UNIVERSITY OF LEICESTER

Programme Specification (Undergraduate)

For students entering in 2019/20

Date amended: Feb 2019

1. Programme title(s) and UCAS code(s):

BSc Data Science **I255**

BSc Data Science with a Year in Industry **I256**

2. Awarding body or institution:

University of Leicester

3. a) Mode of study:

Full-time

b) Type of study:

Campus-based

4. Registration periods:

The normal period of registration is three years (4 years for "With Industry" variants)

The maximum period of registration is five years (6 years for "With Industry" variants)

5. Typical entry requirements:

ABB including a B in A-Level Mathematics.

6. Accreditation of Prior Learning

APL will not be accepted for exemptions from individual modules, however may be considered for direct entry to year 2 on a case by case basis and subject to the general provisions of the University APL policy.

7. Programme aims:

Students completing a degree in Data Science will be provided with:

- Confidence and expertise in areas of mathematics that are relevant to data science (e.g. Statistics, Algebra and Modelling)
- An ability to solve complex problems by applying rigorous, systematic approaches.
- The skills and experience to write and use software applications.
- An understanding of programming paradigms and software development methods.
- A knowledge of the theory and concepts that underpin Mathematics and Computer Science.
- An ability to model and understand complex data and use it to solve problems.
- An ability to select and apply appropriate tools (technical and analytical) to solve novel, data-related problems.
- Skills to collaborate with and lead a team.
- An ability to persuasively present and communicate.
- An appreciation of sustainability and ethics in relation to data science.
- An appetite and ability to be an independent worker and life-long learner.
- Additional, deeper knowledge of related areas of Computer Science or Mathematics.
- Experience in applying Data Science skills and tools within different domains.
- An ability to successfully apply data science within the context of wider projects and contexts.

Through the **with-industry variant;** "We will better prepare our students for the opportunities, behaviours and demands of the professional workplace"

(Learning Strategy 2016-2020)

8. Reference points used to inform the programme specification:

- QAA Benchmarking Statement – Computing (2016)
- QAA Benchmarking Statement – Mathematics, Statistics and Operational Research (2015)
- University of Leicester Discovery Led and Discovery Enabling Learning Strategy 2016-2020
- Data Science for Undergraduates: Opportunities and Options. National Academies of Sciences, Engineering, and Medicine. 2018 (link)
- University of Leicester Periodic Developmental Review Report
- External Examiners' reports (annual)

9. Programme Outcomes:

ILOs marked "with industry" apply only to students on that variant of the degree.

Intended Learning Outcomes	Teaching and Learning Methods	How Demonstrated?
(a) Discipline specific knowledge and competencies		
(i) Mastery of an appropriate body of knowledge		
1. *Recall* and *describe* Mathematical and Computer Science techniques relevant to the field of Data Science.	Lectures, Tutorials, Surgeries, Poster Presentations, Project work. Guided Independent Study, Feedback.	Written Exam, Project Dissertation and Presentation. Assessed Laboratories, Assessed oral and poster presentations.
2. *Recall* and *describe* software programming paradigms that can be applied to the retrieval, processing and presentation of data.	Lectures, Computer Laboratories, Project Work, Tutorials, Guided Independent Study. Feedback.	Written Exam, Assessed Laboratories, Assessed coursework, Project dissertation and presentation.
3. *Explain* the role that data science plays in the success of modern business and research projects	Lectures, Surgeries, Project Work, Guided Independent Study, Feedback.	Assessed essay, Project dissertation and presentation, Group project presentation.
4. **With-Industry:** *apply* skills and knowledge from their degree within a professional context	Placement Preparation and supervision	Placement assessment and visit report

Intended Learning Outcomes	Teaching and Learning Methods	How Demonstrated?
(ii) Understanding and application of key concepts and techniques		
5. *Apply* knowledge of Computer Science and Mathematical techniques to solve problems.	Lectures, Tutorials, Surgeries, Poster Presentations, Project work. Guided Independent Study, Feedback.	Written examinations, summative and formative coursework, group and individual project presentations, individual project oral examinations and project dissertations.
6. *Apply* the concepts and techniques of abstraction, reification, logical structure and modelling that pervade Computer Science, Mathematics and Software Engineering to *specify*, *design*, *implement* and *test* data management and processing systems.	Lectures, Tutorials, Computer laboratories, Group Project work, Independent project work, Guided independent study, Problem classes, Feedback, Project supervision	As Above
7. *Explain* and *apply* suitable processes and methodologies creating for innovative solutions of data science problems.	Lectures, Tutorials, Independent project work, Guided independent study, Problem classes, Feedback, Project supervision,	Summative and formative coursework, group and individual project presentations, individual project oral examinations and project dissertations.
8. *Apply* mathematical algorithms and techniques to *solve* standard and novel problems.	Lectures, tutorials, problem classes, feedback.	Written Exams, Assessed Problems, Individual project dissertation and Viva.
9. *Apply* tools and techniques to efficiently *collaborate* with others to *plan* and *execute* a project.	Lectures, computer laboratories, Feedback	Coursework, Exams
(iii) Critical analysis of key issues		
10. *Analyse* client/customer problems, requirements and criteria, and hence *plan* an appropriate solution strategy.	Lectures, Tutorials, Group Project work, Independent project work, Guided independent study, Feedback, Project supervision,	Summative and formative coursework. Project dissertation and presentation. Group project presentation.
11. Critically *appraise* a solution to a data science problem.	Lectures, problem classes, feedback, project supervision.	As above
12. *Analyse* data science projects with respect to ethical and legal issues.	Lectures, feedback, project supervision	As above

Intended Learning Outcomes	Teaching and Learning Methods	How Demonstrated?
(iv) Clear and concise presentation of material		
13. *Present* information in a variety of forms, chosen to maximise reader/audience impact and understanding, such as reports, dissertations, seminars, posters, blogs, podcasts, videos and other media technologies.	Lectures, Tutorials, Group Project work, Independent project work, Guided independent study, Poster presentations, Feedback, Project supervision,	Written examinations, summative and formative coursework, group and individual project presentations, individual project oral examinations and project dissertations.
14. **With Industry:** *summarise* key responsibilities and achievements from their placement	Placement Preparation and supervision	Placement assessment and visit report
(v) Critical appraisal of evidence with appropriate insight		
15. *Test* software, and critically *evaluate* and *analyse* test results to *judge* whether a system meets requirements, for future and current use.	Lectures, Tutorials, Computer laboratories, Independent project work, Guided independent study, Feedback, Project supervision,	Assessed computer laboratories, Written exam, assessed problem sets.
16. *Validate and report* on the outcomes of mathematical and statistical analysis to ensure they are suitable for their intended use.	Lectures, problem classes, feedback on assessed problems, project supervision.	Project dissertation and presentation. Assessed problem classes.
17. With Industry: Critically *evaluate* their impact within a workplace environment and *articulate* achievements and skill development.	Placement preparation and supervision	Placement assessment and visit report
(vi) Other discipline specific competencies		
18. *Describe* the purpose and benefits of different approaches and formats for storing data.	Lectures, Tutorials, Independent project work, Guided independent study, Feedback, Project supervision,	Written exam, project dissertation, assessed computer laboratories.
19. *List and compare* software tools for analysing and visualising data.	Lectures, Computer laboratories, Group Project work, Independent project work, Feedback, Project supervision,	Written exam, assessed computer laboratories, project dissertation.

Intended Learning Outcomes	Teaching and Learning Methods	How Demonstrated?
(b) Transferable skills		
(i) Oral communication		
20. *Respond* to technical questions with accurate and concise answers.	Lectures, tutorials, project supervision, group and individual project work.	Group and individual project presentations, individual project oral examinations.
21. *Communicate* scientific, technical and business information fluently and consistently.	Lectures, tutorials, project supervision, group and individual project work.	As above
22. **With Industry:** *verbally promote* professional aspects of themselves in a variety of situations including application and selection processes and networking opportunities.	Placement preparation and supervision	Placement assessment and visit report
(ii) Written communication		
23. *Write* concise and accurate summaries of computing and scientific knowledge, and solutions to problems, in a variety of different formats.	Lectures, Tutorials, Group Project work, Independent project work, Guided independent study, Poster presentations, Feedback, Project supervision,	Written examinations, assessed coursework. Project dissertation.
24. *Report* advanced, technical information in a structured, clear way.	As above	As above
25. **With Industry:** *promote* professional aspects of themselves through written communication.	Placement preparation and supervision	Placement assessment and visit report
(iii) Information technology		
26. C*ompare* between and use a broad range of software and IT tools appropriately.	Lectures, Computer Laboratories, Group Work, Guided Independent Study, Individual Project work, Project supervision.	Assessed computer Laboratories, Project dissertation.
27. *Understand and articulate* the limitations of Information Technology, especially when storing and processing large quantities of data.	Lectures, Surgeries, Computer Laboratories, Guided Independent Study, Individual Project work, Project supervision, Feedback.	Written Exam, Project dissertation, Assessed Computer Laboratories.
28. To *explain* laws that relate to data storage and processing.	Lectures, Problem Classes, Feedback, Individual Project, Project Supervision.	Written Exam, Project dissertation and presentation.
(iv) Numeracy		
29. *Use* of a wide range of analytical and graphical methods	Lectures, Laboratories, Problem Classes, Guided Independent Study	Written exam, project dissertation.

Intended Learning Outcomes	Teaching and Learning Methods	How Demonstrated?
(v) Team working		
30. *Collaborate* effectively as part of a team, *organise* roles and *manage* time, undertake assigned tasks, and ensure completion of a team project. *Identify* strengths and weaknesses of team members.	Lectures, tutorials, group project and project supervision.	Group project assessment. Group project presentation.
31. **With Industry:** *collaborate* with team members in a professional environment working.	Placement preparation and supervision	Placement assessment and visit report
(vi) Problem solving		
32. *Solve* a variety of small and large problems through the integration of knowledge of mathematics, and Computer Science.	Lectures, Tutorials, Project Work, Project supervision, Feedback	Assessed problem-sets, assessed group work, project dissertation and viva.
33. *Describe* a systematic approach to analysing and solving data-science problems and apply these to new problems.	Lectures, Tutorials, Project Work, Project supervision, Feedback	Written Exam, Assessed coursework, project dissertation.
34. **With Industry:** *Describe* the benefits of a proactive strategy to searching for career opportunities and *apply* this to finding a placement.	Placement preparation	Placement assessment and visit report
(vii) Information handling		
35. Demonstrate a *broad understanding* of problems and issues that arise in the discovery, organization, processing and evaluation of data.	Lectures, Tutorials, Computer laboratories, Group Project work, Independent project work, Guided independent study, Feedback, Project supervision,	Written exams, project dissertation. Assessed computer laboratories.
36. *Conduct significant background research* and literature surveys, and *summarise* content from information sources	Lectures, Project work, Supervision, Feedback	Individual and group project reports.
37. Ability to *gather and evaluate* information to independently gain new knowledge.	Guided Independent Study, Project Supervision, Feedback	Individual and group project reports.

Intended Learning Outcomes	Teaching and Learning Methods	How Demonstrated?
(viii) Skills for lifelong learning		
38. *Demonstrate* knowledge and understanding of professional and ethical issues, and aspects of the law, in the context of computing professionals.	Lectures, Tutorials, Computer, Group Project work, Independent project work, Guided independent study, Project supervision, Feedback	Written examinations, assessed coursework, and project reports.
39. *Manage* time and work independently	Group and Individual Project work. Project Supervision, Lectures.	Project dissertation and viva
40. Engage in extra and co-curricular activities to develop career-relates skills.	Lectures, Workshops, Feedback	Assessed coursework
41. *Make and justify* decisions based on the sustainability (e.g. ecological impact) of a proposed solution	Lectures, Group Work, Feedback	Assessed Coursework.
42. With Industry: *Recognise* their existing strengths and skills and articulate their value.	Placement preparation and supervision	Placement assessment and visit report

10. Progression points:

This programme follows the standard scheme of award and classification set out in Senate Regulation 5 modified as follows:

For the 'with industry' variant:

Students will revert to the degree without a with-industry component if any of the following occur:

- they fail to acquire a placement with all necessary paperwork completed one month before the start of the final year. Students that have not secured a placement before the end of term for their 2nd year must submit module and C03203 project preferences as if they were going to return for their final year without a placement.
- they fail to pass the assessment related to the placement (before or during)
- the placement is terminated for whatever reason after less than 9 months.

For students on all variants of the degree, cases where a student has failed to meet a requirement to progress he or she will be required to withdraw from the course.

11. Scheme of Assessment

This programme follows the standard Scheme of award and classification set out in Senate Regulation 5.

12. Special features:

While this programme provides the skills and knowledge required to work with data within industry or research, it provides a foundational knowledge of computer science and mathematics that will allow students to graduate into a wide range of roles.

This programme offers a 'with industry' variant. This allows students to take a placement between their 2nd and their final year and provides additional support before, during and after the placement. All students can transfer from the standards Data Science degree onto the with-industry option at any point before the start of the 2nd year, in line with the progression rules described above.

13. Indications of programme quality

- The programme will be subject to standard University of Leicester procedures for quality assessment, including Annual Developmental Review, Periodic Developmental Review, Quality Office review, liaison with College Academic Committee, and the programme will report to the Mathematics and Informatics departments' Learning and Teaching Committees.
- An External Examiner will be appointed according to Senate regulations 7.18-7.60.
- There will be systematic, regular evaluation by students registered with the programme, including anonymous evaluation of sessions and modules.
- A representative from this programme (both with and without industry variants) will be appointed to each of the Student Staff Committees for Informatics and Mathematics departments (1 rep goes to each).
- The programme's teaching staff will engage with University procedures for peer assessment of teaching and marking.

14. External Examiner(s) reports

To be included following receipt of first report.

Appendix 1: Programme structure (programme regulations)

BSc DATA SCIENCE

FIRST YEAR MODULES **SEMESTER 1**

Core Modules			**Credits**
MA1061	PROBABILITY		15
CO1102	PROGRAMMING FUNDAMENTALS		15
MA1114	LINEAR ALGEBRA (Part 1)		15
CO1101	COMPUTING FUNDAMENTALS		15
		Semester Total	**60**

SEMESTER 2

Core Modules			**Credits**
MA1202	INTRODUCTORY STATISTICS		15
MA1114	LINEAR ALGEBRA (Part 2)		15
CO1107	ALGORITHMS, DATA STRUCTURES AND ADVANCED PROGRAMMING		15
CO1106	REQUIREMENTS ENGINEERING AND PROFESSIONAL PRACTICE		15
		Semester Total	**60**

SECOND YEAR MODULES

SEMESTER 1

Core Modules			**Credits**
CO2102	DATABASES AND WEB INTERFACES		15
MA2403	STATISTICAL DISTRIBUTIONS AND INFERENCE		15
MA2041	MATHEMATICAL FOUNDATIONS OF MACHINE LEARNING		15
CO2202	COLLABORATION AND PROJECT MANAGEMENT		15
		Semester Total	**60**

SEMESTER 2

Core Modules			**Credits**
MA2206	STATISTICAL DATA ANALYSIS		15
CO2106	DATA ANALYTICS		15
GY3421	INFORMATION VISUALISATION		15

Optional Modules

15 credits of options selected from:

CO2105	SOFTWARE AND TECHNOLOGY IN LARGE ORGANISATIONS		15
MA2511	BUSINESS APPLICATIONS OF MATHEMATICS		15
CO1105	INTRODUCTION TO OBJECT ORIENTED PROGRAMMING		15
		Semester Total	**60**

THIRD YEAR MODULES

SEMESTER 1

Core Modules			**Credits**
	CO3203	DATA SCIENCE PROJECT [PART I]	15
	MA3077	OPERATIONAL RESEARCH	15
	CO3101	COMPUTERS, SOCIETY & PROFESSIONALISM	15
Optional Modules			
	15 credits of options selected from:		
	MA3080	MATHEMATICAL MODELLING	15
	CO3091	COMPUTATIONAL INTELLIGENCE AND SOFTWARE ENGINEERING	15
	CO3095	SOFTWARE MEASUREMENT AND QUALITY ASSURANCE	15
		Semester Total	**60**

SEMESTER 2

Core Modules			**Credits**
	CO3203	DATA SCIENCE PROJECT [PART II]	15
	MA3022	DATA MINING AND NEURAL NETWORKS	15
	CO3093	BIG DATA AND PREDICTIVE ANALYTICS	15
Optional Modules			
	15 credits of options selected from:		
	MA3201	GENERALISED LINEAR MODELS	15
	CO3002	ANALYSIS AND DESIGN OF ALGORITHMS	15
	MD3001	MEDICAL STATISTICS	15
		Semester Total	**60**

Appendix 2: Module specifications

See folder “Appendix-2-ModuleSpecs”

Appendix 3: Skills matrix

See file “Appendix-3-data-science-skills-matrix.xlsx”