# MSc in Statistics - Student Handbook

**Department of Mathematics**  
**Imperial College London**  
**2016/17**

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1 Introduction

Welcome to the MSc in Statistics at Imperial. The course is run by the Statistics Section of the Department of Mathematics. The main webpage for the course is imperial.ac.uk/mathematics/postgraduate/msc/statistics.

Most course material will be made available in a virtual learning environment (VLE) at bb.imperial.ac.uk.

Some useful general information for new students can be found at imperial.ac.uk/students/newstudents.

Aims/Objectives/Learning Outcomes

Here is what you can broadly expect from the course:

You will improve your understanding of the probabilistic background to statistics. This will be mainly achieved through one of the compulsory courses.

You will learn about the theoretical and methodological foundations of statistics. Besides a compulsory course, you can choose to specialise in methodological aspects of statistics through appropriate choice of optional courses as well as through the choice of project.

You will become proficient in modern computational methods for statistics. A minimal level will be achieved through a compulsory course, which will be improved upon by the optional courses as well as the project.

You will become confident in using statistical methods to solve practical problems. This will be achieved through the compulsory course “Applied Statistic”, through the use of the statistical software R throughout the course, through the range of optional courses and through the individual project. You will get proficient in the statistical language R.

You will learn about the breadth of statistical applications. This will be achieved through the wide range of optional courses, which allow you to specialise in more methodological aspects as well as in a diverse range of modern applications. Furthermore, there will be talks by practising statisticians, called “Statistics in Practice”, in the summer term. This will help you with your career choice.

You will learn to tackle, analyse and solve realistic statistical problems independently. This will be mostly achieved through the research project.

About the Department of Mathematics (imperial.ac.uk/mathematics)

The Department of Mathematics at Imperial College London is an internationally renowned department within one of the world’s most prestigious universities. The principal aim of the Department is to train professional mathematicians to pursue the study of scientific and technological problems by mathematical methods, and to undertake research in various branches of the subject, for which it has achieved outstanding results in the most recent government research assessment exercise.

About the Statistics Section (imperial.ac.uk/statistics)

The Statistics Section, part of the Department of Mathematics, has an international reputation for conducting methodological and applied statistical research at the highest level. Particular areas of current activity include statistical genetics and biostatistics, statistical methods in retail financial services, time series, core statistical methodology, classification and data mining, with many interactions and overlaps between these areas of research.

The Section is one of the leading statistics groups in UK. In the 2008 RAE, Imperial was ranked third nationally.

You can find a list of academic staff in the Statistics Section at imperial.ac.uk/statistics/people.

Key contacts:

- Head of Department: Prof Richard Craster
- Head of the Statistics Section: Prof Niall Adams
- Director of Postgraduate Studies: Prof Henrik Jensen (pgr.director@imperial.ac.uk)
Each student will be assigned a course advisor (sometimes also called personal tutor), who

- advises on course choice and project choice,
- provides pastoral support.

Graduate School ([imperial.ac.uk/graduateschool](https://imperial.ac.uk/graduateschool))

As soon as you begin your postgraduate studies at Imperial you automatically become a member of the Graduate School. Membership means you become part of a wider community, broadening and enriching your academic experience. The Graduate School also provides professional skills training for Master’s students, see [imperial.ac.uk/study/pg/graduate-school/professional-skills/masters/](https://imperial.ac.uk/study/pg/graduate-school/professional-skills/masters/).

2 Programme Structure

## Autumn Term

<table>
<thead>
<tr>
<th>week 1</th>
<th>Induction week</th>
</tr>
</thead>
<tbody>
<tr>
<td>week 2-11</td>
<td>Compulsory courses</td>
</tr>
<tr>
<td>M5MS01 Probability for Statistics</td>
<td>M5MS02 Fundamentals of Statistical Inference</td>
</tr>
<tr>
<td>M5MS03 Applied Statistics</td>
<td>M5MS04 Computational Statistics</td>
</tr>
</tbody>
</table>

Week 1-11 M5S8 *Time Series*. This is an optional course and is equivalent to 30 hours of lecturing.

Week 2-11 M5MF12 *Algorithmic Trading and Machine Learning*. This course is optional and numbers are limited and subject to approval by the Course Directors of the MSc in Statistics and the MSc in Mathematical Finance. It is equivalent to 30 hours of lecturing.
Spring Term

All courses in this term are optional. You have to take optional courses equivalent to 120 hours of lecturing, e.g. 8 courses of 15 hours each. This may include optional courses in the Autumn term. **You are limited to taking at most two 30h equivalent courses** (in other words: you have to take at least four 15h equivalent courses).

<table>
<thead>
<tr>
<th>week 1</th>
<th>exams for M5MS01, M5MS02</th>
</tr>
</thead>
<tbody>
<tr>
<td>week 2-6</td>
<td>M5MS05 Advanced Statistical Theory</td>
</tr>
<tr>
<td></td>
<td>M5MS08 Multivariate Analysis</td>
</tr>
<tr>
<td></td>
<td>M5MS10 Machine Learning</td>
</tr>
<tr>
<td></td>
<td>M5MS11 Statistics for Extreme Events</td>
</tr>
<tr>
<td></td>
<td>M5MS13 Pricing and Hedging in Financial Markets</td>
</tr>
<tr>
<td></td>
<td>M5MS17 Medical Statistics</td>
</tr>
<tr>
<td></td>
<td>M5MS18 Official Statistics</td>
</tr>
<tr>
<td></td>
<td><em>(15h courses)</em></td>
</tr>
<tr>
<td>week 7-11</td>
<td>M5MS06 Bayesian Data Analysis</td>
</tr>
<tr>
<td></td>
<td>M5MS07 Non-parametric Smoothing and Wavelets</td>
</tr>
<tr>
<td></td>
<td>M5MS09 Graphical Models</td>
</tr>
<tr>
<td></td>
<td>M5MS12 Financial Econometrics</td>
</tr>
<tr>
<td></td>
<td>M5MS14 Statistical Bioinformatics and Genetics</td>
</tr>
<tr>
<td></td>
<td>M5MS19 Further Topics in Statistics (Big Data)</td>
</tr>
<tr>
<td></td>
<td>M5MS20 Sequential Monte Carlo</td>
</tr>
<tr>
<td></td>
<td><em>(15h courses)</em></td>
</tr>
</tbody>
</table>

Summer Term

| week 1-2 | Written exams for optional 15 hour courses |
| week 3-10 | Project Talks: Statistics in Practice |
| 9 or 10 | Project - Poster presentation |

The exams for the 30h courses will take place in the Summer Term. The precise dates will be announced in due course.

July-September

Work on Project. Projects have to be handed in by the date mentioned in “Important Dates”. Presentation on the project shortly afterwards. The precise dates are listed in Section 3.

3 Calendar of Important Dates

- **Monday, 3 October 2016** Begin Autumn Term
- **Friday, 28 October 2016** Deadline for completing plagiarism awareness course
- **Friday, 16 December 2016** End Autumn Term
- **Monday, 9 January 2017** Begin Spring Term
- **Friday, 23 March 2017** End Spring Term
- **Monday, 1 May 2017** Begin Summer Term
- **Friday, 30 June 2017** End Summer Term
- **Wednesday, 6 September 2017, 1pm** Deadline for handing in the thesis
- **Wednesday, 13 September 2017 (TBC)** Project presentation
- **May 2018 (TBC)** Graduation Ceremony

A detailed timetable will be made available electronically.
4 Assessment / Requirements for Programme Completion

4.1 General

The MSc in Statistics programme specification can be found on the course website, along with the competency standards for all taught mathematics masters programmes

imperial.ac.uk/mathematics/postgraduate/current-students/msc

The entire MSc course will be worth 90 ECTS. It consists of two elements. The first element consists of the taught courses and is worth 67.5 ECTS. The second, the project, is assigned 22.5 ECTS.

The individual courses taken by the students will be assessed through coursework or individual exams.

4.1.1 M5MS coded courses

The compulsory courses M5MS03 Applied Statistics and M5MS04 Computational Statistics will be examined through three single-day courseworks only. Some of the optional courses in the second term will also be examined through coursework. All other courses will be examined through written papers in the first week of the spring term or in the summer term. 30 hour courses will normally be examined by a 2 hour exam, 15 hour courses by a 1.5 hour exam.

Imperial College has the “College Scale” on which all marks across the college are standardised and student’s final marks are awarded, i.e. the marks on the student’s final transcript will be College Scale marks. The College Scale boundaries are as follows:

<table>
<thead>
<tr>
<th>Pass with Distinction</th>
<th>[70,100]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pass with Merit</td>
<td>[60,70)</td>
</tr>
<tr>
<td>Pass</td>
<td>[50,60)</td>
</tr>
<tr>
<td>Fail</td>
<td>[0,50)</td>
</tr>
</tbody>
</table>

We feel that the college scale is too restrictive in its discriminatory power between degree classifications and therefore use a mapping that will be used to convert the student’s raw marks to College Scale marks. Assessments are set by the course lecturers with this mapping in mind.

For an individual module, raw marks for all coursework and exam elements are appropriately weighted and combined to give a raw mark out of 100 for the module. A piecewise linear mapping is then applied on this raw mark with the following default fixed points:

<table>
<thead>
<tr>
<th>Raw Mark</th>
<th>College Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>80</td>
<td>70</td>
</tr>
<tr>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>40</td>
<td>50</td>
</tr>
<tr>
<td>30</td>
<td>40</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Lecturers still have the academic freedom and judgement to adjust the raw mark mapping points as they see fit. As such, this is not fixed but acts as a guide so students can gauge approximately what is required on their assessment to get a particular College Scale mark.

4.1.2 M5S coded courses

For courses run by the undergraduate teaching system (M5S8,M5S14,M5S17,M5A44), then marks are calibrated and moderated together with the undergraduate students.
When sitting exams for these courses there will be a 5th "mastery" question that MSc and the M4 (4th year) undergraduate students are required to take on top of the other four questions. This will be harder than the other 4 questions. Students will be given an extra half an hour for this question (M3 students have 2hrs for the whole exam, MSc and M4 students have 2.5hrs for the exam) and it has the same mark weighting as questions 1-4. Bonus marks are awarded to questions according to the following scheme:

<table>
<thead>
<tr>
<th>Mark (out of 20)</th>
<th>Bonus</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>0.5</td>
</tr>
<tr>
<td>14</td>
<td>1</td>
</tr>
<tr>
<td>15</td>
<td>1.5</td>
</tr>
<tr>
<td>16</td>
<td>2</td>
</tr>
<tr>
<td>17</td>
<td>2.5</td>
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<tr>
<td>18</td>
<td>3</td>
</tr>
<tr>
<td>19</td>
<td>3.5</td>
</tr>
<tr>
<td>20</td>
<td>4</td>
</tr>
</tbody>
</table>

Thus the maximum possible raw mark on the examination paper is 120.

The marks for the entire group of students (undergraduate and postgraduate) sitting the module are collated and then scaled and converted to the College Scale as a whole (details can be found in the undergraduate handbook pages 32-33). A postgraduate student is required by College to obtain 50% (college scale) to pass the course.

4.1.3 Project

The second course element, the project, will be examined as follows. Students have to submit a thesis, a substantial written report normally not exceeding 12000 words. The thesis must be submitted by the deadline specified above. The thesis is worth 90% of the project mark. An integral part of the project will be an oral examination, consisting of a 20 minute presentation and 10 minute questioning on the project. The oral examination will be worth 10% of the total project mark.

MSc degrees are awarded only once each year, following the Examiners’ Meeting which is normally held by the end of September.

In line with usual practice, the MSc in Statistics has an external examiner, meaning an examiner external to the university whose main role it is to uphold standards and to ensure that the assessment process is fair and rigorous. More details of the role of the external examiner are available from the website of the registry. Our current external examiner is Professor Jim Griffin from the University of Kent.

4.2 Degree Classifications

MSc degrees are awarded only once each year, following the Examiners’ Meeting which is normally held by the end of September.

In line with usual practice, the MSc in Statistics has an external examiner, meaning an examiner external to the university whose main role it is to uphold standards and to ensure that the assessment process is fair and rigorous. More details of the role of the external examiner are available from the website of the registry. Our current external examiner is Professor Jim Griffin from the University of Kent.

To obtain a pass mark, students will have to:

- Register for, and take the examination in courses equivalent to 240 lecture hours, including the 4 compulsory 30 hour lecture courses. They must earn a pass mark (i.e., a score of at least 50%) in courses equivalent to 180 lecture hours with no mark below 40%, and score a weighted average mark of at least 50%. Courses will be weighted by their nominal lecture hours. A student who earns below 40% in a course examined by a paper will have to re-sit that paper. A student who earns below 40% in a course examined by coursework will be given a re-sit coursework.
• Earn a pass mark (i.e., a score of at least 50%) in the project.

A *merit* mark will be awarded to students who gain a weighted average mark of 60% or above in courses equivalent to 240 lecture hours, including the 4 compulsory 30 hour lecture courses, with no mark below 50%, and who score 60% or above on the project.

A *distinction* mark will be awarded to students who gain a weighted average mark of 70% or above in courses equivalent to 240 lecture hours, including the 4 compulsory 30 hour lecture courses, with no mark below 50%, and who score 70% or above on the project.

Students are usually only offered one re-sit opportunity for failed courses in the following academic year. Marks for re-sits are capped at 50%.

### 4.3 Release of Results

The exam board, which will take place after the course has finished, will have final authority to decide your results. This board will, among other things, consider borderline cases and take mitigating circumstances into account. You will receive your final results from registry (in October/November after your course has finished).

During the year, you will receive indications of your performance in the various courses you have taken - these are provisional and subject to confirmation by the exam board. Specifically, in Blackboard, under the “course” M5MS00, you will find rough indications of your results on the College Scale (under “My Grades”). The following code will be used:

- **A+**: a high distinction [80,100]
- **A**: in the distinction range [70,80)
- **A-B**: Borderline between merit and distinction (around 70).
- **B**: in the merit range [60,70).
- **B-C**: Borderline between pass and merit (around 60).
- **C**: in the pass range [50,60).
- **C-D**: Borderline between fail and pass (around 50).
- **D**: in the fail range [40,50).
- **D-F**: Borderline between fail and a bad fail (around 40).
- **F**: Bad Fail (<40)

### 4.4 Mitigating Circumstances

If you want mitigating circumstances to be taken into account, you need to fill in the appropriate mitigating circumstances form and submit it to the MSc Administrator **within 5 working days of the examination or coursework submission date**.

Below are the links to these forms on the registry webpage. During term time they are also available in front of the Undergraduate Maths Student office.

- [Request for Mitigation for Minor pieces of coursework Form](#)
- [Request for Mitigation for Examinations and Major pieces of coursework Form](#)

### 4.5 Plagiarism / Examination Offences

All Master’s students are required to undertake the Imperial online course in plagiarism awareness. Details on how to enrol this course can be found [here](#). You have to complete this online course by the end of October.

The College and Department are against all forms of plagiarism. While discussing among fellow students and consulting relevant literature and internet resources to gain genuine understanding are accepted as part of your learning process, producing coursework (or parts of coursework) identical, or nearly identical, to others, or using materials from published literature and/or web sites without proper acknowledgement will be viewed as plagiarism and will be investigated. Once an act of plagiarism is established, all students involved will be penalised, which
may include marks for coursework or project being zeroed and/or disciplinary actions by the Department and the College. Records of plagiarism and penalty imposed may be kept in the student records.

The penalties for plagiarism and examination offences can be very severe, including effectively expulsion from the College. Further information is in Appendix A of this document.

The library has some information concerning plagiarism at imperial.ac.uk/admin-services/library/learning-support/plagiarism-awareness/.

5 Facilities

5.1 Your College E-Mail

You will be getting an individual Imperial e-mail account. This will be our primary way of contacting you. It is your responsibility to check this e-mail account regularly.

Furthermore, please use this e-mail address (and not any other e-mail address) to send e-mails to your lecturers or any other member of staff at Imperial.

5.2 Virtual Learning Environment (VLE)

Most course material will be made available in a virtual learning environment, see learn.imperial.ac.uk. At the start of the year the VLE may be found at bb.imperial.ac.uk instead.

5.3 Where to find us

Teaching will mainly take place in the Huxley building on the South Kensington Campus. The MSc Administrator’s office is on the 6th floor (room 652). Most academics involved in the programme have their offices on the 5th floor of the Huxley building.

5.4 MSc Room

There is a dedicated room for MSc students (Huxley 215). This room is reserved for students of the MSc in Statistics, the MSc in Pure Mathematics and the MSc in Applied Mathematics. You can also use the Mathematics Learning Centre (level 4 Huxley), in particular over the summer.

5.5 Health and Safety

There will be a health and safety induction in the first week. Further information on health and safety at Imperial is available at www3.imperial.ac.uk/safety

5.6 The Library (imperial.ac.uk/library)

We strongly encourage you to make heavy use of the library. It has extensive print and electronic mathematics collections, which support related research and teaching within the College. The statistics material forms one of the most significant parts of this collection and the holdings have been developed by the library in close liaison with staff within the department’s statistics section. The collection of statistics books contains more than 8,000 volumes and gives comprehensive coverage of all topics within the field. The library’s journal holdings in statistics are nearly all available electronically and include several hundred current journals and complete runs of major titles, such as all the Royal Statistical Society journals, Annals of Statistics, Journal of the American Statistical Association and Biometrika. Students within the department are also able to contact Ann Brew, the Mathematics Librarian, who can provide support and tuition throughout their studies.
5.7 Lockers
There is a (limited) number of lockers in the basement of the Huxley building.

https://www.imperial.ac.uk/natural-sciences/departments/mathematics/study/students/undergraduate/lockers/

6 Pastoral Support, Student Representative, College Tutors

Every student is assigned a Course Advisor who should be the first point of contact for any problems. Students can also approach the course director, the course administrator or the postgraduate tutor directly.

Students will elect a representative of the MSc in Statistics, who will be a member of the departmental postgraduate staff-student committee, which meets three times a year.

All students also have confidential access - independent of department or division - to the College Tutors regarding academic issues, and all aspects of pastoral care and discipline within the College.

imperial.ac.uk/student-space/here-for-you/college-tutors-and-departmental-support

The student-space provides you with information and advice about staying fit and healthy, both physically and mentally, while at Imperial and gives contact details of people who can help should you need it.

imperial.ac.uk/student-space

7 Evaluation and Quality Assurance

Students will obtain feedback via:

- Marked coursework
- Meetings with research project supervisors.
- Meetings with course advisor.
- Meetings with course director.

Feedback from students via:

- Departmental Postgraduate Staff-Student Committee (meets three times a year).
- Individual Course Survey (PGSole).
- Research project supervisors meeting their students.
- Course advisors meeting their students.
- Meetings between course director and students, particularly their elected representative.
- The Postgraduate Tutor being approached by students.

It is very important that you provide us with your feedback (I am sure you are aware of the bias that can be caused by missing data):

- If something is great we definitively want to know.
- If something does not work well - we can only fix it if we know about it.

An annual course review will take place taking into account the student feedback.
8 Core Courses

M5MS01 Probability for Statistics (Dr A Veraart)

Probability and statistics are separate disciplines, although intricately linked. This course covers many of the fundamental ideas in probability theory that are crucial to statisticians. These include: Review of axiomatic probability theory: probability spaces, distributions and their characteristics [including generating functions], conditional distributions. Asymptotic theorems and convergence. Convergence modes and stochastic orders, convergence of transformations, laws of large numbers, central limit theorem. Multivariate normal distribution. Markov chains, classification of chains, stationary distributions, continuous-time Markov chains, (compound) Poisson processes, Brownian motion.

M5MS02 Fundamentals of Statistical Inference (Prof A Young)


M5MS03 Applied Statistics (Dr N Kantas)

The course focuses on statistical modelling when applied to realistic problems and real data. We will cover the following topics: The Normal Linear model (estimation, residuals, residual sum of squares, goodness of fit, hypothesis testing, ANOVA, model comparison), Improving Designs and Explanatory Variables (categorical variables and multi-level regression, experimental design, random and mixed effects models), Diagnostics and Model Selection & Revision (outliers, leverage, misfit, exploratory and criterion based model selection, Box-Cox transformations, weighted regression), Generalised Linear Models (exponential family of distributions, iteratively re-weighted least squares, model selection and diagnostics). Advanced Topics (Penalised Regression, Time series, Classification, State Space models)

M5MS04 Computational Statistics (Prof A Gandy)

This course covers a number of computational methods that are key in modern statistics. Topics include: Statistical Computing: R programming: data structures, programming constructs, object system, graphics. Numerical methods: root finding, numerical integration, optimisation methods such as EM-type algorithms. Simulation: generating random variates, Monte Carlo integration. Simulation approaches in inference: randomisation and permutation procedures, bootstrap, MCMC, Sequential Monte Carlo/particle filtering.
9 Optional Courses

9.1 Course Choice

You have to register for optional courses exactly equivalent to 120 lecture hours (not more, not less). You are limited to taking at most two 30h equivalent courses (in other words: you have to take at least four 15h equivalent courses). You can only take courses if you not have taken these courses (or their equivalents for undergraduate students) as part of a previous degree at Imperial.

You will be asked to indicate a preliminary course choice at the end of the Autumn Term. This is only a preliminary indication.

You will have to make a final course choice once the second wave of optional courses in the Spring Term is running (probably in week 7 or 8 of the Spring Term - precise date to be announced). However, you will be deemed to be officially registered on a course through the submission of coursework which (in total) is worth at least 15% of the final mark. Thus, once you have reached this point in a course, you will be committed to completing the course.

What does this mean for the Time Series course running in the Autumn Term? The coursework in this course is worth at most 10% of the final mark, so you will not be officially registered on this course before making your final course choice.

9.2 Courses Equivalent to 15 Lecture Hours

M5MS05 Advanced Statistical Theory (Prof A Young)

This course aims to give an introduction to key developments in contemporary statistical theory, building on ideas developed in the core course Fundamentals of Statistical Inference. Reasons for wishing to extend the techniques discussed in that course are several. Optimal procedures of inference, as described, say, by Neyman-Pearson theory, may only be tractable in unrealistically simple statistical models. Distributional approximations, such as those provided by asymptotic likelihood theory, may be judged to be inadequate, especially when confronted with small data samples (as often arise in various fields, such as particle physics and in examination of operational loss in financial systems). It may be desirable to develop general purpose inference methods, such as those given by likelihood theory, to explicitly incorporate ideas of appropriate conditioning. In many settings, such as bioinformatics, we are confronted with the need to simultaneously test many hypotheses. More generally, we may be confronted with problems where the dimensionality of the parameter of the model increases with sample size, rather than remaining fixed. We consider here a number of topics motivated by such considerations. Focus will be on developments in likelihood-based inference, but we will give consideration too to: problems of multiple testing, objective Bayes methods, bootstrap alternatives to analytic distributional approximation, and introduce too more theoretical notions involved in high-dimensional inference.

Written exam in the Summer Term.

M5MS06 Bayesian Data Analysis (Dr D Mortlock)

Scientific inquiry is an iterative process of integrating and accumulating information. Investigators assess the current state of knowledge regarding the issue of interest, gather new data to address remaining questions, and then update and refine their understanding to incorporate both new and old data. Bayesian inference provides a logical, quantitative framework for this process.

In this course we will develop tools for designing, fitting, validating, and comparing the highly structured Bayesian models that are so quickly transforming how scientists, researchers, and statisticians approach their data. This will include:
Motivation for Bayesian data analysis; comparisons with likelihood-based and frequency-based methods; Bayesian analysis of standard models binomial, Poisson, Gaussian, and Gaussian linear models; conjugate, semi-conjugate, informative, non-informative, flat, invariant, and Jeffries prior distributions; summarizing posterior inference; the posterior as an average of the prior and data; handling nuisance parameters; hierarchical models including
random-effects models, finite mixture models, two-level Gaussian models; shrinkage; model checking, selection, and improvement; posterior-predictive checks, Bayes factors and their comparison with significance tests and p-values.

Written exam in the Summer Term.

**M5MS07 Non-parametric Smoothing and Wavelets (Dr E Cohen)**

Non-parametric methods, as opposed to parametric methods, are desirable when we cannot confidently assume parametric models for our observations. In such situations we need flexible, data-driven methods for estimating distributions or performing regression. This course looks at a number of non-parametric methods. These will include:

- Non-parametric density estimation: histograms, kernel estimators, window width, adaptive kernel estimators.
- Non-parametric regression: regressograms, kernel regression, local polynomial regression, cross-validation.
- Regularisation and Spline Smoothing: roughness penalty, cubic splines, spline smoothing, Reinsch algorithm.
- Basis function approach: B-spines, wavelets: discrete wavelet transform; wavelet variance, wavelet shrinkage, thresholding.

Written exam in the Summer Term.

**M5MS08 Multivariate Analysis (Dr E Cohen)**

Multivariate Analysis is concerned with the theory and analysis of data that has more than one outcome variable at a time, a situation that is ubiquitous across all areas of science. Multiple uses of univariate statistical analysis is insufficient in this setting where interdependency between the multiple random variables are of influence and interest. In this course we look at some of the key ideas associated with multivariate analysis. Topics covered include: multivariate notation, the covariance matrix, multivariate characteristic functions, a detailed treatment of the multivariate normal distribution including the maximum likelihood estimators for mean and covariance, the Wishart distribution, Hotelling’s $T^2$ statistic, likelihood ratio tests, principle component analysis, ordinary, partial and multiple correlation, multivariate discriminant analysis.

Written exam in the Summer Term.

**M5MS09 Graphical Models (Prof A Walden)**

Graphical models are those probability models whose independence structure is characterised by a graph, the conditional independence graph. In this course we will look at some aspects of graphical modelling for both (a) a vector of random variables, and (b) vector-valued time series. We will look at models and their estimation.

Syllabus: (i) graphs; (ii) [for both random vectors and vector-valued time series] conditional independence, Markov properties, normal (Gaussian) graphical models, estimation, model selection. Since the second part of the course involves time series some previous familiarity with time series is strongly advised.

Written exam in the Summer Term.

**M5MS10 Machine Learning (Dr B Calderhead)**

This course will provide an introduction to statistical pattern recognition and machine learning. The lectures will focus on different techniques including methods for feature extraction, dimensionality reduction, data clustering and pattern classification. State-of-the-art approaches such as support vector machines and ensemble learning methods will be introduced. Real-world applications will illustrate how the techniques are applied to real data sets. Continuous assessment through coursework.

**M5MS11 Statistics for Extreme Events (Dr R Noven)**

This course introduces extreme value theory. We focus on statistical methods for extreme events and study applications in insurance and finance. The main topics are as follows: Extreme value theory: Fluctuations of
maxima; fluctuations of upper order statistics; Statistical Methods: Probability and quantile plots; mean excess function; Gumbel’s method of exceedances; parameter estimation for the generalised extreme value distribution; estimating under maximum domain of attraction conditions; fitting excess over a threshold.

Written exam in the Summer Term.

M5MS12 Financial Econometrics (Dr M Pakkanen)

Financial econometrics is an interdisciplinary area focusing on a wide range of quantitative problems arising from finance. This course gives an introduction to the field and presents some of the key statistical techniques needed to deal with both low and high frequency financial data. Main topics: Discrete time framework: ARCH, GARCH models and their estimation; Continuous time framework: Brownian motion, stochastic integration and stochastic differential equations, Itô’s formula, stochastic volatility, realised quadratic variation and its asymptotic properties, Lévy processes, testing for jumps, volatility estimation in the presence of market microstructure effects.

Written exam in the Summer Term.

M5MS13 Pricing and Hedging in Financial Markets (Dr M Pakkanen)

This course introduces the basics of arbitrage-free pricing of financial derivatives (such as call and put options, forward contracts) in discrete time using the trinomial model. The Black-Scholes pricing framework is then derived as an asymptotic limit of the discrete-time model. Additionally, we endeavour to discuss optimal stopping and pricing of American options in discrete time. The intended learning outcomes of this course are:
- To understand the concept of arbitrage and arbitrage-free prices.
- To be able to compute an arbitrage-free price for a European derivative using the trinomial model.
- To be able to explain how Black-Scholes prices can be derived as asymptotic limits of prices computed using the trinomial model.
- To be familiar with arbitrage-free pricing of American options using optimal stopping arguments in discrete time.

Written exam in the Summer Term.

M5MS14 Statistical Bioinformatics and Genetics (Dr M Evangelou)

Modern biomedical research is increasingly exploiting advances in biotechnology for routine data production and analysis. Technological advancements in the areas of DNA sequencing as well as the development of projects such as the 1,000 Genomes Project have allowed scientists to transform our understanding of the human genome and its relation to health and disease.

Statistical genetics is a rapidly evolving and dynamic field of study that has emerged over the last decade. In this course students will be introduced to genomics datasets and statistical models that have enabled scientists to understand complex biological processes. The course will introduce both Frequentist and Bayesian variable selection techniques as well as clustering approaches. The course will be assessed through coursework and a class test.

M5MS17 Medical Statistics (Dr N Fitz-Simon)

The objective of the course is to provide a broad range of statistical techniques to analyse biomedical data that are produced by pharmaceutical companies, research units and the NHS. Besides a general introduction to linear, generalised linear models and survival analysis, the course will focus on clinical trials (study design, randomisation, sample size and power, covariates and subgroups adjustment) to examine the effect of treatments on the disease process over time and longitudinal data analysis from the perspective of clinical trials. The statistical theory and the derivation and estimation of model parameters will be illustrated as well as the application of longitudinal models on real case studies drawn from biomedical and health sciences. The analysis of the real examples will be performed using standard statistical software. At the end of the course, students will be able to plan basic clinical trials, analyze longitudinal data and interpret the results.
The course will cover the following models and topics: Introduction to linear/generalised linear models and survival analysis. Introduction to clinical trials. Treatment allocation, monitoring and effect estimation. Introduction to longitudinal data and repeat measures. General and generalised linear model for longitudinal data. Random and mixed-effects models. Continuous assessment through coursework.

M5MS18 Official Statistics (Mr P Allin, Visiting Professor)

Every country has some form of official statistics system, making available statistics about the economy, society and the environment. Official statistics are used not only by governments but also by businesses, the media, researchers, Civil Society and the public. The course aims to provide insight into: why official statistics are needed; how they are produced; the fundamental principles that underpin them; and how the quality of official statistics is assessed. The course will also explore the main methodologies for the production of official statistics, including sample surveys, censuses and the use of administrative (‘big’) data.

This is a reading course. A list of texts and other source material to be consulted will be provided, covering the broad themes and methodologies outlined above. This material will also highlight case studies, such as national wellbeing, unemployment, consumer prices and inflation, and migration. There will also be a seminar on a topical aspect of official statistics, given by the course tutor. The course will be assessed by means of coursework and oral exam in the summer term.

M5MS19 Further Topics in Statistics (Dr M Briers)

This course covers varying current topics in Statistics and change year on year. In 2016/17 the following course will be offered:

Statistics in Big Data

The emergence of Big Data as a recognised and sought-after technological capability is due to the following factors: the general recognition that data is omnipresent, an asset from which organisations can derive business value; the efficient interconnectivity of sensors, devices, networks, services and consumers, allowing data to be transported with relative ease; the emergence of middleware processing platforms, such as Hadoop, InfoSphere Streams, Accumulo, Storm, Spark, Elastic Search, ..., which in general terms, empowers the developer with an ability to efficiently create distributed fault-tolerant applications that execute statistical analytics at scale. To promote the use of advanced statistical methods within a Big Data environment - an essential requirement if correct conclusions are to be reached - it is necessary for statisticians to utilise Big Data tools when supporting or performing statistical analysis in the modern world. The objective of this course is to train statistically minded practitioners in the use of common Big Data tools, with an emphasis on the use of advanced statistical methods for analysis. The course will focus on the application of statistical methods in the processing platforms Hadoop and Spark. Assessment will be through coursework.

M5MS20 Sequential Monte Carlo (Dr N Kantas)

Nonlinear non-Gaussian state-space models are ubiquitous in statistics, econometrics, information engineering and signal processing. Particle methods, also known as Sequential Monte Carlo (SMC) methods, provide reliable numerical approximations to the associated state inference problems, also known as the non-linear filtering. The aim of the course is to provide an introduction to these algorithms and illustrate fundamental strengths and weaknesses. The course will have an emphasis in the methodology and practical aspects of the method, but will also briefly touch on the theory behind the SMC and its relevance in improving the methodology. The course will be assessed by means of coursework and oral exam in the summer term.

9.3 Courses equivalent to 30 lecture hours

The following courses are from the general course offering of the Mathematics Department. These courses can be taken as optional courses if the student has not taken these courses or their equivalents for undergraduate students (M3S8/M4S8,M3S14/M4S14) as part of a previous degree.
At the discretion of the Course Director, students may be allowed to take other courses offered by the Department of Mathematics. To request to take a course from outside the MSc in Statistics Programme, you will need to complete the Module Request Form.

**M5S8 Time Series with Advanced Study (Prof A Walden)**

An introduction to the analysis of time series (series of observations, usually evolving in time) is given which gives weight to both the time domain and frequency domain viewpoints. Important structural features (e.g. reversibility) are discussed, and useful computational algorithms and approaches are introduced. The course is self-contained.


Additional material: From long-memory processes, Autoregressive parametric spectrum estimation, Harmonic analysis, Multichannel time series modelling and analysis.

Written exam in the Summer Term.

**M5S14 Survival Models and Actuarial Applications with Advanced Study (Prof A Gandy)**

Survival models are fundamental to actuarial work, as well as being a key concept in medical statistics. This course will introduce the ideas, placing particular emphasis on actuarial applications. Explain concepts of survival models, right and left censored and randomly censored data. Introduce life table data and expectation of life. Describe estimation procedures for lifetime distributions: empirical survival functions, Kaplan-Meier estimates, Cox model. Statistical models of transfers between multiple states, maximum likelihood estimators. Binomial model of mortality. Counting process models and the Poisson model. Estimation of transition intensities that depend on age. Graduation and testing crude and smoothed estimates for consistency.

Students obtaining a grade of 60% or higher in this course unit will gain an exemption from the Actuarial Profession Core Technical exam CT4.

Written exam in the Summer Term.

**M5S17 Quantitative Methods in Retail Finance (Dr A Bellotti)**


**M5A44 Computational Stochastic Processes (Dr Pavliotis)**

Prerequisites: Some knowledge of stochastic processes, ODEs, PDEs, linear algebra, scientific computing, numerical analysis will be useful. Knowledge of Matlab or any other programming language. Simulation of Brownian motion, Brownian bridge, geometric Brownian motion. Simulation of random fields, The Karhunen-Loeve expansion. Numerical methods for stochastic differential equations, weak and strong convergence, stability, numerical simulation of ergodic SDEs.
Statistical inference for diffusion processes, maximum likelihood, method moments.
Markov Chain Monte Carlo, sampling from probability distributions
Applications: computational statistical mechanics, molecular dynamics
Continuous assessment through coursework.

M5MF12 Algorithmic Trading and Machine Learning (Di Graziano and Ramaswamy)

A limited number of students will be allowed on this course which is part of the MSc in Mathematical Finance. The Course Administrator will send you an e-mail in November about how you can express your interest in such a place. Allocation of places is at the joint discretion of the Course Director of the MSc in Statistics and the Course Director of the MSc in Mathematics and Finance.

The aim of the course is to present a series of cutting-edge topics in the area of “Algorithmic trading” in a unified and systematic fashion. For each of the problems presented, we try to emphasize both the mathematical theory as well as industry applications. The course consists of two main parts: 1) Optimal Execution Problems and 2) Machine Learning in Finance. Optimal execution techniques are particularly relevant for market makers and quantitative brokers whereas machine learning is often used by hedge fund and prop desks to generate trading signals. However, machine learning algorithms can be also applied as part of optimal execution tools, for example in order to choose order types or speed of execution. The basic optimal execution problem consists of an agent (e.g. a bank or a broker) who needs to buy or sell a pre-specified number of units of a given asset within a fixed time frame (e.g. an hour, a day, etc). Assuming that the purchase or sale of the asset will have an impact on its price, what is the execution policy which minimizes market impact? Having decided on the execution schedule, what type of order (market or limit order) is better to submit? The first problem can be formulated as a trade-off between the expected execution cost and the price risk due to exogenous factors. We shall solve the optimization problem for different types of

- Price dynamics (ABM vs GBM, with drift or without drift);
- Market impact type (temporary, transient, permanent);
- Exogenous Risk functions (variance, VaR).

Machine learning techniques are becoming increasingly popular in the financial industry. They are typically used to help predict asset price patterns, volatility regimes, etc. The course starts by formalizing the concept of “learning” and providing an overview of various learning techniques. The subsequent lectures analyze in detail some of the most popular machine learning algorithms such as neural networks and support vector machines. We then introduce various smoothing tools (kernel regression, wavelets, HHTs) which have historically been developed for signal processing applications but have found their way into finance over the last few years. Those methods can be used as stand alone or jointly with other learning algorithms, e.g. SVM. Finally, we shall analyze issues related to model selection and how to combine different models to improve the learning outcome. Trading applications using real market data will be presented during the course.

Written exam in January and coursework.

10 The Project

10.1 Allocation

You will receive a list of available projects in the Spring Term. We aim to get this list to you very early in the Spring Term. You are then encouraged to discuss the projects which interest you with the corresponding supervisors. By a certain date in the Spring Term (which will be announced in due course), you will have to submit a ranked list of your top 6 preferred projects. Allocation will then be determined as follows:
• If multiple students have selected a given project, the supervisor will choose one and offer the project to them (taking their suitability for the project and their performance in the compulsory courses into account).

• If a student receives multiple offers, they automatically choose the top-ranked one.

• The two steps above are iterated.

• If a student receives no offers, they may be asked on short notice to add more projects to their list of preferred projects, and/or be put through a clearing round.

We aim to announce the allocation before the end of the Spring Term. Students with a strong desire to work on a specific topic or dataset may approach a potential supervisor during the autumn term to suggest their own project idea.

10.2 Working on the project

The work on the project is done under the direction of a Supervisor, who need not be your Course Advisor. In case of projects done with external partners, you will still have a supervisor from within the Mathematics Department, who has overall responsibility.

You should start with initial work on the project as soon as the topic is allocated. Aim to meet your supervisor before the Easter break. Particularly, try to resolve any issues with regards to access to data as soon as possible.

You should work essentially full-time on the project after the exams for the 15-hour optional courses are finished. During the Summer Term, immediately after the exams, the project should be defined and refined, so that the scope is clear by the end of the Summer Term. Make use of this time period during which your supervisor will be generally available for meetings in person.

You can expect regular face-to-face interaction during terms, usually every two weeks. After the Summer Term, you can only expect less frequent interactions (not necessarily face-to-face).

Continued documentation is good practice and it will help greatly when the final thesis is being prepared. Appropriate referencing is essential.

The purpose of the project is largely to train and test your ability to work independently. The supervisor will give general guidance on the work for the project and the writing of the thesis. You are strongly advised to pass a first draft of the thesis to the supervisor at least a month before the submission deadline. Advice on the suitability or otherwise of particular sections of the thesis cannot be expected.

10.3 Poster Presentation

At the end of the Summer Term, you are expected to present a poster. The poster should clearly state and describe the underlying question and the scope of your project. This is an excellent opportunity to get feedback, both from members of staff as well as from your fellow students. This is a compulsory, but non-assessed part of the course.

There is no need to spend a lot of time dressing up the poster, and no need to overload the poster with material. It is mainly intended to encourage you to clarify (and to explain) the scope of the project. It may very well be that you cannot present any results of your own yet, but you may want to address what results you hope to achieve.

On a practical side: A template for posters will be available in Blackboard. The Department owns a poster printer which can be used for this. Precise details and timings will be circulated in due course.

10.4 The Thesis

You have to submit a thesis, a substantial written thesis normally not exceeding 12000 words. This is a guideline: the appropriate length is a function of the project itself and its subject matter. Excess length disproportionate to the content may be penalised.
The thesis should be on A4-sized paper and typed (ideally using LaTeX), and words or paragraphs must not be crossed out. They should be in a simple binding; a ring or springback binder is sufficient. It is important that students sign the declaration "The work contained in this thesis is my own work unless otherwise stated". Each thesis should include (i) a brief summary, (ii) an introduction (iii) the main body of the thesis, and (iv) a bibliography.

Two printed copies of the thesis must be submitted to the MSc Administrator before the deadline listed in Section 3. An electronic copy of the thesis (one PDF document) must also be submitted via the Virtual Learning Environment. Late submission may be penalised and will normally delay consideration of the thesis to the following year.

The thesis is worth 90% of the project mark.

10.5 Oral Presentation

An integral part of the project will be an oral examination, consisting of a 20 minute presentation and 10 minute questioning on the project. The oral examination will be worth 10% of the total project mark.

The presentation will usually take place shortly after the submission deadline of the thesis, precise dates are listed in Section 3. The audience will consist of two faculty members.

You are strongly advised to prepare your oral presentation carefully, as it is an integral part of your training. Bear in mind that you only have 20 minutes, and that you should not assume or expect that the audience are experts in the area of your project. The purpose of the oral is not only to test your technical mastery of the material, but also to see how you can convey main ideas and results in your work to a general statistical public.

A few more suggestions:

- Spend enough time at the beginning on setting the scene to make sure that the audience is on board. They have not been working on this for the last 4 months.

- Be selective about what you present. You can always add a slide at the end ("other things I have been doing"). Having more slides than minutes is usually never a good idea (imagine sitting through a few high-speed talks in a row).

- The presentation aims at a reasonably educated statistician - essentially your fellow students. You do not have to introduce very basic material.

- Switch off your mobile phone during the presentation (including yours!) - last year somebody’s phone rang during their own talk....

10.6 Guide to the Presentation of the Thesis

The following are guidelines only and need to be taken with common sense and adapted for the needs of your particular presentation.

The recommended structure consists of an abstract, a Table of Contents (Chapter/Section numbers), an introduction, a middle section presenting the results and a conclusion and summary section followed by a bibliography. Sections should be numbered, as should pages, graphs/tables, equations. The graphs and tables should appear at their natural location in the text. Any long program listings should be put in appendices at the end.

It is important that references to other research work consulted or results borrowed or shared should be properly documented and you should copy the style of reference of one of the research articles you consult, i.e. with referencing also included within the text as well as at the end. It is also a good idea to acknowledge the help that your supervisor has given you!

The abstract should be a brief statement of the aims and outcomes of the project, to summarise/advice even for a casual reader!

The introduction should attempt to set your work in the context of other work done in the field. It should demonstrate that you are aware of what you are doing, and how it relates to other work. It should show that you have referenced other work.
The main sections should guide the reader through your results, analysing them and explaining them. It should show both your successes and your failures in trying to solve your problem (your unsuccessful attempts should be discussed, especially if you have ideas or explanations as to why they failed). Graphs and simple diagrams (especially when they are neat) can sometimes be far more effective in presenting results than lots of numbers and/or lots of words.

The **conclusion** section should summarise what you have learned. If you would have done more, given more time, you should indicate where your effort would have gone. If your work has raised any unsettled questions, you should address them and indicate what further work needs doing.

Any programs in the appendices should be representative. A copy of every single version of every code is unnecessary. Programs should be documented with many comment lines and a discussion of the input necessary to drive them and the output resulting from them as appropriate. Large tables of results should be organised in reference form (as should large sets of graphs) with indices and tables of contents to guide the interested reader through them. Appendices do not count towards the word limit.

The **title page** is your own design however it should include your name, CID, project title, supervisor’s name. You may want to include the wording: “Submitted in partial fulfilment of the requirements for the MSc in Statistics of Imperial College London”. You should not be using the Imperial crest, but you can use the Imperial logo:


The second page must contain a **signed and dated plagiarism statement**, “The work contained in this thesis is my own work unless otherwise stated”. It is sufficient if you sign the hard copies.

While the exact form of binding is unimportant, it should be neat and robust so that your work may be read many times by several people. You should use generous margins and least an 11pt font.

Before submitting the thesis, make sure you read the thesis in its entirety. There should be no half-finished sentences. Also, use a spell-checker.

Make sure that you have a proper introduction, that (1) describes the topic of your thesis (aiming at a reasonably educated statistician), (2) gives an overview of the thesis and, very crucially, (3) clearly points out what your main contribution is (what bits are your own doing / what is the best part).

When you present background material, make sure you reference the sources you have used. Try not to rely on Wikipedia - you are expected to go to the underlying textbooks/scholarly articles.

Include an acknowledgement.

Figures: The best place is at the top or at the bottom of a page. If this is not possible they should go on a separate page. In LaTeX this can be achieved by

\begin{figure} [tbp]
...
\end{figure}

When generating plots from R it is usually best to export them as pdf or eps for inclusion in LaTeX. To get Greek letters, sub and superscripts into labels use eg \texttt{xlab=expression(alpha[5])}.

List of references: Using author (year) style notation is good practice (the reader may know the paper, but she will definitively not know the number in your reference list). To achieve this in LaTeX you can use BibTeX together with the package natbib. If citing several references together, use..\citep{ref1,ref2,ref3} . Use a coherent style - either all authors get their first full names or none gets their full names. Books need the name of the publisher, journal articles need the name of the journal. When using BibTeX for generating references, make sure that appropriate capitalisation is used, eg it should be Monte Carlo and not monte carlo. To achieve this in BibTeX, use \texttt{\{M\}onte \{C\}arlo}.

Maths: In formulas use, for example, \texttt{\exp} and not \texttt{exp}, or \texttt{\sin} and not \texttt{sin}. 19
10.6.1 Submission

Two hard copies of the thesis must be submitted; a single copy will NOT be accepted. One of the copies will be returned to you.

You also have to submit an electronic copy of the thesis (in PDF format) through the online learning system (bb.imperial.ac.uk .. M5MS00 .. Project). Please name this file in the following format: “Surname_Firstname_Thesis.pdf”. Note that this electronic copy may be checked for plagiarism via online plagiarism detection services (e.g. Turnitin).

The thesis submission deadline is a very hard deadline since the assessment process has then to be completed on a very short timescale.

10.6.2 Computing

The Mathematics Department has several research computing resources - discuss with your supervisor if you need to use those. See https://www.imperial.ac.uk/natural-sciences/departments/mathematics/about-us/information-for-staff/research-computing-support/ for an overview.

10.6.3 Marking Guidelines

See separate document, available on Blackboard.

11 Further Elements of the Course

Introduction to R and LaTeX

There will be an introduction to R & LaTeX in the first week of the term. The goal is to enable you to use these tools with confidence and to produce reports as well as presentations.

Talks “Statistics in Practice”

These are talks given by statisticians from various industries (e.g. pharmaceutical, consulting, official statistics, academia) about their career in particular and about typical problems in their industry. This will show students the various career paths that are open to them.

Most of these talks will take place in the Summer Term (most likely combined with the poster presentation).

Attendance is expected, even though there will not be an examination on this.

The Statistics Research Seminar

The Statistics Section organizes regular research seminars. Seminars are advertised by e-mail and at imperial.ac.uk/statistics/seminars.

Attendance is strongly encouraged. Speakers are specifically instructed to “start gently”, to allow MSc students to follow at least parts of the talks.

12 Professional Skills Development

Working as a practical statistician will involve several skills, a lot of these will be trained during the year.

Some of your lecturers may allow some of the coursework to be done in groups, which usually will be randomly assigned. This is supposed to train your teamwork abilities.

You will train your problem-solving skills throughout the course. In particular, it is very important that you work through the problem sheets that you will be given. Furthermore, the project will enable you to work thoroughly on a major problem.
Presentation skills are very important for your future career. You will have the opportunity to train these in the presentation of your project. Furthermore, some lecturers may require you to present your coursework.

13 Useful Links

**Campus info**

The MSc in Statistics is mainly run in the Huxley building at the South Kensington Campus. For maps and information about this campus see [imperial.ac.uk/visit/campuses/south-kensington](https://imperial.ac.uk/visit/campuses/south-kensington).

**Past examination papers**

Past examination papers will be made available for exam-based courses (precise location will be announced but are usually posted on the blackboard module page by the course lecturer).

For courses which are shared with BSc/MSci students (M5S8, M5S14) past exam papers are available at [imperial.ac.uk/natural-sciences/departments/mathematics/study/students/undergraduate/pastexampapers](https://imperial.ac.uk/natural-sciences/departments/mathematics/study/students/undergraduate/pastexampapers).

**Imperial Study Guide for Master’s Students**

This is an Imperial wide guide to help you with your studies.

[imperial.ac.uk/students/success-guide](https://imperial.ac.uk/students/success-guide)

[https://workspace.imperial.ac.uk/college/public/pdfs/ISGMasters.pdf](https://workspace.imperial.ac.uk/college/public/pdfs/ISGMasters.pdf)

**Academic and Examination Regulations**

[www.imperial.ac.uk/about/governance/academic-governance/regulations/](https://www.imperial.ac.uk/about/governance/academic-governance/regulations/)

**Registry (imperial.ac.uk/registry)**

You get official results and transcripts from registry.

**Student Hub (imperial.ac.uk/studhub)**

The Student Hub is the one stop shop for all key information and support that students need for everyday life at Imperial. All the student support departments are brought together here, so that you can get answers to your most frequent queries in one place, saving you from going all over the campus! The Hub provides a comprehensive information service run by knowledgeable staff who answer questions about university services available to students. As a student, you can obtain various letters (e.g. for opening a UK bank account).

The Student Hub is located at the west end of Level 3, Sherfield Building, South Kensington Campus.

**Careers Service (imperial.ac.uk/careers)**

The Careers Service provides a varied and comprehensive careers guidance, information and vacancy service for all students and alumni of Imperial College, from first to final year undergraduates and postgraduates.

**Royal Statistical Society (rss.org.uk)**

The Royal Statistical Society (RSS) is one of the world’s most distinguished and renowned statistical societies. It is both a learned society for statistics and a professional body for statisticians.

It was founded in 1834 as the Statistical Society of London and became the Royal Statistical Society by Royal Charter in 1887. Today the Society has more than 7000 members around the world, of whom some 1500 are
professionally qualified as Chartered Statistician. The RSS is active in a wide range of areas both directly and indirectly relevant to the study and application of statistics. The RSS headquarters is located in 12 Errol street (about 50 minutes on public transport from the Mathematics Department).

Throughout the year, the RSS organizes Ordinary Meetings, at which statistical papers are being presented and discussed. The Young Statisticians Section organizes Pre-Ordinary Meetings, held just before the Ordinary Meetings, which are aimed at giving an introduction to the area of the paper presented at the Ordinary Meeting. You might be interested in joining the RSS, in particular the Young Statisticians section.

**The MSc in Statistics is accredited by the Royal Statistical Society.** For you that means:

- **Students of the MSc in Statistics get a [free one year student membership](mailto:records@imperial.ac.uk).** You are very much encouraged to apply for this membership and get involved in the RSS.

- Once graduated, the RSS will grant you **“Graduate Statistician” status**. This will allow you to use the postnomial designation of “Gradstat”.

  When applying for Gradstat status, the RSS needs confirmation that you are indeed a graduate. Only registry can issue such a confirmation. Please send an e-mail to [records@imperial.ac.uk](mailto:records@imperial.ac.uk) stating that a confirmation of degree should be posted to the RSS, giving the address of the RSS (if in doubt ask the RSS for the precise address).

**Imperial Policy on Employment during Studies**

[https://workspace.imperial.ac.uk/registry/Public/Procedures%20and%20Regulations/Policies%20and%20Procedures/Student%20Employment%20During%20Studies.pdf](https://workspace.imperial.ac.uk/registry/Public/Procedures%20and%20Regulations/Policies%20and%20Procedures/Student%20Employment%20During%20Studies.pdf)

**Examinations and Religious Obligations**


**College Procedures**

The College's Regulations for Students:

[imperial.ac.uk/students/terms-and-conditions](http://imperial.ac.uk/students/terms-and-conditions)

Exam, assessment and regulations including mitigation / extenuating circumstances policy and procedures:


Complaints and Appeals procedures:

[imperial.ac.uk/about/governance/academic-governance/academic-policy/complaints-appeals-and-discipline](http://imperial.ac.uk/about/governance/academic-governance/academic-policy/complaints-appeals-and-discipline)

Academic integrity and cheating offences policy and procedures:

Welfare and Support

Personal Development Planning and 'iPlan'

[imperial.ac.uk/careers/staff/staff/pdp]

Information for students with disabilities, including the Disability Advisory Service:

[imperial.ac.uk/disabilityadvisoryservice]

Other welfare and pastoral care/support resources

[imperial.ac.uk/humanities/englishlanguagesupport]
[imperial.ac.uk/students/welfareandadvice]
[imperial.ac.uk/students/new-students/international-students]

Imperial College Union (ICU)

[www.imperialcollegeunion.org]

Graduate Students’ Association (GSA)

[union.ic.ac.uk/presidents/gsu/]

Student representation - how to become a student representative:

[imperialcollegeunion.org/representation]

Graduate School Open Day

In case you contemplate continuing at Imperial after the MSc, there is a Graduate School Open Day toward the end of the Autumn Term, see [www.imperial.ac.uk/study/pg/open-days-and-visits/postgraduate-open-day].

Alumni services [imperial.ac.uk/alumni]

This is Imperial’s alumni community! The College has more than 150,000 alumni worldwide, and we look forward to keeping in touch with you after your degree, welcoming you back to campus and connecting you with classmates.

A Policy on Scientific Misconduct

The College considers any allegation of scientific misconduct to be a matter of great concern and will investigate any such allegation fully. Given its international reputation and status, the College has a responsibility to the scientific community and to the public at large and therefore, where appropriate, will make public the outcome of any such investigation.

Definitions

The College has adopted the Royal College of Physicians’ definitions of scientific misconduct as including piracy, plagiarism and fraud. The following definitions give indicative descriptions of the types of activity covered by this regulation. These descriptions are neither exclusive nor exhaustive:

1. Piracy is the deliberate exploitation of ideas and concepts from others without acknowledgement.

2. Plagiarism is the copying of ideas, data or text (or a combination of these) without permission or acknowledgement.
3. Fraud – involves deception, usually (but not exclusively) the invention of data. This could also include the omission from analysis and publication of inconvenient components of a data set.

Other types of scientific misconduct may be separately defined, but the College views them as combinations or sub-types of those defined above. In addition to scientific misconduct, these procedures will also apply to cases of scientific negligence. Procedures for the Investigation of Allegations of Scientific Misconduct See https://www.imperial.ac.uk/research-and-innovation/about-imperial-research/research-integrity/misconduct/.

Statement on Plagiarism

You are reminded that all work submitted as part of the requirements for any examination (including coursework) of Imperial College and the University of London must be expressed in your own words and incorporate your own ideas and judgements.

Plagiarism, that is, the presentation of another person’s thoughts or words as though they were your own, must be avoided, with particular care in coursework, essays and reports written in your own time. Note that you are encouraged to read and criticise the work of others as much as possible. You are expected to incorporate this in your thinking and in your coursework and assessments. But you must acknowledge and label your sources.

Direct quotations from the published or unpublished work of others, from the internet, or from any other source must always be clearly identified as such. A full reference to their source must be provided in the proper form and quotation marks used. Remember that a series of short quotations from several different sources, if not clearly identified as such, constitutes plagiarism just as much as a single unacknowledged long quotation from a single source. Equally, if you summarise another person’s ideas or judgements, figures, diagrams or software, you must refer to that person in your text, and include the work referred to in your bibliography. Departments are able to give advice about the appropriate use and correct acknowledgement of other sources in your own work.

The direct and unacknowledged repetition of your own work which has already been submitted for assessment can constitute self-plagiarism. Where group work is submitted, this should be presented in a way approved by your department. You should therefore consult your tutor or course director if you are in any doubt about what is permissible. You should be aware that you have a collective responsibility for the integrity of group work submitted for assessment.

The use of the work of another student, past or present, constitutes plagiarism. Where work is used without the consent of that student, this will normally be regarded as a major offence of plagiarism.

Failure to observe these rules may result in an allegation of cheating. Cases of suspected plagiarism will be dealt with under the College’s Examination Offences Policy and may result in a penalty being taken against any student found guilty of plagiarism.

Cheating Offences Policy and Procedures

imperial.ac.uk/registry/exams/examoffences

Plagiarism advice for postgraduate taught course (Master’s) students

imperial.ac.uk/admin-services/library/learning-support/plagiarism-awareness/masters-students

TurnitinUK Plagiarism Detection Service at Imperial College

imperial.ac.uk/admin-services/ict/self-service/teaching-learning/elearning-services/turnitin