Programme Title: MSc Data Analytics (PT)



# Programme Specification (PG)

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| Awarding body / institution: | Queen Mary University of London |
| Teaching institution: | Queen Mary University of London |
| Name of final award and title: | MSc Data Analytics (PT) |
| Name of interim award(s): | PG Cert in Mathematics and PG Dip in Mathematics |
| Duration of study / period of registration: | 2 years [part-time] |
| Queen Mary programme code(s): | PMSP-QMMATH1_PSDAN_G31B |
| QAA Benchmark Group: | 7 |
| FHEQ Level of Award: | Level 7 |
| Programme accredited by: | |
| Date Programme Specification approved: | |
| Responsible School / Institute: | School of Mathematical Sciences |

**Schools / Institutes which will also be involved in teaching part of the programme:**

N/A

**Collaborative institution(s) / organisation(s) involved in delivering the programme:**

N/A

## Programme outline

This Data Analytics MSc will teach you the core mathematical principles of data analysis and how to apply these to real world scenarios. Building on the statistical foundations of machine learning you will then choose from module options which explore the financial, business and scientific applications; such as in trading and risk systems, optimisation of business processes, and relationships across complex systems.

Data science is the driving force behind today's most successful businesses. In our data-driven economy, companies are seeking highly numerate data experts who can use statistical techniques and the latest technologies to extract clear insights to inform every aspect of their strategy and operations. From financial corporations, to AI start-ups, and across the technology, retail and healthcare industries, highly sought-after Data Scientists can earn over £56k per year on average (according to Indeed.co.uk, UK figures).

The programme is run by the School of Mathematical Sciences and is offered full time (one year) and part-time (two years). Part-time students will take two modules per semester, with the dissertation spread across two years.

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## Aims of the programme

The programme will provide students with:
- an understanding of the major theories, principles and concepts of data analytics
-a familiarity with some of the routine materials, techniques and practices of current data analytics as practiced in industry and research.
-with the required skills for the gathering, basic analysis, and presentation of analysis of data, ideas, concepts and conclusions. Including the use of standard tools in data analytics.
-the ability to apply their skills in a number of different contexts

## What will you be expected to achieve?

The outcomes are in line with the QAA Benchmark Standards for Mathematics, Statistics and Operational Research (Masters'). Broadly, this includes:
-a good understanding of the mathematical foundations of Data Analytics as well as some state-of-the-art advanced techniques
-how to apply this understanding and techniques to compute with and analyze data
-able to choose appropriate techniques for different contexts
-able to communicate results and conclusions effectively
-be proficient in using standard software packages

This will include both theoretical underpinnings as well as practical experience.

The specific outcomes are listed below:

| Academic Content: | |
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| A 1 | Knowledge of the mathematical foundations of data analytics |
| A 2 | Knowledge of the interpretation of results based on a mathematically rigorous methodology |
| A 3 | Knowledge of methodologies for designing and carrying out experiments with data |
| A 4 | Understanding statistical methodologies and their application |
| A 5 | Understanding a project pipeline, including inception, planning, execution, and presentation of results |
| A 6 | Knowledge of and specialisation in some applications of data analytics |
| A 7 | knowledge of current state of the art techniques and accepted best practices |

| Disciplinary Skills - able to: | |
|---|---|
| B 1 | Achieve an understanding of mathematical and computational techniques for data analytics |

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| B 2 | Assess and interpret results of statistical analyses |
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| B 3 | Use core knowledge to investigate and learn new and emerging techniques in data analytics |
| B 4 | Investigate data associated to an unfamiliar problem, and perform meaningful analysis of it |
| B 5 | Using core principles to be able to work with different data modalities |
| B 6 | Work effectively with computational and analytic tools |

| Attributes: | |
|---|---|
| C 1 | Work effectively with computational and analytic tools |
| C 2 | Ability to follow the literature and keep up with new developments |
| C 3 | Ability to structure and produce high quality written material (develop transferable skills required to be effective) |
| C 4 | Inform decision making using performed analysis |
| C 5 | Investigate quantitative data confidently and competently |
| C 6 | be able to identify pertinent facts and trends from complex, often contradictory information |
| C 7 | Integrate knowledge from many different fields |

## How will you learn?

The taught programme is designed to provide the students with the understanding and grounding needed to progress successfully through the MSc through to the dissertation. Lectures that provide the theoretical background will be balanced by coursework and a project that give the students the practical skills needed to undertake research projects. Following the courses will also prepare students to read, understand and evaluate current scientific literature, and prepare them for analysing data. The final dissertation project will teach students to manage their own study, perform research and produce scientific output at Masters level.

Throughout the whole academic year students are encouraged to undertake independent reading both to supplement and consolidate what is being taught and learnt and to broaden their individual knowledge and understanding of the subject.

Practical and computational skills are developed through coursework, the project work and through interaction with the other research students and the project supervisor.

Technical reports and presentations are taught and developed through workshops and feedback on written coursework, progress reports of the project and presentations. Use of the scientific literature is introduced by the Library during the induction week and then developed by academic staff through lectures on Research Methods, coursework, and reports and presentation of the individual supervised special project.

Transferable skills are built up through the teaching and learning programme outlined above. Effective communication is taught and assessed through workshops and feedback on the project reports and oral presentations. It is assessed through coursework, written examinations and project work.
Usage of information and communications technology is developed through workshops, computer based exercises, coursework

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activities, the project and other and individual learning.

Management of resources and time is developed throughout the course within a framework of coursework deadlines and the examination system. Moreover, the programme is structured and delivered in such a way as to promote independent learning with open mindedness and critical inquiry.

Throughout the project what is being taught and simultaneously assessed is management skills, the integration and evaluation of information from a variety of sources, and the transfer of knowledge techniques and solutions from one discipline to another.

## How will you be assessed?

The assessment is by written examination and a written dissertation, in line with the regulations for projects/dissertations at Masters level. Where computational and programming skills are delivered, modules will have in-term assessed project work and coursework.

The project - a dissertation that counts for 60 credits written during the summer - starts early in January. It is assessed, on the basis of the individual literature review, main report and presentation, initially by the supervisor and second examiner, and then by the External Examiner and the full Examination Board.

## How is the programme structured?
Please specify the structure of the programme diets for all variants of the programme (e.g. full-time, part-time - if applicable). The description should be sufficiently detailed to fully define the structure of the diet.

The program consists of four compulsory taught modules in Semester A and four elective modules, in Semester B, as well as a summer dissertation project.

The compulsory modules will cover the most important aspects of data analytics while the elective modules allow the student to tailor the learning experience according to their interests. Several modules are exclusive to this programme.

The programme will seek to give students a solid understanding of the mathematical underpinnings of the core techniques in data analytics while allowing them to gain breadth by choosing modules from statistical foundations, financial applications, and scientific applications of data analytics (taking modules from at least two of these areas) and gain depth in the dissertation. This includes a two module, year-long cycle of Machine Learning with Python and Advanced Machine Learning, which form the cornerstone of modern data analytics.

(All modules are at level 7, and all apart from the project carry 15 credits.)

Year 1

Semester A

Two compulsory modules:
MTH786P Machine Learning with Python
MTH794P Probability and Statistics for Data Analysis

Semester B

Stream 1: Applied Machine Learning

Two compulsory modules:
MTH769P Forecasting with AI
MTH791P Computational Statistics with R

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Stream 2: Pattern Recognition and Deep Learning

Two compulsory modules:
MTH767P Neural Networks and Deep Learning
MTH793P Advanced Machine Learning

Stream 3: Statistical Inference

Two compulsory modules:
MTH776P Bayesian Statistics
MTH791P Computational Statistics with R

Year 2

Semester A

Two compulsory modules:
MTH765P Storing, Manipulating and Visualising Data
MTH766P Programming in Python

Semester B

Stream 1: Applied Machine Learning

Choose two electives from:
MTH776P Bayesian Statistics
MTH782P SAS for Business Intelligence
MTH784P Optimisation for Business Processes
MTH792P Financial Data Analytics
MTH741P Digital and Real Asset Analytics

Stream 2: Pattern Recognition and Deep Learning

Choose two electives from:
MTH750P Graphs and Networks
MTH769P Forecasting with AI
MTH776P Bayesian Statistics
MTH791P Computational Statistics with R

Stream 3: Statistical Inference

Choose two electives from:
MTH750P Graphs and Networks
MTH767P Neural Networks and Deep Learning
MTH769P Forecasting with AI
MTH793P Advanced Machine Learning

Years 1 and 2

Semester C

MTHM038 Dissertation

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**Academic Year of Study**     PT - Year 1

| Module Title | Module Code | Credits | Level | Module Selection Status | Academic Year of Study | Semester |
|---|---|---|---|---|---|---|
| Machine Learning with Python | MTH786P | 15 | 7 | Compulsory | 1 | Semester 1 |
| Storing Manipulating and Visualising Data | MTH765P | 15 | 7 | Compulsory | 1 | Semester 1 |
| Probability and Statistics for Data Analysis | MTH794P | 15 | 7 | Compulsory | 1 | Semester 1 |
| Programming in Python | MTH766P | 15 | 7 | Compulsory | 1 | Semester 1 |
| Forecasting with AI | MTH769P | 15 | 7 | Elective | 1 | Semester 2 |
| Computational Statistics with R | MTH791P | 15 | 7 | Elective | 1 | Semester 2 |
| Bayesian Statistics | MTH776P | 15 | 7 | Elective | 1 | Semester 2 |
| SAS for Business Intelligence | MTH782P | 15 | 7 | Elective | 1 | Semester 2 |
| Optimisation for Business Processes | MTH784P | 15 | 7 | Elective | 1 | Semester 2 |
| Financial Data Analytics | MTH792P | 15 | 7 | Elective | 1 | Semester 2 |
| Neural Networks and Deep Learning | MTH767P | 15 | 7 | Elective | 1 | Semester 2 |
| Advanced Machine Learning | MTH793P | 15 | 7 | Elective | 1 | Semester 2 |
| Graphs and Networks | MTH750P | 15 | 7 | Elective | 1 | Semester 2 |
| Dissertation | MTHM038 | 60 | 7 | Compulsory | 1 | Semester 3 |
| Digital and Real Asset Analytics | MTH741P | 15 | 7 | Elective | 1 | Semester 2 |

## What are the entry requirements?

An upper second class degree is normally required, usually in a STEM related subject (electronic engineering, computer science, mathematics, physics or a related discipline). Students with a good lower second class degree may be considered on an individual basis. Applicants with unrelated degrees will be considered if there is evidence of equivalent content in their academic or professional background. For international students we require English language qualifications IELTS 6.5.

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## How will the quality of the programme be managed and enhanced? How do we listen to and act on your feedback?

The Student Voice Committee provides a formal means of communication and discussion between schools/institutes and its students. The committee consists of student representatives from each year in the school/institute together with appropriate representation from staff within the school/institute. It is designed to respond to the needs of students, as well as act as a forum for discussing programme and module developments. Student Voice Committees meet regularly throughout the year.

Each school/institute operates a Learning and Teaching Committee, or equivalent, which advises the School/Institute Director of Taught Programmes on all matters relating to the delivery of taught programmes at school level including monitoring the application of relevant QM policies and reviewing all proposals for module and programme approval and amendment before submission to Taught Programmes Board. Student views are incorporated in the committee's work in a number of ways, such as through student membership, or consideration of student surveys.

All schools/institutes operate a periodic Programme Review of their taught undergraduate and postgraduate provision. This is a continuous process of reflection and action planning which is owned by those responsible for programme delivery; the main document of reference for this process is the Taught Programmes Action Plan (TPAP) which is the summary of the school/institute's work throughout the year to monitor academic standards and to improve the student experience. Students' views are considered in this process through analysis of the NSS and module evaluations.

## What academic support is available?

The Postgraduate Taught Programmes Officer and Student Support Officer in SMS will run the induction programme. The Senior Tutor in SMS will assign an adviser to each student on the programme - initially this will be the Programme Director but as numbers increase, we expect other staff will also advise students on the programme. The Student Support teams in SMS will ensure that students feel able to consult staff to resolve any difficulties as they arise.

Course representatives from the new programme will attend the Postgraduate Student-Staff Liaison Committee in SMS. The programme review will be overseen by the Director of Taught Programmes in SMS and the SMS Education Committee.

## Programme-specific rules and facts

N/A

## How inclusive is the programme for all students, including those with disabilities?

Queen Mary has a central Disability and Dyslexia Service (DDS) that offers support for all students with disabilities, specific learning difficulties and mental health issues. The DDS supports all Queen Mary students: full-time, part-time, undergraduate, postgraduate, UK and international at all campuses and all sites.
Students can access advice, guidance and support in the following areas:
• Finding out if you have a specific learning difficulty like dyslexia
• Applying for funding through the Disabled Students' Allowance (DSA)
• Arranging DSA assessments of need
• Special arrangements in examinations
• Accessing loaned equipment (e.g. digital recorders)
• Specialist one-to-one "study skills" tuition
• Ensuring access to course materials in alternative formats (e.g. Braille) • Providing educational support workers (e.g. note-takers,

readers, library assistants)
• Mentoring support for students with mental health issues and conditions on the autistic spectrum.

## Links with employers, placement opportunities and transferable skills

The Data Analytics MSc programme will prepare students for a range of careers dealing with data, especially in the information technology sector, as well as public health, finance, public services, marketing, consultancy and commerce. The analytic and computing skillsacquired through the programme are much valued in the financial sector and a number of recent graduates from the School of Mathematical Sciences have gone on to work for companies such as the Royal Bank of Scotland, HSBC, Procter and Gamble, Barclays Capital, JP MorganChase and EDF Energy. During the project phase of the MSc, the students will have the opportunity to define their project in collaboration with our external collaborators.

## Programme Specification Approval

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| **Person completing Programme Specification:** | Pedro Vergel |
| **Person responsible for management of programme:** | Nicola Perra |
| **Date Programme Specification produced / amended by School / Institute Education Committee:** | 29 Oct 2024 |
| **Date Programme Specification approved by Taught Programmes Board:** | |