MSc in Applicable Mathematics
Preparatory Reading List – 2020/1

This list of resources is meant for those of you who feel they will benefit from a refresher in a particular area of mathematics, as a way to prepare yourself for the kind of work you will be doing when you arrive. It can also be useful if you simply want to start looking at the course material early.

We must emphasis that this reading is **not** compulsory. But we also want to point out that Applicable Mathematics students in the past told us they would have liked some stronger guidance on the type of material they would be covering in their courses.

Accessing resources

It is not necessary to purchase lots of expensive books before you arrive. You should be able to access the books we recommend from an academic library, or from the sources indicated below. If you arrive early, you can access the LSE Library before registration. To do so, you should cut out the temporary pass provided in your Offer Pack and present it to Library reception. Alternatively, you may bring your offer letter to Library reception and staff will issue a temporary pass.

All these books should be available, should you wish to purchase any, from online retailers. In some cases, the first chapter or other parts of a book are available to read online, through the publisher (search for the book with your choice of search engine).

General and Abstract Mathematics

The MSc in Applicable Mathematics programme assumes some knowledge of general mathematics. In particular, we expect you to be familiar with reading and writing formal mathematical proofs, and capable of working with abstract concepts. It is likely that your previous degree covered this material. However, it's always a good idea to refresh your memory. If your previous degree had less mathematical content, then there may be gaps in your knowledge which you should try to fill before starting the MSc programme.

At LSE, the material we assume in the MSc Applicable Mathematics course is taught in the following LSE courses:

- **MA100 - Mathematical Methods**
- **MA103 - Introduction to Abstract Mathematics**
- **MA203 - Real Analysis**

MSc in Applicable Mathematics
Preparatory Reading List – 2020/1

The official course guides, lecture notes (for MA103 and MA203), and exam papers with solutions from recent years, can be found here and also on the offer holders/new arrivals page: http://www.lse.ac.uk/Mathematics/Offer-Holders/WelcomeMScAM

We suggest that you read briefly through the course guides, skim the lecture notes and perhaps look at a past exam paper in order to check that your understanding of the material matches our expectations.

If the past exam papers for those courses look hard to you, you should spend some time studying the corresponding parts of the above courses before arriving at LSE. Apart from the MA103 and MA203 notes, we recommend the following two books.

- P.J. Eccles (1997), *An Introduction to Mathematical Reasoning: Numbers, Sets and Functions*. Cambridge University Press, ISBN 0521597188.
  Parts I to IV of this book give a good and very readable text for those wanting to refresh their abstract mathematics skills in general.
- N.L. Biggs (2nd edition, 2002), *Discrete Mathematics*. Oxford University Press, ISBN 0198507178.
  This book covers several areas. Chapters 1–7 are good for students who are unsure about their background in abstract mathematics.

Preliminary reading for specific courses

Indicative and preliminary reading for the core courses MA407 Algorithms and Computation and MA421 Advanced Algorithms are given in the separate document '*Notice regarding MA407 Algorithms and Computation and MA421 Advanced Algorithms*', that is included in your preliminary information.

If you have little or no programming experience, you are strongly advised to prepare for the MA407 course as detailed in the notice. Students with limited experience who do not prepare typically struggle with that (core) course. If you have programming experience, but not with the Java language, you should find it easy to adapt.

The general and abstract mathematics discussed above are prerequisite for all mathematics courses in the MSc programme. Additionally the core course MA407 (or an equivalent course) is a prerequisite for many courses. Some courses have further   prerequisites; these are indicated below.

For most courses, the lecturer will explain what background knowledge they expect during the first lectures of the course. Nevertheless, if you wish to familiarise yourself
with the basics now, or if you know your understanding of a specific area is not good, the following resources may be helpful.

MSc in Applicable Mathematics
Preparatory Reading List – 2020/1

The course descriptions on the LSE website include an indicative list of literature for each course. However you **do not** need to buy any books before starting the course. If certain books are required to follow a course the lecturer will say this at the beginning of the course.

MA402 - Game Theory I
No prerequisites will be assumed. A good introductory text is
- K. Binmore (2007), *Playing for Real: A Text on Game Theory*. Oxford University Press, ISBN 0195300572.
  This book is an improved version of *Fun and Games* (1991) by the same author.

MA407 - Algorithms and Computation
See additional '*Notice regarding MA407 Algorithms and Computation and MA421 Advanced Algorithms*'.

MA409 - Continuous Time Optimisation
This course assumes knowledge at the level of the LSE course MA212 - Further Mathematical Methods. The course guide for MA212 is at: http://www.lse.ac.uk/resources/calendar/courseGuides/MA/2017_MA212.htm. The recommended book is:
- A. Ostaszewski (1990). *Advanced Mathematical Methods.* Cambridge University Press, ISBN 0521289645.

MA410 - Information, Communication and Cryptography
No preliminary reading is suggested for this course.

MA411 - Probability and Measure
Some background in real analysis is essential.
No preliminary reading is suggested for this course.

MA420 - Quantifying Risk Modelling and Alternative Markets
No preliminary reading is suggested for this course. ST409 - Stochastic Processes is a prerequisite.

MA421 - Advanced Algorithms
See additional '*Notice regarding MA407 Algorithms and Computation and MA421 Advanced Algorithms*'.

MSc in Applicable Mathematics
Preparatory Reading List – 2020/1

MA433 - Mathematics of Networks
Preliminary Reading
(1) D. Easley, J. Kleinberg. Networks, crowds and markets, Cambridge University Press, 2010.
(2) M. Newman. Networks: An Introduction, Oxford University Press, 2010.
(3) The Rise of the Network Society, The Information Age: Economy, Society and Culture, 2010 edition, Manuel Castells.

MA434 – Algorithmic Game Theory
Preliminary Reading
(1) Noam Nisan, Tim Roughgarden, Eva Tardos, Vijaj V. Vazirani. Algorithmic Game Theory. Cambridge University Press. September 2007.
(2) Tim Roughgarden. Twenty Lectures on Algorithmic Game Theory. Cambridge University Press. August 2016.
(3) David C. Parkes and Sven Seuken. Introduction to Economics and Computation: A Design Approach. Cambridge University Press. June 2019.