

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)
Name of interim award(s):	CertHE; DipHE
Duration of study / period of registration:	3 years
QMUL programme code / UCAS code(s):	UBSF-QMPHYS1
QAA Benchmark Group:	Computing
FHEQ Level of Award :	Level 6
Programme accredited by:	N/A
Date Programme Specification approved:	16 Dec 2024
Responsible School / Institute:	School of Physical and Chemical Sciences

Schools / Institutes which will also be involved in teaching part of the programme:

School of Biological and Behavioural Sciences

School of the Arts

School of Engineering & Materials Science

School of Mathematical Sciences

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

N/A

Programme outline

The BSc in Applied Artificial Intelligence is a new degree programme at Queen Mary with a unique focus on interdisciplinary applications of AI. The goal of the degree is to equip graduates with both knowledge of the core principles that power modern AI and the essential business skills to build their career as AI professionals. The curriculum is based on authentic, project-based learning, and draws on applied AI expertise from across the science faculty. Employability is embedded throughout the programme ensuring graduates are equipped with the necessary skills to secure highly skilled employment.

In the first year of the degree, students study the fundamental concepts that underpin modern AI, including coding, data science, and mathematics & statistics. The first year of the degree also encompasses essential broader AI topics, including ethical

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concerns, design considerations, and professional business skills. The highlight of the first year is a group project based on an authentic application of machine learning.

In their second year, students have the opportunity to build their expertise in AI with topics including machine learning, real world applications of AI, and generative AI. In addition to these modules, students build their portfolio as AI professionals with a disciplinary AI project on challenges from industry and the science faculty.

In the third year of the degree, students study advanced topics in applied AI, including language analysis and data collection from online sources. Students will also develop their professional portfolios with a module on entrepreneurship and consultancy. The culmination of the third year - and the degree - is the final year group project.

During the project, students collaborate in small groups drawn from across the faculty to work on genuine academic and industrial applications of AI. The goal of the project is to develop AI solutions with the potential to grow into AI startups, with support provided throughout for professional project development and adopting best industry practices. For the most successful projects, mentorship will be provided from the faculty to support the teams to grow into independent AI-based companies.

When students graduate from the degree, they are ready for the huge range of further directions offered by a career in AI, from working as an AI professional, an independent AI consultant, further academic study in applied AI, or building their own AI-based company. Whether graduates choose a more established path, or decide to forge their own direction, students can ensure they are ready for the AI-powered future with the BSc in Applied Artificial Intelligence.

Aims of the programme

The Applied AI undergraduate degree programme aims to equip students with a comprehensive understanding of artificial intelligence, preparing them for professional roles or further study in the field. Graduates will gain in-depth knowledge of key AI domains, including machine learning, natural language processing, and computer vision, as well as proficiency in solving complex AI-related problems. The programme also emphasises practical skills in AI development and implementation, ensuring that students are adept at using modern AI tools and techniques to solve real-world challenges. By fostering analytical thinking and the ability to interpret data, students will be well-prepared for both technical roles and interdisciplinary collaboration.

More broadly, the programme is designed to meet the evolving needs of employers, supporting the professional development of students and laying the foundation for successful careers that benefit both the economy and society. Alongside AI-specific knowledge, students will develop key transferable skills such as communication, teamwork, and problem-solving. The curriculum encourages an open-minded and creative approach to learning, while instilling scientific discipline and social awareness. Students have the opportunity to tailor their studies with a variety of modules, preparing them for diverse career paths in AI, from research and development to industry applications, while also gaining exposure to workplace experiences that complement academic studies.

What will you be expected to achieve?

Students enrolled in the Applied AI undergraduate programme can expect to achieve a robust foundation in artificial intelligence principles and applications, gaining both theoretical knowledge and practical skills essential for success in the AI field. Specific Programme Level Learning Outcomes are outlined below:

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 a comprehensive understanding of core AI concepts, including mathematical methods, machine learning & neural networks and their applications across various sectors.
A 2	Develop expertise in data management, processing, analysis and presentation techniques to derive insights from large datasets, including cleaning, preprocessing and using data for training AI models.
A 3	Exhibit proficiency in programming languages and AI development tools, enabling the effective design, implementation, deployment and maintenance of AI systems.
A 4	Describe fundamental concepts in language structure, variation, and use, and explain how linguistic understanding enhances AI's ability to process and generate human language.

Disciplinary Skills - able to:

B 1	Apply problem-solving techniques and critical thinking to develop innovative AI solutions, including designing, training, and evaluating AI models for real-world scenarios
B 2	Evaluate the ethical implications of AI technologies, understanding the potential social, legal, sustainability and EDI impacts of AI applications and promote responsible AI development
B 3	Conduct independent research in the field of AI, using appropriate methodologies to explore ideas and critically assess AI technologies
B 4	Identify and evaluate unique selling points and/or distinguishing features of AI technologies
B 5	Set up and maintain a computer environment for Applied AI development, including software installation, updates, and troubleshooting.

Attributes:

C 1	Demonstrate effective presentation, communication and teamwork skills in multidisciplinary teams, contributing to AI projects that integrate different perspectives and expertise to solve complex challenges
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C2	Develop the ability to think critically and creatively, approaching AI challenges with innovative solutions that push the boundaries of current technologies and methodologies.
C3	Develop problem-solving skills and the capacity to make informed, data-driven decisions in complex and/or uncertain situations
C4	Demonstrate awareness of continuous professional development, reflecting on skills, knowledge and behaviours to inform personal training and practice.

How will you learn?

In line with QMUL's Active Curriculum for Education (ACE) approach, the acquisition of knowledge in Applied Artificial Intelligence is achieved through a combination of large group interactive teaching, self-paced independent learning, learning by doing (labs and workshops) and group problem classes. Active learning is embedded in our approach to learning and teaching. Specifically, active learning encourages deeper engagement with course material, allowing students to apply concepts through hands-on activities, discussions and problem-solving exercises. This approach enhances critical thinking and retention, fostering a more meaningful understanding of the subject matter and better preparation for real-world applications. Regular feedback is provided on assignments to enhance understanding, while additional support is available via Queen Mary's online learning environment (QMplus), offering primers, guidance notes, online recordings, and supplementary materials. Practical skills are honed through hands-on computer lab exercises, which increase in complexity throughout the programme, encouraging students to engage directly with the material. A compulsory independent project allows students to demonstrate their research abilities, critical thinking, and communication skills. The programme is designed to blend large group teaching with active learning strategies, such as peer discussions and hands-on experimentation, ensuring students develop both theoretical and practical competencies in a dynamic, interactive environment.

How will you be assessed?

Students on the BSc Applied AI degree will be assessed through a variety of authentic assessment methods, with a significant focus on project-based assessments. Throughout the programme, students will complete portfolios of work, particularly for the third-year project, where they will tackle real-world AI challenges with the potential to develop into startup ideas. Assessment for this project may include venture-capital style presentations, pitch decks, business cases, and a portfolio of code, reports and mixed media showcasing their AI solutions. While coursework will form the majority of assessments, including problem-solving activities and applied AI tasks, there will also be some exams, such as in the mathematics modules. Each year, the assessment approach will be reviewed to ensure alignment with programme goals and student progression.

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.

Year 1 (all new compulsory year-long 30 credit modules)

Exploring AI: Understanding and applications

This module introduces the history and contemporary language of machine learning and artificial intelligence. It then discusses key sectors which exemplify uses of AI e.g. finance, healthcare, policy making, scientific research, and commercial applications. We address issues of ethics and professional practice.

Mathematical principles for AI

Here, we outline the key core mathematical and statistical methods that underly machine learning (e.g. linear algebra, numerical methods, probability and statistics). In each case, we illustrate the methods with direct examples from the employment sectors listed in the above module. The focus is on real-world context as opposed to formal theory in isolation.

Coding practices in AI development

Key computational methods are introduced in a hands-on way, including e.g. coding in Python, use of bespoke packages for machine learning applications, data manipulation and visualisation, version control and building a shareable code portfolio. Students will also implement machine learning algorithms (excluding deep learning). Examples throughout the course are taken

from the real-world applications outlined above.

Applied AI Collaborative Project

Students work in groups to apply machine learning methods to a brief originating from industry, science or policy making. The project will involve analysing data from one of these sectors, and presenting the results in a visually effective manner. External collaborators will be invited in to provide suitable briefs, and the students will present their results to an interdisciplinary panel, including staff, external stakeholders and fellow students. The first part of the module in Semester A will focus on preparing students for the project. Specifically taught elements on project planning and management, communication skills, approaches for literature reviews, and background research for the project. This will be essential to ensuring our students are thoroughly prepared for the project in semester B. In semester B the student will move into a closely scaffolded phase of project work where there is a high percentage of supervision and support given this will be the first time students will have completed this form of assessment.

Year 2 (all new compulsory year-long 30 credit modules)

Tools and Applications of Generative AI

This module introduces the notion of generative AI models, building on ideas from the first year. The wide range of applications of generative AI is discussed, including use of tools that require no previous coding knowledge. Ethical issues are discussed in detail, and students are given hands-on experience.

Machine Learning

This module explores various types of machine learning algorithm that remain in widespread contemporary use, up to and including deep learning methods. Computational resources are discussed. Hands-on examples are taken from a wide variety of employment sectors as above.

AI in the Real World

This module brings in external visitors from industry / policy / elsewhere in QMUL. A wide range of applications is seen, explaining in detail how idealised situations in the more theoretical modules are adapted / modified for real-world problems. Students gain awareness of machine learning pipelines, and how these are maintained / monitored.

Disciplinary AI project

Students pick a problem from a particular sector / discipline, and apply a deep learning or generative AI method of their choice. The results are again presented to an interdisciplinary panel. By this stage, students are building up a sizeable portfolio of code, reports and other (visual) media. Students may also produce externally usable software products / applications.

Year 3 (all new modules)

Entrepreneurship and consultancy (30 credits, year-long)

This compulsory module will see students engaging with the Business Development Unit and Queen Mary Innovation. Grant writing and patent applications will be discussed, including issues around intellectual property. Students will practice how to pitch for venture capital funding, and also learn what data consultancy work looks like in practice.

Analysing Language Datasets (15 credits)

This module introduces computational methods for analysing textual data using R. How to handle large / complex datasets involving text is discussed in detail, and the module is taught by specialists in linguistics from the School of the Arts.

Analysis of Social Media (15 credits)

This module introduces automated methods for extracting text / numerical data from online sources, with hands-on experience. The data is analysed using techniques including keyword analysis, and sentiment / stance classification. Use of different machine

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learning methods is discussed, and compared with large language model approaches.

Applied AI in industry Project (60 credits, year-long)

Students work in interdisciplinary groups, but where the final assessment has a strong individual element. A sizeable project is undertaken around an industry-like brief, containing multiple elements of work. Students must collaborate to project-manage these elements, demonstrate a strong individual contribution to the whole, and also undertake a significant element of critical reflection.

There are no electives currently proposed. As the programme expands there is the potential for electives to be offered in Year 3 only from across the faculty and further afield. Analysis of Social Media and Analysing Language Datasets will move from compulsory to elective modules.

Academic Year of Study FT - Year 1

Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester
Exploring AI: Understanding and applications	SPC4004	30	4	Compulsory	1	Semesters 1 & 2
Mathematical principles for AI	SPC4002	30	4	Compulsory	1	Semesters 1 & 2
Coding practices in AI development	SPC4003	30	4	Compulsory	1	Semesters 1 & 2
Applied AI Collaborative Project	SPC4001	30	4	Compulsory	1	Semesters 1 & 2

Academic Year of Study FT - Year 2

Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester
Tools and Applications of Generative AI	SPC5004	30	5	Compulsory	2	Semesters 1 & 2
Machine Learning	SPC5003	30	5	Compulsory	2	Semesters 1 & 2
AI in the Real World	SPC5002	30	5	Compulsory	2	Semesters 1 & 2
Disciplinary AI project	SPC5001	30	5	Compulsory	2	Semesters 1 & 2

Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester
Entrepreneurship and consultancy	SPC6005	30	6	Compulsory	3	Semesters 1 & 2
Analysing Language Datasets	LIN6211	15	6	Compulsory	3	Semester 1
Analysis of Social Media	SPC6002	15	6	Compulsory	3	Semester 2
Applied AI in industry Project	SPC6001	60	6	Compulsory	3	Semesters 1 & 2

What are the entry requirements?

Typical offer AAB at A-Level, must include Mathematics, and ABB for clearing if necessary

English language entry requirements (for international students):

Please specify the IELTS requirements for each component (the minimum component score for degree level study is 5.5):

Overall: 6

Reading: 5.5 Writing: 5.5

Listening: 5.5 Speaking: 5.5

See: <https://www.qmul.ac.uk/international-students/englishlanguage/requirements/undergraduate-and-postgraduate-programmes/>

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

The Student Voice Committee provides a formal means of communication and discussion between SPCS and its students. The committee consists of student representatives from each year in the school together with appropriate representation from staff within the School. It is designed to respond to the needs of students, as well as act as a forum for discussing programme and module developments. Student Voice Committees meet regularly throughout the year.

Furthermore, there is an online form for feeding back comments, concerns or praise that all students have access to. This is monitored by the SPCS Education team and together with the student reps they prioritise these and refer them to the HoS/DoE as appropriate. Finally, we invite our student reps to join the School Executive Group at least once per semester for a meeting. This provides students with direct access to the leadership team of the School.

Each school operates an Education Committee which advises the School's 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 the Taught Programmes Board. Student views are incorporated in the committee's work in a number of ways, such as through student membership, or consideration of student surveys.

All schools operate a Programme Review of their taught undergraduate and postgraduate provision. This is a continuous process of reflection and action planning which is owned by those responsible for programme delivery; the main document of reference for this process is the NSS Action Plan which is the summary of the school/institute's work throughout the year to monitor academic standards and to improve the student experience. Students' views are considered in this process through analysis of the NSS and module experience surveys.

What academic support is available?

The induction programme for new undergraduate students is held during Welcome Week. Students on the Applied AI programme will participate in an induction designed to introduce them to the course structure, key learning resources, and the tools they will use throughout their studies, such as AI development platforms and data analysis software. Throughout the programme, students will have access to comprehensive support, including academic advisors, peer mentoring, and the QMplus online learning environment, which offers guidance notes, recorded lectures, and additional learning materials.

Each student is assigned an academic advisor, normally the same member of staff for the duration of a student's studies, who can provide academic, developmental and pastoral guidance. Additionally the School has a dedicated Student Support Officer who is available to discuss any student related problem. The School runs an open door policy which encourages the students to come and talk to their advisor, other academics or the dedicated Student Support Officer. The School also actively participates in the QMUL Peer Assisted Study Scheme (PASS).

The Senior Tutor in the School has overall responsibility for academic support and pastoral care. The Senior Tutor also has a key role in overseeing the School's engagement policy. The Senior Tutor will address any problems that cannot be resolved by a student's academic adviser or the Student Support Officer.

Project-work is carried out under the guidance of a specific academic member of staff (the "supervisor"), whose role includes the provision of academic and technical guidance, as well as monitoring progress throughout the project.

There are dedicated staff for supporting students with both maths and coding.

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

The School has a robust support mechanism in place for supporting the wellbeing of our students, with a dedicated student support team member who is a mental health first aid trained member of staff. We have several other members of staff, including the HoS who are mental health first aiders. The university has a central team providing Disability and Dyslexia Support, in addition to other central services that can be accessed via our report and support hub for students. Our School EDI committee is undergoing a transformation, with an expectation that student representation will be embedded on the committee to strengthen the feedback between our student body and the university EDI agenda.

To support female applicants in computing (section 1.12 subject benchmark), we will implement several initiatives focused on inclusivity, visibility, and support:

Inclusive Marketing and Outreach: Showcase female role models in promotional materials and highlight women in computing achievements. Ensure that marketing materials use inclusive language, imagery, and narratives to reflect diverse perspectives. Furthermore, ensuring a gender balance and encouraging female applicants is a priority area for our existing Physics UG Programmes. We run multiple outreach events with female academics acting as role models. For example, we run the Girls in Physics summer school and anticipate running an equivalent outreach programme for the BSc Applied AI.

Collaborate with Schools and STEM Organizations: Partner with schools, especially those that promote STEM for girls, and organizations like WISE (Women in Science and Engineering) or Girls Who Code. These partnerships can help raise awareness among prospective students and show the programme's commitment to gender diversity.

Inclusive Curriculum and Assessment: Our curriculum has been designed as an inclusive curriculum that includes gender-neutral language and real-world applications, encouraging diverse perspectives. For assessments, we are implementing project-based work/group assignments that emphasize collaboration and real-world problem-solving, appealing to a broader range of interests.

Female Mentorship and Peer Support: Offer mentorship programmes connecting female students with female faculty members, alumni, or senior students. Peer support groups or women-in-tech societies can also help female students build networks, find role models, and feel supported.

Promote an Inclusive Culture: Establish a supportive and welcoming learning environment through visible policies and training on diversity, equity, and inclusion for both students and faculty. Actively address stereotypes, microaggressions, or biases that

may discourage female participation.

With respect to the programme and curriculum design we have insured it is accessible and inclusive by:

Writing Clear Learning Outcomes

Ensuring that the learning outcomes for the programme and each individual module are clear is fundamental to inclusion. Learning outcomes are written in accessible language and outlined in a way that allows all students, regardless of their learning needs, to easily understand what is expected of them. This clear guidance enables students to focus on achieving these outcomes with confidence.

Reviewing Reading Lists for Accessibility

Reading Lists are reviewed regularly, with a special focus on ensuring texts are available in both electronic and hard copy formats. This helps to support students who may face barriers to traditional text-based learning, such as those with visual or physical disabilities. E-books and audio versions are preferred wherever possible, providing flexibility in accessing materials in a format that suits individual needs.

Implementing Online Reading Lists (Tallis Aspire)

To streamline access, all reading lists are included in the Tallis Aspire resource available through Library Services. This ensures students can quickly and easily find the resources they need from a central platform, minimising time spent searching for materials and reducing any potential frustrations/barriers to learning. This is reviewed regularly and kept up to date.

Ensuring access to Q-Review and Recording

A key aspect of supporting diverse learning needs, especially for neurodiverse students, is providing the opportunity to revisit teaching and content. Therefore, all teaching content that can be recorded is made available through Q-Review, with recordings released promptly after sessions. This is automatic via QM+. This allows students to review material at their own pace, which is especially helpful for those who benefit from additional time to process information, such as students with ADHD, autism, or dyslexia.

Performing Accessibility Checks on QMPlus Content

All content on QMPlus is checked for accessibility standards with the E-Learning Unit. This includes ensuring that all visual content has appropriate alt-text descriptions, that materials are compatible with screen readers, and that the content is structured for easy navigation.

Making Reasonable Adjustments and Accessibility

The programme is designed to allow for flexibility in meeting the needs of students who require reasonable adjustments. Guided by the DDS, SPCS ensures that support mechanisms are in place, including personalised adjustments to assessments, flexible deadlines, and access to additional services through the Disability and Dyslexia Service. Regular consultation with these services helps keep our practices aligned with the most current inclusive education standards. We encourage all MO to undertake regular CPD to stay abreast on recent developments with respect to inclusive teaching practices as well as sign posting the inclusive curriculum framework.

In addition to above, the following steps will be taken to ensure access in classroom-based modules to ensure accessibility:

* All QMPlus modules will meet the baseline standard defined in the School, following the checklist for accessibility

* Written notes, handouts and any other asynchronous material provided at least 1 week in advance where appropriate, and in different readable formats upon request.

* Videos will have closed captions provided

* All images will have ALT text provided

* Microphones will be used in classrooms

*Active learning: the primary delivery mode for teaching will be "flipped classroom", with asynchronous tasks on QMPlus followed by interactive sessions that build on the understanding from those tasks.

* Teaching sessions will have a 10 minute break after each 50 minute period.

In addition, reasonable adjustments will be made to the computer-based aspects of the module, for example in enabling accessible technologies, additional teaching support, and/or extra time for students with visual or motor impairments that impact routine computer use.

Programme-specific rules and facts

N/A

Links with employers, placement opportunities and transferable skills

Although there are no placement opportunities on the programme, academic staff involved in the programme have national and international experience in their respective research fields and regularly work with internal and external partners (DERI, Turing Institute, Atomic Weapons Establishment, etc.).

Queen Mary Innovation provides a conduit to QMUL spin out companies, the alumni team, business development unit provide further capability to engage with industry. IBM have agreed to support QMUL through guest lectures and other activities, building on an existing partnership. In addition to specific long term strategic partnerships with individual stakeholder companies, we have links to several important networks of employers via STFC and EPSRC funded doctoral training centres that have successfully run over the past decade, along with a network accessible via the SEPnet consortium.

Graduates of the BSc in Applied AI develop essential programming and coding skills that are widely used in software development, data analysis, and AI implementation across many industries. They gain expertise in working with large datasets, drawing meaningful insights, and applying statistical methods, which are valuable not only in AI but also in fields like finance, healthcare, and marketing. With a strong focus on problem-solving, the programme trains students to think creatively and logically to tackle complex issues, making them adaptable to a variety of innovative industries. They also build project management skills by learning to manage projects from start to finish, including task organization, meeting deadlines, and teamwork. Effective communication and collaboration are key aspects, as graduates are equipped to explain complex technical ideas to both technical and non-technical audiences, which is critical in multidisciplinary teams and client-focused roles. Finally, the fast-evolving nature of AI ensures that graduates develop adaptability and a mindset for continuous learning, enabling them to quickly acquire new skills and tools across diverse industries. Therefore graduates will be able to progress to careers in the widest range of fields.

Programme Specification Approval

Person completing Programme Specification:

Lesley Howell

Programme Title: Applied Artificial Intelligence

Person responsible for management of programme:

Lesley Howell

**Date Programme Specification produced / amended by
School / Institute Education Committee:**

9 Nov 2024

**Date Programme Specification approved by Taught
Programmes Board:**

16 Dec 2024