The University Of Sheffield.

Programme Specification

A statement of the knowledge, understanding and skills that underpin a taught programme of study leading to an award from The University of Sheffield

Programme Details

1. Programme title	Artificial Intelligence
2. Programme code	COMT130
3. QAA FHEQ level	Masters
4. Faculty	Engineering
5. Department	Computer Science
6. Other departments providing credit bearing modules for the programme	None
7. Accrediting Professional or Statutory Body	British Computer Society
8. Date of production/revision	October 2023

Awards	Type of award	Duration
9. Final award	Master of Science (MSc)	1 year
10. Intermediate awards	Postgraduate Diploma (PGDip), Postgraduate Certificate (PGCert)	

Programme Codes

11. JACS code(s) *Select between one and three codes from the HESA website.*	I460		
12. HECoS code(s) *Select between one and three codes from the HECoS vocabulary.*	100366		

Programme Delivery

13. Mode of study	Full-time
14. Mode of delivery	On-site teaching

15. Background to the programme and subject area

Computer Science is the fundamental discipline of the information and communication age. Computing now permeates every aspect of life, ranging from business and medicine to science, engineering and the humanities, requiring skilled personnel to harness and exploit the growing power of computing devices, and to process the ever-increasing data flows generated on a day-to-day basis.

The MSc in Artificial Intelligence is suited to graduates in numerate disciplines (such as Economics, Mathematics, Pure Sciences) who wish to acquire industrially relevant skills in artificial intelligence, while studying in a research-led teaching environment. The programme provides students with an education in leading-edge aspects of scalable data science, and has been developed with the support of various major players in the industrial sector.

The content of the programme reflects the wide range of expertise and research excellence of the Department. Teaching is informed by the research activity of staff, which has an international reputation for the quality of its research. In addition to foundational material, the programme allows students to learn about the latest developments in the field from both leading industrialists and staff who publish their research findings world-wide.

We have key relationships with major companies which support our learning, teaching and research. Some of these include: IBM, Amazon, and VoiceBase. The Department's Industrial Advisory Board (a panel of industrial and academic members) plays an important role in advising the Department on its teaching provision, with particular emphasis on the suitability of its degree programmes as training and development for careers in computer science and software engineering. This programme's content and structure has also received explicit support from key members of the Data Science community, including leading figures at Facebook and Amazon.

See the Department of Computer Science website: http://www.shef.ac.uk/dcs for more information.

16. Programme aims

MSc Artificial Intelligence aims to:	
A1	To broaden knowledge of leading-edge topics in artificial intelligence, for students whose first degree need not have provided them with a background in engineering or computer science;
A2	To deepen students' knowledge of selected areas of computer science and artificial intelligence, through the completion of group and individual project work;
A3	To provide immediately employable graduates with an industrially-relevant mix of knowledge and practical skills;
A4	To provide research training, thus providing a solid foundation for graduates to pursue a research degree or an industrial career in research and development;
A5	To immerse students in an academic environment that rewards innovation, fosters a sense of community and encourages students to direct their own learning.

17. Programme learning outcomes

Knowledge and understanding On successful completion of the programme, students will be able to demonstrate knowledge and understanding of:		
		Links to Aim(s)
K1	Have a sound knowledge and critical understanding of gathering, organising and evaluating information needed to formulate and solve problems.	A4, A5
K2	Have a thorough understanding of software design and implementation as it relates to industrially relevant data science.	A1, A3
K3	Have a deep academic understanding of several advanced, research-led subject areas, gained by following modules covering topics central to machine learning and artificial intelligence.	A1, A4
K4	Have engaged in an industrially relevant team project, to a level commensurate with leading-edge industrial research.	A2, A3, A5
K5	Have an in-depth knowledge of legal, social, ethical and professional issues and challenges facing industrial data science.	A3
K6	**(MSc only):** Have a deep knowledge and understanding within the specific subject area of the MSc project and dissertation.	A1, A2, A4
Skills and other attributes On successful completion of the programme, students will be able to:		
S1	Be able to function in a computer-based learning environment, making full use of email, the internet and electronic media.	A5
S2	Be able to conceive, design and write correct working computer programs in relevant languages, e.g., Python.	A1, A3
S3	Have written communication skills, including the ability to comprehend, summarise, synthesize and properly cite research-level material as part of an integrated argument.	A4, A5
S4	Have oral communication skills, specifically the ability to present and defend a substantial piece of work, to engage with enquirers and respond effectively to questions.	A3
S5	Have team working skills, demonstrating personal responsibility and group management ability, interpersonal communication skills, leadership and delegation, and the ability to plan to meet deadlines.	A3, A5
S6	Have research skills, demonstrating an ability to identify material from multiple published sources, relevant to a chosen topic, and from it synthesize theories, principles or designs pertinent to a practical, problem-solving project.	A4

S7	Be able to demonstrate project planning and management skills, fostered through the completion of a practical, problem-solving team project with a research dimension.	A2, A4, A5
S8	**(MSc only):** Be able to demonstrate initiative and self-motivation, fostered through the completion of an individual project.	A2, A4, A5

18. Learning and teaching methods

Development of the learning outcomes is promoted through the following teaching and learning methods:

Learning is student-centred, that is, the Department fosters an environment with many opportunities for individual and group learning, but the responsibility for learning rests with the student, who must be personally organised and self-motivated to make the most of the programme. Students are assigned to a personal tutor; they meet regularly to discuss progress and learning issues. Academic and technical advice may be sought from lecturers, teaching assistants and supporting staff (initially, via email). Teaching is offered through induction procedures, formal lectures, seminars, computer laboratories, problem-solving classes and project supervision.

Induction procedures in which students are provided with an introduction pack and participate in tutorial sessions. Contents of the pack include the MSc Student Handbook, and a departmental map enabling students to familiarise themselves with the layout of the department and the main computing facilities. During intro week, students participate in orientation activities that bring them up to speed on basic mathematics and key aspects of programming, at the same time introducing them to the resources available via the departmental website and local intranet. Learning outcomes *K1* and *S1* are supported through this.

Lectures are 50-minute formal presentations to a large class of students by a lecturer, who is responsible for the delivery of the module concerned. The purpose of a lecture is to motivate interest in a subject, to convey the core concepts and information content succinctly and to point students towards further sources of information. Lectures are interactive and students are encouraged to ask questions at suitable points. Students are expected to take notes during lectures, adding detail to published course materials. The learning outcomes *K1-K5* are supported mainly through this mode.

Seminars are longer 90- to 110-minute informal presentations to a class of students by a lecturer, researcher, industrial partner or student, describing an area of their current research or business. There is typically more opportunity to structure the session internally with questions, problem-solving and other kinds of interactive or shared learning experiences, in which the students may also participate in the teaching. The learning outcomes *K4*, *S5* and *S6* are directly promoted through this mode, with indirect support for *S4* and *K1-K3.*

Computer laboratories are 50-minute or 110- minute sessions, supervised by teaching assistants (and sometimes attended by the responsible lecturer) in which students work at a computer, to learn and practise a specific practical skill such as computer programming. The learning outcomes *S1* and *S2* are promoted mainly through this mode, with indirect support for *K1-K5*.

Problem-solving classes are 50-minute sessions conducted by a lecturer with a class of students, in which exercises are completed interactively and solutions are provided within the period. The purpose of such a class is to help students engage practically with the material presented in lectures and start to apply this knowledge. The learning outcomes *K1-K5* are supported through this mode.

Project supervision is a regular meeting held with an individual or group project supervisor, who may also be the student's personal tutor. During the 20-50 minute session, students report on their progress to the supervisor, who highlights further areas of investigation, helps with technical problems, advises about the content and structure of technical reports and generally encourages the students to organise their time effectively. The learning outcomes *S4-S7* and *K5* are directly promoted through this mode, with *S2* and *S3* supported indirectly.

The transition from teaching to self-motivated learning is encouraged through specialist teaching materials such as lecture handouts or copies of lecture slides, which are typically supplied via the Department of Computer Science website. Set course texts and more general background materials are available through the University libraries, at bookshops and also via the Internet. Students are responsible for obtaining textbooks and printing any material downloaded over the Internet. Active learning is fostered and promoted through engagement in practical work, such as exercises, assignments and projects. Additionally, students are expected to undertake private study.

Exercises are short tasks, either writing computer programs or working out solutions to other kinds of set problem, which are typically reviewed at the end of the session. Learning outcomes *K1-K5* and *S1-S3* may be supported this way.

Assignments are offered over several weeks, typically involving the design and implementation of a software system to perform a given task, or the researching of a body of information leading to the writing of a discursive essay on a given topic. Learning outcomes *K1-K5* and *S2-S4* are supported by this.

Projects are undertaken individually or in groups over one or two semesters. Projects typically solve a larger problem, possibly for an industrial client, possibly with a research dimension, and require good personal and organisational skills and good presentation skills. Learning outcomes *K5* and *S2-S8* are supported by this; indirectly, *S1* and *K1-K5* are reinforced.

Private study makes up more than half of the time allocated to each module. Students are expected to read around the topics of each module and follow directed reading from recommended course texts. Private study will include further investigations prior to exercises or projects and consolidates the lecture notes

19. Assessment and feedback methods

Modules may be assessed by examination, by an individual or group project, or by some combination of examination and a practical assignment. Learning outcomes K1-K5 and S2-S4 may be assessed by examination or coursework. Learning outcome S1 is not formally assessed but is a skill acquired as a side-effect of working in a computer-based learning environment. Learning outcomes S4-S8 are assessed by individual and group project work.

Examinations are typically 2-hour question papers. Examinations test the knowledge learning outcomes K1-K5, but also provide evidence of practical skill S3, and evidence of previous engagement in S2.

Assignments are pieces of continuously assessed coursework, which students complete individually or in groups as directed. Assignments both develop and assess the practical skills S2-S4 (and S5 for group assignments).

A dissertation **project** is completed during the summer. Students select a topic, research the background literature, prepare a survey/analysis report at the interim assessment stage, and apply this knowledge in a practical, problem-solving project which is expected to contain some degree of original contribution. The final assessment stage is by dissertation and poster session (including a software demonstration, if appropriate), assessed independently by two examiners. A viva voce examination may be held to form a common view in cases of insufficient evidence or divergent opinions. The learning outcomes S3-S4 and S7 are directly assessed, together with specialist areas of knowledge from K2-K4. Practical skills in S1-S4 may be assessed indirectly.

20. Programme structure and student development

The programme is offered over 12 months, starting in mid-September each year, and finishing the following September. The teaching year is divided into two semesters of 15 weeks, plus a 12-week project period during the summer. The first 12 weeks of each semester are devoted to teaching, with the remaining 3 weeks devoted to examinations. The programme is fully modular, delivered in multiples of 15 credits. Masters' students study for 180 credits in a year (120 credits of taught

modules and a 60-credit dissertation).

The **core** modules consist of 165 credits (15 credits each):

- COM6115 Text processing (promoting K2, S2)
- COM6509 Machine Learning and Adaptive Intelligence (promoting K2, K3, K5, S2)
- COM6018 Data Science with Python (promoting K2)
- COM6911 Industrial Team Project (promoting K1-K5, S3-S5, S7)
- COM6513 Natural Language Processing (promoting K2, K3)
- COM6012 Scalable Machine Learning (promoting K2, K3, K5)
- COM6655 Professional Issues (promoting K1, K2, K5)

The **elective** modules consist of 15 credits chosen from the following modules (15 credits each):

- COM6009 Modelling and Simulation of Natural Systems (promoting K2, K3)
- COM6515 Network Performance Analysis (promoting K3)
- COM6517 Web Technologies (promoting K2, K3)
- COM6501 Computer Security and Forensics (promoting K3-K5)
- COM6521 Parallel Computing with Graphical Processing Units (GPUs) (promoting K2, K3)

MSc students also undertake the 60-credit Individual Artificial Intelligence Dissertation Project (supporting K1-K3, K5, K6, S3, S4, S6, S8).

Students who obtain 180 credits in total are awarded the degree of MSc. Exit awards of PG Diploma and PG Certificate can also be awarded to students who have obtained the appropriate number of credits as stated in the University regulations.

Detailed information about the structure of programmes, regulations concerning assessment and progression and descriptions of individual modules are published in the University Calendar available online at http://www.sheffield.ac.uk/calendar/.

21. Criteria for admission to the programme

See 'Entry Requirements' at

https://www.sheffield.ac.uk/postgraduate/taught/courses/2023/data-analytics-msc

22. Reference points

The learning outcomes have been developed to reflect the following points of reference:

Subject Benchmark Statements
https://www.qaa.ac.uk/quality-code/subject-benchmark-statements

Framework for Higher Education Qualifications (2014)
https://www.qaa.ac.uk/docs/qaa/quality-code/qualifications-frameworks.pdf

University Strategic Plan
http://www.sheffield.ac.uk/strategicplan

Vision and Strategic Plan for Education
https://www.sheffield.ac.uk/vision/our-pillars/education

23. Additional information

The Department of Computer Science is housed in the modern, purpose-built Regent Court building and has its own dedicated computing facilities. The Department is internationally recognized for its teaching and research, and has particular research strengths in the fields of natural language

processing, speech technology, machine learning, robotics, computer graphics, software verification and testing.

The Department of Computer Science MSc Student Handbook, available at https://sites.google.com/sheffield.ac.uk/compgtstudenthandbook/, governs all local aspects of academic student life, with regard to services offered, computer etiquette, and local regulations.

This specification represents a concise statement about the main features of the programme and should be considered alongside other sources of information provided by the teaching department(s) and the University. In addition to programme-specific information, further information about studying at The University of Sheffield can be accessed via our Student Services website at http://www.shef.ac.uk/ssid.