

## PROGRAMME SPECIFICATION – POSTGRADUATE PROGRAMME

### KEY FACTS

Programme name	Data Science (Apprenticeship Route)
Award	MSc
School	Mathematics, Computer Science and Engineering
Department or equivalent	Department of Computer Science
Programme code	PSDASA
Type of study	Part Time, Day Release
Total UK credits	180
Total ECTS	90
Partner (partnership programmes only)	None
Type of partnership	

### PROGRAMME SUMMARY

This Masters level apprenticeship in Data Science will prepare you for a successful career as a data scientist, including leadership roles within the field. Data Science (DS) is the area of work concerned with the extraction of insight from large collections of data. The MSc DS will develop your specialist skills in data acquisition, information extraction, aggregation and representation, data analysis, knowledge extraction and explanation, which are in high demand in the IT business, security and health sectors, intelligent transport, energy efficiency and the creative industries. The next generation of scientific discovery and innovation will be data-driven as previously unrecognised patterns are discovered by analysing massive and mixed data sets. Leadership skills developed within the programme include the ability to oversee and manage complex data science projects, including assessing project feasibility and risk analysis.

The Data Science MSc (Apprenticeship route) meets the requirements of the Digital and Technology Solutions Specialist (Integrated Degree) Data Analytics Specialist apprenticeship programme. Successful completion of all requirements means that you will achieve an MSc Data Science award based on the Level 7, Digital and Technology Solutions Specialist standard.

You will be taught alongside students from a variety of organisations, as well as those on the non-apprenticeship route, enabling you to learn and network with a range of your peers.

The course covers the study and integration of advanced methods and techniques from knowledge representation and reasoning, statistical machine learning, high-performance computation, pattern recognition, service-oriented computing, computer programming, data warehousing, and data visualisation. It will enable you to specialise in an application area of data science, from health to retail, and engage with researchers to develop your scientific knowledge and skills in each of the above core areas.

The course will include hands-on, lab-based tutorials and coursework, and the use of DS tools and technologies which will equip you to pursue a work-based MSc DS project which will be of benefit to your employer. During the project, you will solve a real-world problem using big data from your company, e.g. collecting and processing

real data, designing and implementing Big Data methods and tools, applying and evaluating big data techniques to solve a real problem.

The course is designed for those who have completed a first degree in science and technology subjects including computing, math, physics, engineering, information science and economics, or from areas such as business, psychology or health who have a demonstrable mathematical aptitude or relevant work experience. To be selected onto the programme, you will need employment within an organisation that support your enrolment.

### Aims

This programme aims to prepare you with the knowledge, skills and values needed for a technical career as a data scientist by:

- equipping you with the breadth of knowledge, skills and techniques required by the data science profession,
- developing your knowledge in specialised and advanced topics in data science,
- enabling you to work with, and learn from, active researchers in machine learning, high-performance computing and data visualization,
- enabling you to critically evaluate the technical, social and management dimensions of data-intensive systems and technologies,
- developing your ability as a project manager in a data science context, developing, presenting and defending the business and financial case for an analytics project.

There are three types of awards that you can get as part of the apprenticeship MSc (please see the section “**WHAT AWARD CAN I GET?**”). If the apprentice fails the end point assessment of the Digital and Technology Solutions Specialist (Integrated Degree) Data Analytics Specialist standard, the degree cannot be awarded.

### **Postgraduate Certificate in Data Science**

For all of you completing the Postgraduate Certificate you will have had the opportunity to examine the theories related to the analysis, design, and evaluation of data science systems, and demonstrated sufficient ability in at least four taught modules (60 credits), which can be any combination of modules among the available ones.

### **Postgraduate Diploma in Data Science**

For all of you completing the Postgraduate Diploma, in addition to the above you will have explored the theory and practice, and demonstrated ability in all the different aspects of data science, considering such aspects from different perspectives and demonstrating critical insight on the applicable methods and techniques used in data science. You will have demonstrated ability in analysing, designing, developing and evaluating data science systems, which equates to passing all eight taught modules, worth 120 credits.

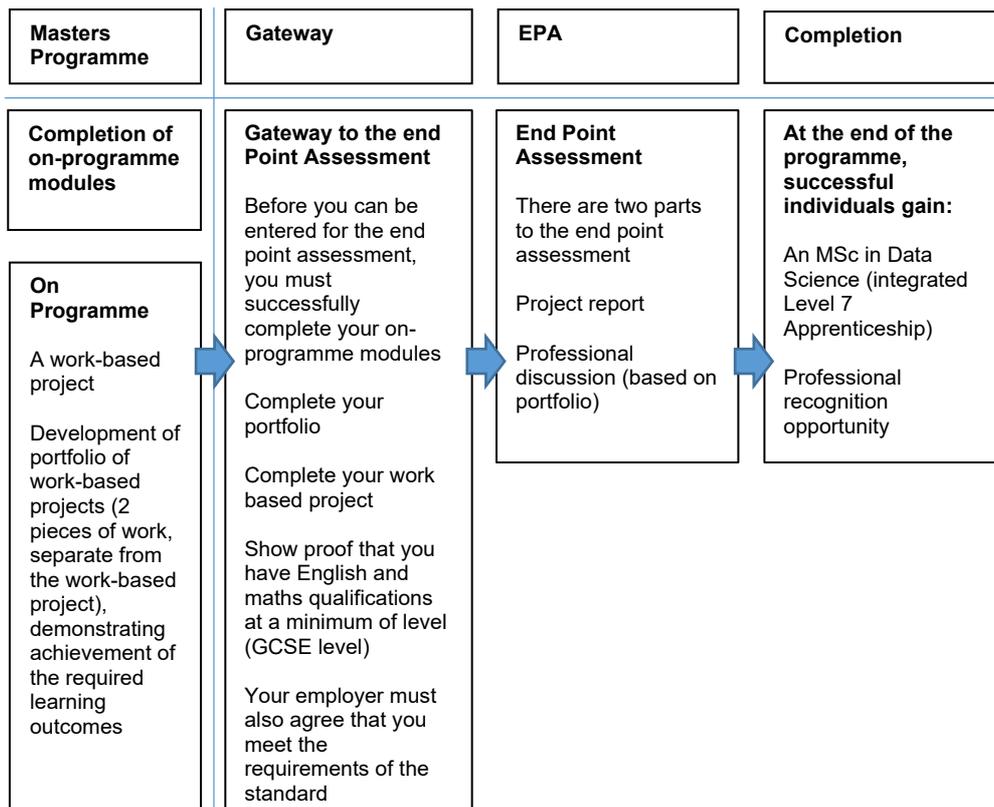
### **MSc in Data Science**

For all of you completing the MSc in Data Science, in addition to the above you will have demonstrated original application of knowledge in the area, either through the analysis, design, and evaluation of a data science artefact, the design and implementation of a data science solution that meets a client’s needs, or the critical evaluation and extension of the knowledge in the area through a research-led project, which can involve the development of software artefacts as well, e.g. to support data analysis and visualization. This will be achieved through your individual

(work-based) project, a substantial module worth 60 credits that you can commence once you have successfully passed all your taught modules.

### Digital and Technology Solutions Specialist (Integrated Degree) Data Analytics Specialist

Completion of the on-programme modules that cover the apprenticeship standard skills/knowledge is a requirement of the Digital and Technology Solutions Specialist (Integrated Degree) Data Analytics Specialist programme and is one of the gateway requirements that you must achieve in order to be entered for the End Point Assessment. If an apprentice fails the end point assessment, the degree cannot be awarded until the failed assessment has been passed. When the end point assessment has been passed, the MSc degree will be classified in accordance with the standard regulations.



### WHAT WILL I BE EXPECTED TO ACHIEVE?

On successful completion of this programme, you will be expected to be able to:

Knowledge and understanding:

- develop and plan a data science project and present the associated business case
- manage and critically appraise the success of a data analytics project using appropriate project management techniques

- use data science methods and techniques such as data analysis, pattern recognition and machine learning, high-performance computing, knowledge extraction, visual analytics
- review and critically evaluate the literature and current developments and challenges in data science, such as designing distributed solutions or efficient learning algorithms
- analyse and solve problems, developing innovative solutions through processing real data, designing and implementing big data methods and tools, selecting, applying and evaluating big data techniques
- identify and manage scientific and technical risks and uncertainties associated with data science and its applications

Skills:

- analyse, develop and select robust algorithms and tools that can handle uncertainty and large amounts of data
- design, develop, adapt and critically evaluate data science computer programs and systems
- use the latest hardware and software technologies to create high-performance systems with a high level of capacity
- design and use data visualization tools to communicate topics in data science effectively to technical and non-technical audiences
- function effectively as a manager of a project team, and taking responsibility for functional aspects of the project
- evaluate/assess the success of a project, with the ability to recommend improvement

Values and attitudes:

- apply professional, social, cultural and ethical issues related to data analysis in the context of the scientific process
- embrace technical challenges as an opportunity for personal development
- rationally exploit both traditional and novel technological approaches
- rigorously assess alternative approaches and novel designs
- gain skills about professional ethics and privacy in the context of data protection

*Registration period*

The normal period of registration for this degree programme is 27 months and you will be entered for your EPA once you have completed all the gateway requirements. The maximum period of registration for this degree programme is five years

Notes:

This programme has been developed in accordance with the QAA Subject Benchmark Statement for Computing (Masters) (2019), and the apprenticeship standard Digital and Technology Solutions Specialist (Degree), ref ST0482, specialism occupation Data analytics specialist.

<https://www.instituteforapprenticeships.org/apprenticeship-standards/digital-and-technology-solutions-specialist-integrated-degree/>

The apprenticeship is regulated by the Institute for Apprenticeships and will therefore comply with the above apprenticeship standard. No separate external accreditation is required. A mapping of the course modules to the KSB set out by the standard is available as a separate document. The requirements set out by the end point assessment plan are detailed below.

## **HOW WILL I LEARN?**

The teaching and learning methods used are such that the levels of both specialisation of content and autonomy of learning increase as you progress through each module and the programme. This progression will be guided by active researchers in machine learning, pattern recognition, data visualization, and high-performance computing, culminating with an individual project containing an original piece of research conducted largely independently with appropriate academic supervision and in collaboration your employer.

The standard format is that taught modules are delivered through a series of 20 hours of lectures and 10 hours of tutorials/laboratory sessions. Lectures are normally used to:

- (a) present and exemplify the concepts underpinning a particular subject;
- (b) highlight the most significant aspects of the syllabus;
- (c) indicate additional topics and resources for private study.

Tutorials are used to help you develop skills in applying the concepts covered in the lectures, normally in practical problem solving contexts.

Laboratory sessions serve a similar purpose as the tutorials but their strategy is to demonstrate application of concepts and techniques through the use of state-of-the-art software development tools and environments.

In addition to the 30 contact hours, you are expected to undertake independent study and substantial coursework assignments for each module, amounting to approximately 120 hours per module (150 hours total).

The coursework takes many forms, including programs, theoretical work, and essays, and is primarily summative.

The work-based project is a substantial task that develops a research related topic and is performed under the supervision of academic staff. The assessment of projects relies on a project report. During the project, you will be given an opportunity to solve a real problem using data from your company, e.g. collecting and processing real data, designing and implementing Big Data methods and tools, applying and evaluating big data techniques to solve a real problem. The work-based project is carried out over 6-months at your company.

In addition to lecture, laboratory and tutorial support, each student will be assigned a personal tutor, and the programme is supported by City's Moodle learning environment, which will contain resources for each of the modules. This includes materials such as lecture notes and lab sheets, as well as interactive components, such as discussion fora.

In accordance with the apprenticeship standard Digital and Technology Solutions Specialist (Degree), you are required to spend a minimum of 20% of your time

engaged in “off-the-job” activities. The eight taught modules of 150 hours each total 1,500 hours. Over 27 months, this equates to 55.6 hours/month which exceeds the 20% requirement. In addition, the Work Based (Individual) project is a 60-credit module and is therefore expected to take 600 hours (a large proportion of this time will be devoted to work based activities).

## **WHAT TYPES OF ASSESSMENT AND FEEDBACK CAN I EXPECT?**

Typically, the assessment methods include a combination of written examination and coursework. The assessment of certain modules is based on coursework only, as detailed in each module’s specification. The written examinations will contain theoretical questions, including small essays and mathematical aspects, and practical questions requiring the analysis and exemplifying of data science methods and techniques. Formative feedback will be given as part of lab sessions and exercises, as well as draft project documents (project definition document and thesis).

### Assessment and Assessment Criteria

Assessment criteria are descriptions, based on the intended learning outcomes, of the skills, knowledge or attitudes that you need to demonstrate in order to complete an assessment successfully, providing a mechanism by which the quality of an assessment can be measured. Grade-related criteria are descriptions of the level of skills, knowledge or attributes that you need to demonstrate in order to achieve a certain grade or mark in an assessment, providing a mechanism by which the quality of an assessment can be measured and placed within the overall set of marks. Assessment Criteria and Grade-Related Criteria will be made available to you to support you in completing assessments. These may be provided in programme handbooks, module specifications, on the virtual learning environment or attached to a specific assessment task.

The assessment criteria will reflect the learning outcomes of the modules and the programme as a whole.

The final Work-Based Project and an executive report will form part of your EPA submission, along with a portfolio detailing two additional work-based projects.

### Feedback on assessment

Feedback will be provided in line with our Assessment and Feedback Policy. In particular, you will normally be provided with feedback within three weeks of the submission deadline or assessment date. This would normally include a provisional grade or mark. For end of module examinations or an equivalent significant task (e.g. an end of module project), feedback will normally be provided within four weeks. The timescale for feedback on work-based projects or end point assessment may be longer. The full policy can be found at:

[https://www.city.ac.uk/\\_data/assets/pdf\\_file/0007/453652/s19.pdf](https://www.city.ac.uk/_data/assets/pdf_file/0007/453652/s19.pdf)

### Assessment Regulations

In order to pass this Programme, you should complete successfully or be exempted from the relevant modules and assessments and will therefore acquire the required number of credits.

The pass mark for each module is 50%.

If you fail an assessment component or a module, the following will apply:

1. Compensation: where you fail up to a total of 20 credits at first or resit attempt (15 credits for a Postgraduate Certificate), you may be allowed compensation if:
  - Compensation is permitted for the module involved (see the What will I Study section of the programme specification), and
  - It can be demonstrated that you have satisfied all the Learning Outcomes of the modules in the Programme, and
  - A minimum overall mark of no more than 10% below the module pass mark has been achieved in the module to be compensated, and
  - An aggregate mark of 50% has been achieved in the Programme overall.

Where you are eligible for compensation at the first attempt, this will be applied in the first instance rather than offering a resit opportunity.

If you receive a compensated pass in a module you will be awarded the credit for that module. The original component marks will be retained in the record of marks and your original module mark will be used for the purpose of your Award calculation.

2. Resit: where you are not eligible for compensation at the first attempt, you will be offered one resit attempt according to the University's assessment regulations.

If you are successful in the resit, you will be awarded the credit for that module. The mark for each assessment component that is subject to a resit will be capped at the pass for the module. This capped mark will be used in the calculation of the final module mark together with the original marks for the components that you passed at first attempt.

If you do not meet the pass requirements for a module and do not complete your resit by the date specified you will not progress and the Assessment Board will require that you be withdrawn from the Programme.

MSc Data Science (Apprenticeship Route) is an integrated Degree Apprenticeship and includes the End Point Assessment (EPA) which is not linked to any module and is non-credit-baring. The End Point Assessment Plan is governed by the, Digital and Technology Solutions Specialist Integrated Degree Apprenticeship, Level 7, ST0482/AP01. <https://www.instituteforapprenticeships.org/apprenticeship-standards/digital-and-technology-solutions-specialist-integrated-degree/>.

#### EPA procedures

The EPA is assessed and graded by an independent assessor from an awarding university (usually City, University of London) listed on the Register of End-Point Assessment Organisations, who should be independent of the course delivery. The EPA should only start once the employer is satisfied that the apprentice is consistently working at or above the level set out in the standard and the pre-requisite gateway requirements have been met and can be evidenced. The EPA must be completed over a maximum period of three months after the apprentice has met the gateway requirement. The EPA comprises a project report and a professional discussion. Each of these two assessments is graded as Fail, Pass, Merit or Distinction, and these two grades inform the overall apprenticeship grade; both assessments must be passed to pass the apprenticeship overall. One or both of

failed assessments may be re-sat (within 6 months and without further learning) or re-taken; there are no limits to the number of times an apprentice may re-take/re-sit any of the assessments. The EPA project report is based on the work in INM363, but may be different from the project report submitted within INM363. The apprentice writes the EPA project report after the university assessment for INM363 has been completed. The EPA project report presents the project work according to the requirements of the EPA plan and may significantly overlap with the INM363 project report but may also differ significantly. The EPA professional discussion is informed by a portfolio based on workplace-based projects (usually towards the end of the apprenticeship) other than INM363 which demonstrate the apprentice's competencies against each of the areas defined by apprenticeship standard. The portfolio is not evidence that the learning has taken place, but is evidence that the apprentice has applied the knowledge, skills and behaviours in the Standard. The apprentice will be guided on preparing the portfolio during the course by their academic advisor, with support from their employer.

If you would like to know more about the way in which assessment works at City, please see the full version of the Assessment Regulations at:

[http://www.city.ac.uk/data/assets/word\\_doc/0003/69249/s19.doc](http://www.city.ac.uk/data/assets/word_doc/0003/69249/s19.doc)

## WHAT AWARD CAN I GET?

### Apprenticeship Level 7

Successful completion of the on-programme modules (including your Work Based Project module) alongside your portfolio will enable you to enter for the End Point Assessment required to obtain your award.

Candidates who do not successfully complete the End Point Assessment for the Digital and Technology Solutions Specialist (Integrated Degree) Data Analytics Specialist programme will not receive a degree award.

### Master's Degree:

	HE Level	Credits	Weighting (%)	Class	% required
Taught	7	120	67	With Distinction	70
Dissertation	7	60	33	With Merit	60
				Without	50
				Classification	

### Postgraduate Diploma:

	HE Level	Credits	Weighting (%)	Class	% required
Taught	7	120	100	With Distinction	70
				With Merit	60
				Without	50
				Classification	

### Postgraduate Certificate:

	HE Level	Credits	Weighting (%)	Class	% required
--	----------	---------	---------------	-------	------------

Taught	7	60	100	With Distinction	70
				With Merit	60
				Without	50
				Classification	

## WHAT WILL I STUDY?

### Taught component

*There are 8 taught modules (all core)*

Module Title	SITS Code	Module Credits	Core/ Elective	Compensation Yes/No	Level
Principles of Data Science	INM430	15	Core	Yes	7
Machine Learning*	INM431	15	Core	Yes	7
Big Data	INM432	15	Core	Yes	7
Visual Analytics	INM433	15	Core	Yes	7
Neural Computing	INM427	15	Core	Yes	7
Research Methods and Professional Issues*	INM373	15	Core	Yes**	7
Executive Development*	INM413	15	Core	Yes	7
Project Management*	INM372	15	Core	Yes	7

\*These modules are studied in the second year.

\*\* Compensation will only be applied at resit.

*You are normally required to complete all the taught modules successfully before progressing to the dissertation*

### Dissertation component

Module Title	SITS Code	Module Credits	Core/ Elective	Compensation Yes/No	Level
Individual Project	INM363	60	Core	No	7

The Work Based (Individual) Project enables you to apply the knowledge and skills acquired earlier in the programme through a project which benefits the business of your employer.

### End Point Assessment

The End Point Assessment will consist of:

- A Project Report (a written account of a set of practical tasks undertaken within a work-based project context), which the independent assessor assesses and grades. The project report will be closely based on the Work Based (Individual) project report.

- A Professional Discussion (a structured discussion with the independent assessor allowing the apprentice to respond to questions using a portfolio), which the independent assessor assesses and grades.

Alongside your academic and professional development programme you are also required to compile an electronic portfolio to evidence your achievement of the required Digital and Technology Solutions Specialist (Data Analytics Specialist) learning outcomes. You will work with your academic supervisors to reflect on your learning and choose the appropriate evidence which will be submitted for discussion as part of your End Point Assessment.

The programme will enable you to understand the requirements for the EPA and support your preparation, so that you are confident in your ability to take the assessment at the end of your apprenticeship. Further details of the apprenticeship standards and the EPA process are available in your apprenticeship handbook, on our dedicated Moodle pages.

Module Title	SITS Code	Module Credits	Core/ Elective	Compensation Yes/No	Level
End Point Assessment (EPA)	INM714	0	Core	No	7

#### **TO WHAT KIND OF CAREER MIGHT I GO ON?**

MSc Data Science (Apprenticeship Route) students will be employed by a company wishing to expand their data science capability. Graduates are expected to become leaders in the data science field, managing large scale projects and providing high level strategy and direction. The emphasis of this programme is on areas for which City has renowned research expertise, including machine learning and visual analytics. City's links with industrial partners will enable students to further their network and become part of a vibrant data science community.

#### **WHAT STUDY ABROAD OPTIONS ARE AVAILABLE?**

- None

#### **WHAT PLACEMENT OPPORTUNITIES ARE AVAILABLE?**

Additional placements are not available. Students will be employed as a requirement of the apprenticeship programme.

#### **HOW DO I ENTER THE PROGRAMME?**

*Entry requirements:* You should have a UK first or an upper second-class honours degree (or equivalent) in a subject area such as computing, mathematics, physics, engineering, information science, economics, or a related discipline with mathematical and computational content. We will also accept applicants with degrees in business, economics, psychology and health, if they demonstrate some statistical, mathematical and computer scripting aptitude, e.g. by referring to qualifications, courses and

experience. We may accept applicants with lower second-class degrees if they have relevant work experience, but this is at our discretion. We recommend your personal statement explains why you are interested in Data Science, points to relevant experience and indicates which particular aspects of our course that interest you.

You will require:

- Level 2 qualification in English and Mathematics (usually GCSE)
- Two references
- Employment within an organisation that support your enrolment in the degree as part of your Digital and Technology Solutions Specialist (Data Analytics Specialist) training.

You must be a UK or EU national with the right to work in the UK. The Apprenticeship Levy covers roles in organisations in England.

*English language requirements:* If your first language is not English, one of the following qualifications is also required:

IELTS: 6.5 (minimum of 6.0 in all four components) OR  
TOEFL (internet based): 90

Please note that TOEFL is not accepted as evidence of English language ability for students that require a Confirmation of Acceptance for Studies.

For the availability of scholarships please enquire at the Programmes Office of the Department of Computer Science.

Version: 1.4  
Version date: September 2020  
For use from: 2020-21