Programme Specification (PG)

Awarding body / institution:	Queen Mary University of London
Teaching institution:	Queen Mary University of London
Name of final award and programme title:	MSc Data Science and Artificial Intelligence by Conversion
Name of interim award(s):	PGCert, PGDip
Duration of study / period of registration:	12 Months
Queen Mary programme code(s):	I4U5
QAA Benchmark Group:	Computing
FHEQ Level of Award:	Level 7
Programme accredited by:	The British Computer Society will be sought.
Date Programme Specification approved:	
Responsible School / Institute:	School of Electronic Engineering & Computer Science

Schools / Institutes which will also be involved in teaching part of the programme:
School of Electronic Engineering & Computer Science

Collaborative institution(s) / organisation(s) involved in delivering the programme:
Institute of Coding

Programme outline

This programme is a conversion Master's targeted at students who have some programming or mathematical background, but not enough to take a standard Master's in Artificial Intelligence or Data Analytics. It is designed to be accessible for students with a general STEM background, or for students who have taken courses in Arts and Humanities that have a statistical component. It will also be accessible for students who have less formal training in these areas, but do have compensatory work or life experience. It is based on our successful Big Data Science and Artificial Intelligence programmes, but differs from them by:
- inclusion of pre-sessional modules in order to build up pre-requisite skillsets
- cutting down on the non-core elements of the programmes in order to compensate
- the introduction of a new module covering Ethics and Regulation.

It maintains the same kinds of core learning outcomes (though the specifics have been updated using the most recent applicable national model), though the breadth of options has been reduced.

Aims of the programme

The purpose of this programme is to enable learners who do not have a strong Computer Science background to train as Artificial Intelligence Data Specialists. The broad purpose of this occupation is to discover and devise new data-driven AI solutions to automate and optimise business processes and to support, augment and enhance human decision-making. AI Data

Specialists may also carry out applied research in order to create innovative data-driven artificial intelligence (AI) solutions to business problems within the constraints of a specific business context, and advise business managers on the suitabilty of the different approaches available. They typically work with datasets that are too large, too complex, too varied or too fast-changing, that render traditional approaches and techniques unsuitable or unfeasible. Projections of the demand for skilled graduates in this area are that it will increase significantly, outstripping current supply. Moreover, graduates entering this area come from a restricted range of educational and social backgrounds, and this impacts on the quality and robustness of the systems that are being produced.

The second important aim for this programme is therefore to increase the number of people from groups currently underrepresented in the AI and data science fields, and to encourage graduates from diverse backgrounds to consider a future in these occupations.

This degree will allow learners who do not have a strong background in programming or statistics first to acquire a level of skills in these areas and then to move on to apply them in learning specialist AI techniques.

What will you be expected to achieve?

The programme-level learning outcomes for this degree are derived from the outcomes for the draft Level 7 Degree Apprenticeship Standard Artificial Intelligence (AI) Data Specialist, also benchmarked against the Level 7 Degree Apprenticeship Digital Technology Solutions Specialist (Data Analytics).

Academic Content:	
A 1	K1: How to use AI and machine learning methodologies such as data-mining, supervised/unsupervised machine learning, natural language processing, machine vision to meet business objectives
A 2	K2: How to apply modern data storage solutions, processing technologies and machine learning methods to maximise the impact to the organisation by drawing conclusions from applied research
A 3	K3: How to apply advanced statistical and mathematical methods to commercial projects
A 4	K4: How to extract data from systems and link data from multiple systems to meet business objectives
A 5	K5: How to design and deploy effective techniques of data analysis and research to meet the needs of the business and customers
A 6	K7: How to solve problems and evaluate software solutions via analysis of test data and results from research, feasibility, acceptance and usability testing
A 7	K9: The current or future legal, ethical, professional and regulatory frameworks which affect the development, launch and ongoing delivery and iteration of data products and services.
A 8	K11: The roles and impact of AI, data science and data engineering in industry and society
A 9	K12: The wider social context of AI, data science and related technologies, to assess business impact of current ethical issues such as workplace automation and misuse of data
A 10	K15: The engineering principles used (general and software) to investigate and manage the design, development and deployment of new data products within the business
A 11	K17: How to identify current industry trends across AI and data science and how to apply these
A 12	K19: The principles and properties behind statistical and machine learning methods

A 13	K22: The relationship between mathematical principles and core techniques in AI and data science within the organisational context
A 14	K24: Sources of error and bias, including how they may be affected by choice of dataset and methodologies applied
A 15	K26: The scientific method and its application in research and business contexts, including experiment design and hypothesis testing
A 16	K28: How to communicate concepts and present in a manner appropriate to diverse audiences, adapting communication techniques accordingly
A 17	K29: The need for accessibility for all users and diversity of user needs

Disciplinary Skills - able to:	
B 1	S1: Use applied research and data modelling to design and refine the database & storage architectures to deliver secure, stable and scalable data products to the business
B 2	S2: Independently analyse test data, interpret results and evaluate the suitability of proposed solutions, considering current and future business requirements
B 3	S3: Critically evaluate arguments, assumptions, abstract concepts and data (that may be incomplete), to make recommendations and to enable a business solution or range of solutions to be achieved
B 4	S4: Communicate concepts and present in a manner appropriate to diverse audiences, adapting communication techniques accordingly
B 5	S9: Manipulate, analyse and visualise complex datasets
B 6	S10: Select datasets and methodologies most appropriate to the business problem
B 7	S11: Apply aspects of advanced maths and statistics relevant to AI and data science that deliver business outcomes
B 8	S12: Consider the associated regulatory, legal, ethical and governance issues when evaluating choices at each stage of the data process
B 9	S20: Design efficient algorithms for accessing and analysing large amounts of data, including Application Programming Interfaces (API) to different databases and data sets
B 10	S21: Identify and quantify different kinds of uncertainty in the outputs of data collection, experiments and analyses
B 11	S26: Select and apply the most effective/appropriate AI and data science techniques to solve complex business problems

Attributes:	
C 1	B1: A strong work ethic and commitment in order to meet the standards required.
C 2	B2: Reliable, objective and capable of independent and team working
C 3	B3: Acts with integrity with respect to ethical, legal and regulatory ensuring the protection of personal data, safety and security
C 4	B5: Commitment to continuous professional development; maintaining their knowledge and skills in relation to AI developments that influence their work

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C 5	B6: Is comfortable and confident interacting with people from technical and non-technical backgrounds. Presents data and conclusions in a truthful and appropriate manner
C 6	B8: Maintains awareness of trends and innovations in the subject area, utilising a range of academic literature, online sources, community interaction, conference attendance and other methods which can deliver business value

How will you learn?

By attendance at lectures (typically 16 hours per week), tutorials (typically 8 hours per week), and labs (typically 8 hours per Each non-project-based module involves lectures, problem solving coursework and practical sessions. Lectures are used to introduce principles and methods and also to illustrate how they can be applied in practice. Coursework allows students to develop their skills in problem solving and to gain practical experience. Practical sessions provide students with guidance and help while solving a problem. These lessons take the form of exercise classes and programming laboratories that allow the students to learn-by-doing in order to complement the lectures.
Individual projects are undertaken during the summer months under the supervision of an academic member of staff with whom there are weekly consultancy meetings. These are used for students to report on their progress, discuss research and design issues and plan their future work. This develops and reinforces students' ability to communicate technical ideas clearly and effectively. The Projects Coordinator also runs a thread of taught sessions to support the project module. A number of industrial-linked projects are offered each year, which students can apply for.

How will you be assessed?

The assessment of taught modules normally consists of a combination of written examination and coursework.
The project is examined on the basis of a written report, a formal oral presentation, and, where applicable, a demonstration of any software and/or hardware developed by the student.

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 programme is structured as follows:
- it begins with two credit-bearing pre-sessional modules, covering, respectively, programming and statistics and other mathematical prerequisites. The main teaching for these modules will be carried out in the two weeks before the start of teaching at Mile End, but materials and in particular preparatory material will be available online beforehand and support and continuing assessment will be available during the regular teaching semester. The purpose of these modules is to rapidly bring students up to a level where their skills in certain key areas are comparable to those of the mid-range students we currently admit to our Artificial Intelligence and Big Data Science MSc's (entry requirements are 2i in Computer Science, Electronic Engineering, Mathematics or related discipline, and therefore they do not guarantee either strong programming or strong statistics and mathematics).
- during the first semester the students will take the two basic Machine Learning and Data Processing modules from our Artificial Intelligence and Big Data Science Master's programmes. The programming and statistics pre-sessionals will provide essential pre-requisites. They will also take a new Ethic-s module. This gives them a diet over that semester of two new technical modules, and one non-technical, alongside completion of the pre-sessionals.
- during the second semester they will take three modules also selected from our two large Master's programmes and designed to showcase key applications of the material they have learnt during the first semester.
- the programme is rounded out with a standard Master's level project, with preparatory work in the second semester and completion in the third.

All students have a Project / industrial project during the third (summer) semester.

Academic Year of Study FT - Year 1

Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester
Programming for Artificial Intelligence and Data Science (sprint)	ECS7023P	15	7	Compulsory	1	Semester 1
Statistics for Artificial Intelligence and Data Science (sprint)	ECS7024P	15	7	Compulsory	1	Semester 1
Data Mining	ECS766P	15	7	Compulsory	1	Semester 1
Principles of Machine Learning	ECS7020P	15	7	Compulsory	1	Semester 1
Neural Networks and Deep Learning	ECS659P	15	7	Compulsory	1	Semester 2
Information Retrieval	ECS736P	15	7	Compulsory	1	Semester 2
Risk & Decision Making for DS & AI	ECS7005P	15	7	Compulsory	1	Semester 2
Ethics, Regulation and Law in Advanced Digital Information Processing and Decision Makin	ECS7025P	15	7	Compulsory	1	Semester 2
Project Module	ECS750P	60	7	Core	1	Semester 3

What are the entry requirements?

The purpose of this programme is to make a technical career path accessible to students who do not have the standard technical pre-requisites, and the entry requirements are therefore similarly non-standard. Moreover, applicants are expected to find the technical material novel and challenging; we therefore require stronger than usual English language skills to compensate.
Applicants fall into two categories:
- those who have graduated from or attended university in the past five years:
  - should have a 2i in any STEM discipline
  - or a 2i in any other subject, but be able to demonstrate successful completion of at least one module in either programming or statistics (at level 5 or above?)
- those who have not graduated from or attended university in the past five years:
  - will be assessed on an individual basis, admitted on the basis of evidence that they have the technical ability and study skills to successfully complete the programme,
  - this evidence could include successfully completing initial training such the Institute of Coding's programming bootcamp course.

In addition we expect overseas students to achieve an IELTS score of 6.5 both overall and in each of the components: reading, writing, listening and speaking.

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

The programme quality will be managed using the standard mechanisms applied across all EECS PGT programmes. Currently these are:
Student feedback can be informal provided by individual students to teaching staff, in the form, for example of requests for more support on particular topics or learning outcomes, addressed in the first instance to module teaching staff and if necessary to others in the teaching team (programme lead, teaching officers). Lecturers will often respond with changes in the current delivery.
Feedback is also formal provided through standard module-level questionnaires and the relevant SSLC.
Modules and programmes are monitored and developed by subject-level teaching groups and the EECS SETLA committee, with the programme lead, Director of Postgraduate Teaching and Director of Teaching having particular responsibility for the maintenance of programme-level quality and coherence. In particular, these respond to issues raised in questionnaires and at SSLC, and monitor the annual module reports to ensure that issues arising are dealt with.
EECS also runs a programme of peer observation of teaching to ensure that teaching quaity is maintained and enhanced.

What academic support is available?

The structure of our academic support is uniform across our Postgraduate programmes.
The programme is managed by a named Programme Coordinator, students have an Academic Advisor, and we have a Senior Tutor specialising in Postgraduate issues.
Our postgraduate modules are taught by teams of one or two faculty members (typically two if a larger module), supported by demonstrators recruited from amongst our PhD students and RA's who assist with the delivery of laboratory classes.

Programme-specific rules and facts

This programme has no specific assessment rules. However it does have a non-standard structure with the two pre-sessional modules giving five taught modules in the first semester and three in the second.

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

The modules on this programme follow EECS standard practice. Textbooks are chosen with online availability as an important criterion in the choice, most are available as online digital copies from the library, and some are available open-access. Software is chosen with open-source as a preference, and available cross-platform where possible. Teaching materials and laboratory guides are posted on QM-Plus, but are not usually assessed by the Disability and Dyslexia Service. Lectures are recorded as standard and recordings made available shortly after the event. Computing facilities are available with remote access and how-to guides are posted on the EECS intranet. We anticipate that most students will have access to a decent reliable laptop of at least mid-range capability, and reasonable broadband access. Students who do not have either of these would likely be disadvantaged in their studies.

Links with employers, placement opportunities and transferable skills

This programme will enable students to develop transferable skills in programming and data analytics. We are developing links with employers, which include possible placement opportunities and financial support.

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Programme Specification Approval

Person completing Programme Specification:	Prof E P Robinson
Person responsible for management of programme:	Dr M Hansard
Date Programme Specification produced / amended by School / Institute Learning and Teaching Committee:	15 Dec 2022
Date Programme Specification approved by Taught Programmes Board:	