor or Course Leader will advise you which pieces of coursework, if any, are categorised as minor.
# REQUEST FOR MITIGATION – OUTCOMES
(Office use only)

<table>
<thead>
<tr>
<th>Recommended Outcome (please attach documents if necessary):</th>
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<tr>
<td>Uncapped first sitting</td>
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<td>Uncapped resit</td>
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<td>SQT</td>
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<tr>
<td>Addition of mark</td>
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<tr>
<td>Refer to final board for consideration in relation to award of degree</td>
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<td>No action required</td>
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<th>Reasons for decision:</th>
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<th>Members of the advisory panel should sign and date below:</th>
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<td>Was the recommendation of the Advisory Panel accepted by the Board of Examiners? Yes /No</td>
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APPENDIX IX – example

DEPARTMENT OF MATHEMATICS

DEGREE CHANGE

Please write clearly using CAPITAL letters

NAME ........................................................................... CID # .............................................................................

UNIVERSITY EMAIL .......................................................................................... CURRENT YEAR OF STUDY ............

I would like to change my degree

From ....................................................................................................................................................................

To ........................................................................................................................................................................

Signature* .................................................................... Date ...............................................................................

*Handwritten signature required

Completed forms should be submitted via the Undergraduate Maths Student Office (room 649, Huxley)
fax: 020 7594 8517 / email: maths-student-office@imperial.ac.uk

DEGREE CHANGE INFORMATION

International students on a Tier-4 visa are advised to consult the International Student Support Office prior to making ANY degree change as you may be required to apply for a new visa (outside of the UK).

TRANSFER FROM BSc TO BSc

By default, students who do not meet the requirements for a speciality degree (G102, G1F3, G1G3, G125, GG31 or G1GH) will graduate on the G100 code. We do not encourage students to transfer to G100 of their own accord because they believe they will not qualify for the speciality degree as the Department does have the discretion to modify the normal requirements in special cases.

TRANSFER INTO MSci FROM BSc

In order to change, from a BSc to an MSci degree after First Year, overall marks at an Upper Second Class Honours level (or better) must normally have been achieved.

TRANSFER INTO MSci G104 MATHEMATICS WITH A YEAR IN EUROPE

Students on one of the other degrees may be able to transfer into G104 if they can satisfy the Department of their language skills and have good examination results. Normally such transfers will be considered at the end of the First Year of study. Students should make their interest known as early as possible so that funding for any additional year can be obtained.

DEADLINE FOR EACH ACADEMIC YEAR: 31st of March
APPENDIX X - example
(Note this is a Green Form)

DEPARTMENT OF MATHEMATICS

REFERENCE REQUEST FORM

Please write clearly using CAPITAL letters

NAME ..........................................................................................................................................................

CID # ...........................................  DEGREE CODE (e.g. G1GH) ..................................................

EMAIL..........................................................................................................................................................

If you are a current student, we will only contact you via your university email address.

REFEREE NAME (one referee per form) ....................................................................................

Please Note: You are allowed a maximum of five references per referee per academic year

Please provide a short paragraph explaining why you are applying for the courses / posts listed below and attach a current CV along with any relevant referee forms to this application

<table>
<thead>
<tr>
<th>University or Company</th>
<th>Course or Post for which You are Applying</th>
<th>Online or Hardcopy**</th>
<th>Application Deadline</th>
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**If a hardcopy is required, please indicate (below) to whom the reference should be addressed and provide a forwarding address if the letter is to be posted (2nd class) rather than collected

SIGNATURE ...........................................................................  DATE ..................................................

Completed forms should be handed to the person from whom you are requesting the reference or to the Undergraduate Maths Student Office (room 649, Huxley)

fax: 020 7594 8517 / email: maths-student-office@imperial.ac.uk
REFERENCE REQUEST INFORMATION

- All references must be for a specifically named postgraduate course or job; the Department is not prepared to write open references.

- Each member of staff may only provide you with up to five references per academic year.

- You must provide a statement explaining why you are applying for the courses or posts listed and attach a current CV and any relevant referee forms to your application.

- References can take up to three weeks to prepare so please plan ahead; references cannot be provided at very short notice.

- Referees may ask to see you before they provide a reference.

- If you are applying to a number of postgraduate programmes, if possible, please try to ask for all references at the same time.

- If your reference is being posted, you will receive an email (to your university email address if you are a current student) informing you when it has been sent. References will be posted 2nd class.

- If your reference is for collection, you will receive an email (to your university email address if you are a current student) informing you of your reference's availability and from where and when it can be collected.

- If you want someone else to collect your reference(s) for you, you must send the Undergraduate Maths Student Office (maths-student-office@imperial.ac.uk) an email from your university email account authorising the release of your reference(s) to the person named. The person collecting your reference(s) must bring their own picture ID with them for identification purposes.

The person you ask to be your referee should be someone who knows you well enough to give a fair assessment of you. Normally your Personal Tutor will be the main person to write references for you but you may also approach a Project Supervisor or your Year Tutor. The Senior Tutor may also be approached.

Remember that we cannot respond to direct requests for references from third parties; we can only provide a reference for you if you make the initial request.

Please talk to your Personal Tutor for any help with questions, or contact the Undergraduate Liaison Officer.
APPENDIX XI - example

DEPARTMENT OF MATHEMATICS

UNDERGRADUATE LETTER REQUEST FORM

☐ Statement of Attendance Letter*
☐ Tenant Letter*
☐ Confirmation of Degree Letter*
☐ Actuarial Examination Exemption Letter*

*Please indicate below if you require any additional information (to that noted overleaf) in your letter

☐ Other

Please provide details below of the type of letter you need and any required content

Please write clearly using CAPITAL letters

NAME .................................................................................... CID # ..................................................................

DEGREE CODE (e.g. G1GH) ............................................ CURRENT YEAR OF STUDY ......................

UNIVERSITY EMAIL ........................................................................................................................................

SIGNATURE* ........................................................................ DATE ..................................................................

*Handwritten signature required

ADDITIONAL INFORMATION

Completed forms should be submitted via the Undergraduate Maths Student Office (room 649, Huxley)
fax: 020 7594 8517 / email: maths-student-office@imperial.ac.uk

☐ Collection

☐ Email (PDF)
  • to university email address only
  • letters with reference content cannot be sent via this method

☐ Post (2nd Class)
  • please enter forwarding address in the box
LETTER REQUEST INFORMATION

STATEMENT OF ATTENDANCE AND TENANT LETTER CONTENT

Statement of Attendance and Tenant Letters contain the following information:
- your name
- confirmation that you are currently registered as a full-time student in the Department of Mathematics at Imperial College London
- details of the degree for which you are enrolled (e.g. BSc G100 - Mathematics / MSci G103 - Mathematics)
- the date you began your studies and the date you are expected to graduate
- if you are an ERASMUS student, we will note your dates of attendance and the name of your home institution

Tenant Letters also contain a character reference from the Senior Tutor

If you require any other information in your letter, please note this under ‘Additional Information’

CONFIRMATION OF DEGREE LETTER CONTENT

Confirmation of Degree Letters contain the following information:
- your name
- confirmation that you have met your degree requirements
- the title of the degree (e.g. BSc G1G3 Mathematics with Statistics) and the classification you have been awarded
- the date of the graduation ceremony
- a statement to the effect that degree certificates will be sent by Registry within the next few months

If you require any other information in your letter, please note this under ‘Additional Information’

ACTUARIAL EXAMINATION EXEMPTION LETTER CONTENT

Actuarial Examination Exemption Letters contain the following information:
- your name
- confirmation that you have met your degree requirements
- the title of the degree (e.g. BSc G1G3 Mathematics with Statistics) and the classification you have been awarded
- confirmation that you have fulfilled the requirements for exemption from the CT3 and/or CT4 examinations

If you require any other information in your letter, please note this under ‘Additional Information’

POST / EMAIL / COLLECTION

- if your letter is being posted, you will receive an email (to your university email address) informing you when it has been sent. Letters will be posted 2nd class
- if your letter is for collection, you will receive an email (to your university email address) informing you of your letter’s availability and from where and when it can be collected
- if your letter is being sent as a PDF via email, we can only email students at their university email address. Letters with reference content cannot be sent via this method
- when collecting your letter, you must bring your student ID card with you for identification purposes
- if you want someone else to collect your letter for you, you must send the Undergraduate Maths Student Office (maths-student-office@imperial.ac.uk) an email from your university email account authorising the release of your letter to the person named. The person collecting your letter must bring their own picture ID with them for identification purposes.
APPENDIX XII
HUXLEY BUILDING GUIDE

Level 1
Lecture Theatres/Classrooms: 130, 139, 140, 144
Lockers: Please see the Technical Services Manager (131) if you require a locker

Level 2
Lecture Theatres/Classrooms: Clore Lecture Theatre (213)
Undergraduate Common Room: 212. This room has space for relaxation, work stations, a photocopier/scanner/printer and a hot and cold water unit.

Level 3
Lecture Theatres/Classrooms: 340, 341, 342
Noticeboards: All important notices, including timetables and examination information, will be found here

Level 4
Computing Rooms: 408, 409 (for 4th Year students only), 410
Maths Learning Centre (MLC) (has photocopiers/scanners/printers)
Information and Communication Technologies (ICT): 411. Please see ICT if you have problems with computing or printing equipment or Department issued printing credit

Level 5
Academic Staff Offices
Huxley Cafe: Staff and postgraduate students only.

Level 6
Lecture Theatres/Classrooms: 642, 658
Departmental Administrative Offices
Undergraduate Liaison Officer’s Office: 632
Senior Tutor’s Office: 657
Director of Undergraduate Studies’ Office: 630
Undergraduate Maths Student Office: 649
Central Office: 649a
Academic Staff Offices
Staff Post Racks: 655a
Student Post Racks: 649
Submission of Assessed Work Pigeonholes: Corridor, opposite the Undergraduate Maths Student Office (649)
Collection of Marked Work Pigeonholes: 649

Level 6M
Academic Staff Offices

Level 7
Academic Staff Offices

*Any letters or documents issued by the Department of Mathematics, which aren’t being posted or emailed, can only be collected from the Undergraduate Maths Student Office. Picture ID and signature are required upon collection.
South Kensington Buildings where wheelchair access is not possible at this time:

- Beit Quadrangle
- Imperial College Union
- Ethos Sports Centre
- Prince's Gdns, North Side
- Weeks Hall
- Blackett Laboratory
- Roderic Hill Building
- Bone Building
- Royal School of Mines
- Aston Webb
- Bessemer Building
- Goldsmiths Building
- Huxley Building
- ACE Extension
- William Penney Laboratory
- Electrical Engineering
- Business School
- 53 Prince's Gate
- Eastside
- Sherfield Building
- Student Hub
- Conference Office
- Grantham Institute – Climate Change and the Environment
- Faculty Building
- 58 Prince's Gate
- Central Library
- Queen's Tower
- Skempton Building
- City and Guilds Building
- Southside
- Sir Ernst Chain Building – Wolfson Laboratories
- Flowers Building
- Chemistry Building
- Sir Alexander Fleming Building
- Chemistry RCS1
- 52 Prince's Gate
- Alumni Visitor Centre

Note: Buildings marked with an accessibility symbol may not be wheelchair accessible.