Programme Title: I400 Bachelor of Science (BSc) Computer Science and Artificial Intelligence 2024-2025

Programme Specification (UG)

Awarding body / institution:	Queen Mary University of London
Teaching institution:	Queen Mary University of London
Name of award and field of study:	Bachelor of Science (BSc) Computer Science and Artificial Intelligence
Name of interim award(s):	CertHE, DipHE, BSc
Duration of study / period of registration:	3 years
QMUL programme code / UCAS code(s):	UBSF-QMCOMP1/USCAI I400
QAA Benchmark Group:	Computing
FHEQ Level of Award :	Level 6
Programme accredited by:	N/A
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 Engineering & Materials Science

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

Programme outline

This BSc Programme builds on the strengths of EECS with respect to Computer Science and Artificial Intelligence. These strengths collectively places it in an ideal yet unique position to offer an excellent BSc programme on CS and AI. This programme covers the fundamentals aspects of Computer Science, complemented with an extensive coverage of the main and different subfields of Artificial Intelligence: ethics, search, evolutionary computation, game theory, machine and deep learning, data science, computer vision, games and music. This programme has been design to be the one in UK, among the other BSc CS&AI and BSc AI in the country, that covers the most extensive selection of AI topics.

The programme is organized in three years. The first year is formed by the same modules as the current BSc CS at EECS, which provides the necessary foundation for the following years while reducing the creation of new modules. The second year is formed by a mix of existing CS and AI modules, reinforced with three new proposed modules that complement the curriculum of EECS on the AI discipline. Finally, the third year focuses on Artificial Intelligence modules taught by our existing AI research groups, who have already been long-established as leaders in their respective research fields (e.g., Game AI group, Vision Group, Centre for Digital Music, Robotics, and Cognitive Science).

The distribution of modules is as follows:
- Years 1 and 2 are formed exclusively of compulsory modules (2 semesters each, 4 modules of 15 credits per semester).

- In year 3 (two semesters), students take 3 modules of 15 credits per semester. They will choose one of two existing streams: "Vision and Data", or "Games and Music". Both streams share two modules (one per semester) on machine learning and decision making, while the other 4 are compulsory within their own streams. "Vision and Data" concerns the analysis and processing of images, videos, texts and other forms of data management. "Games and Music" concerns the logic, programming, design and automatic generation of virtual environments, audio and music.
- All students will also take a 30-credit core project module in year 3, during which they will take on a large project on CS&AI that they want to specialise in, after agreeing on a specific topic with an academic supervisor in the first semester, and completing the preparation phase over the second semester.

The programme has also been designed to allow graduate students to enrol on the MSc AI offered by EECS (one of the most subscribed PGT programmes in the school) without any module clashes or incompatibilities.

Aims of the programme

The programme is intended to respond to a growing demand in the industry for graduates with a high level of training in Computer Science and Artificial Intelligence disciplines. The programme aims to access a new population of better quality and better motivated undergraduate students by exploiting the unique competencies within EECS. The programme is designed to respond to the demand from the technology sector that requires people able to design, implement and deploy computer programmes that fulfill the needs of the sector, both following the latest software architecture paradigms and the advances in artificial intelligence.

The overall aims of the programme are to produce graduates with:
1) A sound understanding of the discipline of computer science and the knowledge and skills that will enable them to develop rapidly into professional software designers and engineers.
2) The essential knowledge, skills, competency, and scientific awareness necessary for a successful career in many AI-based industries, with a developed systematic awareness of the current developments of Artificial Intelligence.

This BSc programme importantly recognises the need for training cutting-edge CS & AI talents, and is specifically designed to maximise student employability on CS & AI jobs. It achieves that by putting together a programme that covers:
- The fundamental aspects of computer programming, networks and web technology, operating systems, algorithms and data structures.
- Practical, theoretical and up-to-date principles behind the most popular AI and Machine Learning algorithms and their applications, including those with a strong presence in EECS, such as compuational linguistics, audio, vision, robotics and games.
- The role of Artificial Intelligence in the modern society and the ethical implications of autonomous decision making processes and the use of data.

What will you be expected to achieve?

Students who successfully complete the programme will be able to develop and demonstrate knowledge and understanding, skills and other attributes in the following areas. The programme outcomes are referenced to the relevant QAA benchmark statement(s) (see above) and the Framework for Higher Education Qualifications in England, Wales and Northern Ireland (2008), and relate to the typical student. Additionally, the SEEC Credit Level Descriptors for Further and Higher Education 2003 and Queen Mary Statement of Graduate Attributes have been used as a guiding framework for curriculum design.

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Please note that the following information is only applicable to students who commenced their Level 4 studies in 2017/18, or 2018/19

In each year of undergraduate study, students are required to study modules to the value of at least 10 credits, which align to one or more of the following themes:

- networking
- multi- and inter-disciplinarity
- international perspectives
- enterprising perspectives.

These modules will be identified through the Module Directory, and / or by your School or Institute as your studies progress.

Academic Content:	
A 1	Demonstrate understanding of the entire software development lifecycle from design through to deployment and maintenance
A 2	Demonstrate broad knowledge of the software development sector, from both a technical and a business perspective, and the role of Artificial Intelligence in a modern society
A 3	Demonstrate understanding of procedural and object-oriented programming principles, as well as the fundamentals of operating systems, formal languages and algorithms
A 4	Implement and compare different algorithmic and AI solutions to challenges affecting the IT/AI sector, such as machine learning and deep learning, bio-inspired algorithms, search and classification methods
A 5	Identify the main ethical and philosophical implications of the use of automated classification, learning and decision-making systems
A 6	Develop awareness of developing technologies related to their own specialisation
A 7	Develop a comprehensive knowledge and understanding of mathematical and computational models relevant to the different AI topics

Disciplinary Skills - able to:	
B 1	Undertake problem-solving and modelling tasks relevant to software development
B 2	Investigate, select, analyse, manipulate and manage information from a variety of technical and non-technical sources
B 3	Apply the technical skills learned in the taught component of the programme
B 4	Appreciate the challenges associated with industry standard software development
B 5	Ability to apply quantitative and computational methods, using alternative approaches and understanding their limitations, in order to solve AI problems and to implement appropriate action

B 6	Ability to investigate and define the problem, identifying any constraints including environmental and sustainability limitations; ethical, health, safety, security and risk issues; intellectual property; codes of practice and standards.

Attributes:	
C 1	Work independently on a practical or research-based project under supervision
C 2	Work effectively as part of a team, identifying tasks and roles, and managing time, resources and progress appropriately
C 3	Be able to communicate their work to technical and non-technical audiences
C 4	Develop research capacity and demonstrate information expertise: Work with information that may be incomplete or uncertain, quantify the effect of this on the AI design and, where appropriate, use theory or experimental research to mitigate deficiencies
C 5	Use information for evidence-based decision-making and creative thinking

How will you learn?

The teaching, learning and assessment strategies will be tailored to the learning outcomes of the different modules. These will include lectures, practical and library-based research, presentations, group work and knowledge transfer activities. Lectures are used to introduce principles and methods and also to illustrate how they can be applied in practice. Practical and library-based research allows students to develop skills in review, investigative methods and critical analysis. Presentations and group work enhance students' team-working and communication skills. Knowledge transfer activities increase students' awareness of the broader context of their discipline and supports them in translating their knowledge, understanding and skills to that broader context.

How will you be assessed?

Taught modules will be assessed through a combination of examinations (EXM), coursework (CWK), portfolio and performance (PRA), as appropriate for the content and focus of each individual module. Project modules (DIS) will be examined on the basis of a final written report, a formal oral presentation, and a demonstration of the software / hardware / installation 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 BSc Computer Science and Artificial Intelligence is a single 3-year programme. In the first two years, all modules are compulsory with no elective choices. In year 3, electives are grouped in two different streams: "Vision and Data" and "Games and Music". These streams share 2 modules, while the other 4 are specific to each specialization or stream. The third year concludes with a final individual project. The modules are distributed as follows:

Year 1 Modules
Semester 1
ECS401U Procedural Programming (15 credits)
ECS404U Computer System and Networks (15 credits)
ECS407U Logic and Discrete Structures (15 credits)
ECS427U Professional and Research Practice (15 credits)

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Semester 2
ECS414U Object Oriented Programming (15 credits)
ECS417U Fundamentals of Web Technology (15 credits)
ECS419U Information System Analysis (15 credits)
ECS421U Automata and Formal Languages (15 credits)

Year 2 Modules
Semester 3
EMS516U Aspects of Robotics (15 credits)
ECS529U Algorithms and Data Structures (15 credits)
ECS509U Probability and Matrices (15 credits)
ECS533U Introduction to Artificial Intelligence (15 credits)
Semester 4
ECS5XXU Design and Build Group Project in Artificial Intelligence(15 credits)
ECS518U Operating Systems (15 credits)
ECS534U Nature-inspired Computing (15 credits)
ECS535U AI for Decision Making (15 credits)

Final Year (both streams):
ECS635U Project (30 credits) Core

"Vision and Data" stream:
Semester 5
ECS663U Principles of Machine Learning (15 credits)
ECS607U Data Mining (15 credits)
ECS669U Computational Imaging (15 credits)
Semester 6
ECS647U Bayesian Decision and Risk Analysis (15 credits)
ECS664U Machine Learning for Visual Data Analysis (15 credits)
ECS665U Introduction to Natural Language Processing (15 credits)

"Games and Music" stream:
Semester 5
ECS663U Principles of Machine Learning (15 credits)
ECS657U Multi-platform Game Development (15 credits)
ECS666U Logic in Computer Science (15 credits)

Semester 6
ECS647U Bayesian Decision and Risk Analysis (15 credits)
ECS667U Music Informatics (15 credits)
ECS668U Computational Game Design (15 credits)

Academic Year of Study FT - Year 1

Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester
Procedural Programming	ECS401U	15	4	Compulsory	1	Semester 1
Computer Systems and Networks	ECS404U	15	4	Compulsory	1	Semester 1

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Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester
Logic and Discrete Structures	ECS407U	15	4	Compulsory	1	Semester 1
Professional and Research Practice	ECS427U	15	4	Compulsory	1	Semester 1
Object Oriented Programming	ECS414U	15	4	Compulsory	1	Semester 2
Fundamentals of Web Technology	ECS417U	15	4	Compulsory	1	Semester 2
Information Systems Analysis	ECS419U	15	4	Compulsory	1	Semester 2
Automata and Formal Languages	ECS421U	15	4	Compulsory	1	Semester 2

Academic Year of Study FT - Year 2

Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester
Aspects of Robotics	EMS516U	15	4	Compulsory	2	Semester 1
Probability and Matrices	ECS509U	15	5	Compulsory	2	Semester 1
Algorithms and Data Structures	ECS529U	15	5	Compulsory	2	Semester 1
Introduction to Artificial Intelligence	ECS533U	15	5	Compulsory	2	Semester 1
Design and Build Group Project in Artificial Intelligence	ECS5XXU	15	5	Compulsory	2	Semester 2
Operating Systems	ECS518U	15	5	Compulsory	2	Semester 2
Nature-Inspired Computing	ECS534U	15	5	Compulsory	2	Semester 2
Artificial Intelligence for Decision Making	ECS535U	15	5	Compulsory	2	Semester 2

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Academic Year of Study FT - Year 3

Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester
Project	ECS635U	30	6	Core	3	Semesters 1 & 2
Principles of Machine Learning	ECS663U	15	6	Compulsory	3	Semester 1
Data Mining	ECS607U	15	6	Elective	3	Semester 1
Multi-platform Game Development	ECS657U	15	6	Elective	3	Semester 1
Logic in Computer Science	ECS666U	15	6	Elective	3	Semester 1
Computational Imaging	ECS669U	15	6	Elective	3	Semester 1
Bayesian Decision and Risk Analysis	ECS647U	15	6	Compulsory	3	Semester 2
Machine Learning for Visual Data Analysis	ECS664U	15	6	Elective	3	Semester 2
Introduction to Natural Language Processing	ECS665U	15	6	Elective	3	Semester 2
Music Informatics	ECS667U	15	6	Elective	3	Semester 2
Computational Game Design	ECS668U	15	6	Elective	3	Semester 2

What are the entry requirements?

Further information about the entry requirements for this programme can be found at:

http://www.eecs.qmul.ac.uk/undergraduates/entry-requirements/

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

EECS has an Education Committee (EduComm) structure which enables programmes to be both managed and enhanced.

The Structure allows for subject level teaching groups and Programme Directors to regularly evaluate the content and delivery of each programme. Feedback from module evaluations and SSLC meetings are fed into these groups and this provides an opportunity for student feedback to be incorporated into the programmes.

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Additionally, Programme Directors work with the Director of Education to ensure each programme is current and can be delivered effectively.

The Student-Staff Liaison Committee (SSLC) provides a formal means of communication and discussion between the School and its students. The committee consists of student representatives from each cohort, together with appropriate representation from School staff. It is designed to respond to the needs of students, as well as act as a forum for discussing programme and module developments. Student-Staff Liaison Committees meet four times a year, twice in each teaching semester.

Each semester, students are invited to complete a web-based module questionnaire for each of their taught modules, and the results are fed back through the SSLC meetings. The results are also made available on the student intranet, as are the minutes of the SSLC meetings. Any actions necessary are taken forward by the relevant Senior Tutor, who chairs the SSLC, and general issues are discussed and actioned through the School's Education Committee (EduComm).

The School's Education Committee (EduComm) advises the Director of Education 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 this Committee's work in a number of ways, including through student membership and consideration of student surveys and module questionnaires.

The School participates in the College's Annual Programme Review process, which supports strategic planning and operational issues for all undergraduate and taught postgraduate programmes. The APR includes consideration of the School's Taught Programmes Action Plan, which records progress on learning and teaching related actions on a rolling basis. Students' views are considered in the APR process through analysis of the NSS and module questionnaires, among other data.

What academic support is available?

All students are assigned an academic adviser during induction week. The adviser's role is to guide advisees in their academic development including module selection and to provide first-line pastoral support.

In addition, the School has a Senior Tutor for undergraduate students who provides second-line guidance and pastoral support as well as advising staff on related matters.

The School also has a Student Support Team, the first point of contact regarding all matters.

Every member of Teaching Staff holds 2 open office hours per week during term time.

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.

Programme-specific rules and facts

Further information on the Academic Regulations can be found at http://www.arcs.qmul.ac.uk/policy

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In addition to this the programme does have special regulations (further details are available in the Academic Regulations):

1. There is a requirement for students to achieve a minimum mark of 30.0 in every module, and to pass the project outright (in addition to the standard award rules) in order to achieve the intended, accredited, award.
2. The exit award and the field of study of the exit award will be dictated by the specific modules passed and failed by a student.

Links with employers, placement opportunities and transferable skills

The School of Electronic Engineering & Computer Science has a wide range of industrial contacts secured through research projects and consultancy, our Industrial Experience programme and our Industrial Board.

The Industry Panel works to ensure that our courses are state of the art and match the changing requirements of this fast moving industry. The Panel includes representatives from a variety of Electronic Engineering & Computer Science orientated companies ranging from SMEs to major blue-chips. These include: Microsoft Research, IBM, Royal Bank of Scotland, BT Labs, Oaklodge Consultancy, Intel Research, The Usability Company, Hewlett Packard Labs and Arclight Media Technology Limited.

Recent graduates have found employment as IT consultants, specialist engineers, web developers, systems analysts, software designers and network engineers in a wide variety of industries and sectors. A number of students also go on to undertake PhDs in electronic engineering and computer science. Merril Lynch, Microsoft, Nokia, Barclays Capital, Logica, Credit Suisse, KPMG, Transport for London, Sky and Selex ES are among the organizations that have recently employed graduates of EECS programmes.

Transferable skills are developed through a variety of means, including embedding of QM Graduate Attributes in taught modules and the project, together with the opportunity to participate in extra-curricular activities, e.g. the School's E++ Society, the School's Annual Programming Competition and external competitions with support from the School.

Programme Specification Approval

Person completing Programme Specification:	Joan Hunter
Person responsible for management of programme:	Simon Lucas
Date Programme Specification produced / amended by School / Institute Education Committee:	11 December 2023
Date Programme Specification approved by Taught Programmes Board:	

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