Congratulations on joining the MSc in Mathematics and Finance at Imperial College London this September! We look forward to welcoming you here and, in the meantime, would like to give you some information about the programme itself and how you can prepare yourself for the course. General information to help you navigate around the College during your first few weeks is available at [www.imperial.ac.uk/students/new-students](http://www.imperial.ac.uk/students/new-students).

The academic contents of the MSc in Mathematics and Finance are both highly theoretical and practical, combining technical modules in Mathematics and Statistics as well as finance-oriented topics and programming tools. This dense and wide range of topics aim at reflecting the diversity of the quantitative finance industry and to provide you with the right tools to pursue a successful career in the field. To help you achieve our goals, we have assembled a team of leading academics and practitioners in Quantitative Finance, whose expertise regularly makes the MSc a leading programme in the field.

The following Core modules, each lasting 40 hours, will give you solid foundations:

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<th>Core Modules</th>
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<tr>
<td>Mathematical Finance</td>
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<td>Quantitative Risk Management</td>
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<tr>
<td>Computing in C++</td>
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<td>Interest Rate Modelling</td>
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<td>Stochastic Processes</td>
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<tr>
<td>Statistical Methods in Finance</td>
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<tr>
<td>Computing in Python</td>
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<td>Simulation Methods for Finance</td>
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You will also be able to choose a certain number of Elective modules (15 hours each) to complement the above and develop cutting-edge knowledge in several topics (the streams are only indicative, to help you choose):

<table>
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<th>Derivatives Pricing Stream</th>
<th>Machine Learning (ML) Stream</th>
<th>Market Microstructure Stream</th>
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<tbody>
<tr>
<td>Topics in Quantitative Finance</td>
<td>Deep learning</td>
<td>Market microstructure</td>
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<tr>
<td>Numerical Methods in Finance</td>
<td>Data Analysis and ML</td>
<td>Convex Optimisation</td>
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<td>Topics in Derivatives Pricing</td>
<td>FinTech</td>
<td>Algorithmic and High-Frequency Trading</td>
</tr>
<tr>
<td>Rough Paths and Data Science</td>
<td>Quantum Computing</td>
<td>Stochastic Control in Finance</td>
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Portfolio Management |
In order to start the programme in the best conditions, we strongly recommend you get acquainted in advance with a few topics and the following reading list should help you in this regard:

**Computing**

Coding is an essential part of the daily task of a quantitative analyst, and C/C++ have historically been the main languages used in the financial industry. We will teach you both C and C++, but it is highly recommended that you already have some notions beforehand. A good reference to start is

B. Stroustrup (designer of C++), *Programming: Principles and Practice Using C++*.

Aside from C/C++, Python has become one of the most widely used languages in the financial industry. It is an open-source, interpreted, high-level, multi-purpose and cross-platform programming language. It also allows easy manipulation and live import of data, an essential feature in the current Big Data context. Several modules in the MSc use Python and we strongly recommend you have a first look at it. A good finance-oriented reference is

Y. Hilpisch, *Python for Finance: Analyze Big Financial Data*.

On the statistical side, the historically reference language is R, which is a free programming language implementing a wide variety of statistical tools, including time-series analysis and statistical tests, and has an extensive list of add-on packages for specialised techniques, such as big-data analysis and survival analysis. A good reference is:


Mathematics

The Imperial College MSc in Mathematical Finance is both highly theoretical and very practical. The theoretical aspects rely on a strong background in Mathematics, with a particular focus on analysis and, ideally some probability. The main reference for the Analysis background are the following two books:


Rudin’s book should have been covered in your undergraduate courses. Folland’s monograph goes deeper, covering functional analysis and measure theory. For background on Probability and Statistics, you should look at


Partial differential equations are fundamental in mathematical finance and the following book provides a good overview:


We highly recommend you to familiarise yourself (or refresh your memories) on these topics. Grimmett and Stirzaker’s book contains both standard probability theory (random variables, generating functions, convergence), as well as some essential results—which will be covered in the MSc—on stochastic processes. Good familiarity with standard probability theory concept is strongly recommended.
Finance

This is an MSc in Mathematical Finance and, even though the underlying tools of quantitative analysis in banks and hedge funds are highly mathematical, one should not lose track of the surrounding context and objectives. Standard (non-mathematical) book about options derivatives are


If you want to learn about the history and the making of quantitative finance (to avoid bad history repeating itself), we recommend the following novels, which should be read with some pinch of critical mind, as they are only their authors’ view on the financial industry:

- S. Patterson:*The Quants, the maths geniuses who brought down Wall Street* (Princeton University Press, 2014): history of the largest quantitative hedge funds from their creations to the 2007-2008 crisis.

Internet also contains ample information and the following videos will get you familiar with quantitative finance:

- *Quants - The Alchemists of Wall Street*.
- *Money & Speed: Inside the Black Box*.
- *An interview with Jim Simons*.
- *An interview with Damiano Brigo*: discussion about the situation of quantitative finance today.

The following websites should also be checked regularly:

- Bloomberg provides analytics, equity trading platform, data services, and news to financial companies.
- Financial Times is one of the main newspaper regarding business and economics.

Other activities during the year

Apart from lectures, courseworks and exams, your academic year in Imperial College will be filled with weekly meetings with industry partners as well as regular mini-lectures on specific topics by practitioners.

Looking forward to seeing you in September.

Dr Jack Jacquier and Dr Eyal Neuman
MSc Mathematics and Finance Directors
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