UNIVERSITY OF LIVERPOOL

MSc

Digital Chemistry: AI, Machine Learning, Automation and Robotics

Study mode	Duration	
Full-time	12 months	Apply by: **29 August 2025** Starts on: **22 September 2025**

About this course

The programme will enable students to relate the concepts and techniques of AI, automation, robotics and machine learning to their applications in chemistry research. Students will extend specific skills and knowledge to a level at which they will be prepared for contemporary and pioneering professional practice or further study at the doctoral level.

Introduction

Digital (AI) Chemistry is a rapidly evolving, growth industry and AI tools such as machine learning, automation and robotics have the potential to support faster chemistry discoveries in order to address key societal needs and global challenges. The University of Liverpool, in conjunction with Imperial College London, is creating a research hub to develop state-of-the-art Digital Artificial Intelligence (AI) for Chemistry interfaces. This ground-breaking hub aims to position the UK as the global leader in Digital Chemistry and be at the forefront of the Digital AI Chemistry revolution.

Our exciting new Digital Chemistry MSc is a cross-disciplinary programme that offers Chemistry graduates the opportunity to be taught the concepts and techniques of AI, automation, robotics and digitalisation relating to chemistry research. This MSc will develop students' skills and knowledge in digital processes and methodologies, in order to critically apply them in a variety of chemical contexts, such as pure materials, pharmaceuticals and formulated materials.

Who is this course for?

This programme is designed for UK BSc (Hons) Chemistry, Chemical Engineering, or Chemistry-related degree graduates with a 2.2 or equivalent. It aims to develop their skills and knowledge in the Digital Chemistry domain, equipping them for contemporary and pioneering professional practice or further study at the doctoral level.

What you'll learn

- Students will be able to relate the concepts and techniques of AI, automation, robotics and digitalisation, to their applications in chemistry research.
- Students will develop critical thinking in the application of digital methodologies across various chemical contexts, such as pure materials, pharmaceuticals, and formulated materials, among others.
- Students will extend specific skills and knowledge, for example, in collaboration, digital literacy and working in interdisciplinary teams, to a level at which they will be prepared for contemporary and ground-breaking professional practice or further study at the doctoral level.

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Course content

Discover what you'll learn, what you'll study, and how you'll be taught and assessed.

Semester one

The programme will enable students to relate the concepts and techniques of AI, automation, robotics and machine learning to their applications in chemistry research. Students will critically apply selected digital methodologies in a variety of chemical contexts, such as pure materials, pharmaceuticals and formulated materials. Students will extend specific skills and knowledge, for example, in collaboration, digital literacy and working in interdisciplinary teams.

Modules

Compulsory modules	Credits
DIGITAL ALCHEMY: SYNTHESISING CODE AND CHEMISTRY (CHEM501)	15
KEY SKILLS FOR DIGITAL CHEMISTRY (CHEM503)	15
MATHS AND STATISTICS FOR AI AND DATA SCIENCE (COMP533)	15
PROGRAMMING FUNDAMENTALS (COMP517)	15

Programme details and modules listed are illustrative only and subject to change.

Semester two

The programme will enable students to relate the concepts and techniques of AI, automation, robotics and machine learning to their applications in chemistry research. Students will critically apply selected digital methodologies in a variety of chemical contexts, such as pure materials, pharmaceuticals and formulated

materials. Students will extend specific skills and knowledge, for example, in collaboration, digital literacy and working in interdisciplinary teams.

Modules

Compulsory modules	Credits
ROBOTICS AND AUTOMATION IN CHEMISTRY (CHEM504)	15
CHEMICAL DATA, DISCOVERY AND DESIGN (CHEM502)	15
RESEARCH PROJECT PLANNING AND MANAGEMENT IN DIGITAL CHEMISTRY (CHEM506A)	30

Programme details and modules listed are illustrative only and subject to change.

Summer research project

Modules

Compulsory modules	Credits
MSC DIGITAL CHEMISTRY RESEARCH PROJECT (CHEM506B)	60

Programme details and modules listed are illustrative only and subject to change.

Teaching and assessment

How you'll learn

- Subject-specific and transferrable skills are developed through the teaching approaches utilised in the modules, including in interactive lectures, workshops, practical sessions and a research project, all supported by online materials, selected textbooks and specific literature. The programme modules encourage individual and group work where students tackle problems by developing ideas

and hypotheses, designing strategies to solve problems, and analysing and interpreting their findings.

- As students advance through the course, they initially engage with taught modules during semesters 1 and 2 laying the groundwork for their forthcoming research project. The content of semester 2 modules is linked to that of semester 1. This sequential structure is designed to support all students, irrespective of their academic background in Chemistry, Chemical Engineering, or Chemistry-related degrees, ensuring they can establish a robust foundation for further advanced study.
- Liverpool Curriculum Framework attributes and hallmarks are at the centre of this programme, and it is also informed by the University Education Strategy 2031. Research-connected teaching, active learning and authentic assessment are embedded in all aspects of teaching. As students progress through the programme, they will enhance their problem-solving skills, independent learning, confidence and digital fluency. Inclusivity is at the heart of this programme, encompassing all aspects of equality, diversity and inclusion as part of value-based programme design. The programme is representative of the diversity of students and provides equal access to the curriculum for each of them.
- Electronic resources available in the University's virtual learning environment and library collections support learning and teaching on this programme.

How you're assessed

The assessment strategy evaluates meaningful and integrated applications of Digital Chemistry. The assessments allow students to demonstrate a systematic knowledge and critical understanding of the application of AI, automation, machine learning and robotics in Chemistry. The learning activities, resources and tasks (e.g. formative or summative assessments) are aligned to the learning outcomes so that students undertaking these tasks will be able to demonstrate their knowledge and ability in relation to the learning outcomes. Many assessments are authentic, meaning students will engage in the simulation of real-world scenarios in hands-on, workshop and project-driven assessments to demonstrate their ability to apply digital technologies and address challenges in chemistry.

Assessment strategies will ensure that students can demonstrate their knowledge and skills through various methods, e.g. coursework, teamwork, presentation, dissertation writing, oral examination, etc.

All modules will provide formative feedback to students on their learning progress and allow for adjustment of their learning. Students also evaluate their progress, are guided to extra information, and are supported via online resources and formative exercises.

Liverpool Hallmarks

We have a distinctive approach to education, the Liverpool Curriculum Framework, which focuses on research-connected teaching, active learning, and authentic assessment to ensure our students graduate as digitally fluent and confident global citizens.

The Liverpool Curriculum framework sets out our distinctive approach to education. Our teaching staff support our students to develop academic knowledge, skills, and understanding alongside our **graduate attributes**:

- Digital fluency
- Confidence
- Global citizenship

Our curriculum is characterised by the three **Liverpool Hallmarks**:

- Research-connected teaching
- Active learning
- Authentic assessment

All this is underpinned by our core value of **inclusivity** and commitment to providing a curriculum that is accessible to all students.

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Careers and employability

Upon completion of the MSc in Digital Chemistry, students will be qualified to enter a wide range of employment or pursue further study leading to a PhD.

The pharmaceutical, data science, analytics & informatics and chemical research industries are possible employers of graduates, especially given the anticipated increases in the use of next-generation sequencing and the corresponding data analysis that will be required.

Upon completion of the MSc in Digital Chemistry, graduates will also be qualified to enter careers such as finance & banking, software development, teaching and consultancy, where the skills obtained in the degree programme are highly valued.

Occupations linked to students who have studied chemistry in a higher education setting are set to grow across the UK. There is an anticipated growing demand for adaptable scientists who can harness the knowledge and skillsets of digital chemists.

The pharmaceutical, data science, analytics & informatics and chemical research industries are possible employers of graduates, especially given the anticipated increases in the use of next-generation sequencing and the corresponding data analysis that will be required.

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Career support from day one to graduation and beyond

Career planning

From education to employment

Networking events

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Fees and funding

Your tuition fees, funding your studies, and other costs to consider.

Tuition fees

UK fees (applies to Channel Islands, Isle of Man and Republic of Ireland)

Full-time place, per year - £12,500

International fees

Full-time place, per year - £29,900

Fees stated are for the 2025-26 academic year.

Tuition fees cover the cost of your teaching and assessment, operating facilities such as libraries, IT equipment, and access to academic and personal support.

- You can pay your tuition fees in instalments.
- All or part of your tuition fees can be funded by external sponsorship.
- International applicants who accept an offer of a place will need to pay a tuition fee deposit.

If you're a UK national, or have settled status in the UK, you may be eligible to apply for a Postgraduate Loan worth up to £12,167 to help with course fees and living costs. **Learn more about paying for your studies**.

Additional costs

We understand that budgeting for your time at university is important, and we want to make sure you understand any course-related costs that are not covered by your tuition fee. This could include buying a laptop, books, or stationery.

Find out more about the additional study costs that may apply to this course.

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Entry requirements

The qualifications and exam results you'll need to apply for this course.

The minimum entry requirements are UK BSc (Hons) Chemistry, Chemical Engineering, or Chemistry-related degrees 2.2 or equivalent.

In addition, international candidates are required to have a level of English equivalent to IELTS 6.5 or reach this standard by satisfactorily completing equivalent pre-sessional English language classes at the University of Liverpool.

Postgraduate entry requirements

We accept a 2:2 honours degree from a UK university, or an equivalent academic qualification from a similar non-UK institution. This degree should be in Chemistry, Chemical Engineering, or a Chemistry-related degree.

In addition, international candidates are required to have a level of English equivalent to IELTS 6.5 or reach this standard by satisfactorily completing equivalent pre-sessional English language classes at the University of Liverpool.

International qualifications

Select your country or region to view specific entry requirements.

The minimum entry requirements are equivalent to the UK BSc (Hons) Chemistry, Chemical Engineering, or Chemistry-related degrees 2.2.

International candidates are required to have a level of English equivalent to IELTS 6.5 or reach this standard by satisfactorily completing equivalent pre-sessional English language classes at the University of Liverpool.

English language requirements

You'll need to demonstrate competence in the use of English language, unless you're from a majority English speaking country.

We accept a variety of international language tests and country-specific qualifications.

International applicants who do not meet the minimum required standard of English language can complete one of our Pre-Sessional English courses to achieve the required level.

IELTS

6.5 overall, with no component below 6.0

TOEFL iBT

88 overall, with minimum scores of listening 19, writing 19, reading 19 and speaking 20. TOEFL Home Edition not accepted.

Duolingo English Test

125 overall, with writing not less than 125, speaking and reading not less than 115, and listening not below 110

Pearson PTE Academic

61 overall, with no component below 59

LanguageCert Academic

70 overall, with no skill below 65

PSI Skills for English

B2 Pass with Merit in all bands

INDIA Standard XII

National Curriculum (CBSE/ISC) - 75% and above in English. Accepted State Boards - 80% and above in English.

WAEC

C6 or above

Pre-sessional English

Do you need to complete a Pre-sessional English course to meet the English language requirements for this course?

The length of Pre-sessional English course you'll need to take depends on your current level of English language ability.

Pre-sessional English in detail

If you don't meet our English language requirements, we can use your most recent IELTS score, or the equivalent score in selected other English language tests, to determine the length of Pre-sessional English course you require.

Use the table below to check the course length you're likely to require for your current English language ability and see whether the course is available on campus or online.

Your most recent IELTS score	Pre-sessional English course length	On campus or online
6.0 overall, with no component below 6.0	6 weeks	On campus
6.0 overall, with no component below 5.5	10 weeks	On campus and online options available
6.0 overall, with no more than one component below 5.5, and no component below 5.0	12 weeks	On campus and online options available
5.5 overall, with no more than one component below 5.5, and no component below 5.0	20 weeks	On campus

Your most recent IELTS score	Pre-sessional English course length	On campus or online
5.0 overall, with no more than one component below 5.0, and no component below 4.5	30 weeks	On campus
4.5 overall, with no more than one component below 4.5, and no component below 4.0	40 weeks	On campus

If you've completed an alternative English language test to IELTS, we may be able to use this to assess your English language ability and determine the Pre-sessional English course length you require.

Please see our guide to Pre-sessional English entry requirements for IELTS 6.5 overall, with no component below 6.0, for further details.

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