

Chemistry with a Year in Industry BSc (Hons)

COURSE DETAILS

- A level requirements: [ABB](#)
- UCAS code: F111
- Study mode: Full-time
- Length: 4 years

KEY DATES

- Apply by: [31 January 2024](#)
 - Starts: 23 September 2024
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Course overview

If you love chemistry and want to keep your future career options open, this programme offers a solid grounding in all aspects of chemistry, while allowing you to incorporate some non-chemical options to broaden your education.

INTRODUCTION

Study Chemistry at Liverpool and learn in a culture of research excellence. Chemistry is a great choice for those with a keen interest in materials chemistry, medicinal chemistry and theoretical and computation chemistry. You'll thrive in our award-winning undergraduate laboratories. All our chemistry programmes have a common core in the first two years, this provides a good measure of flexibility and choice for you during the first two years. These first two years progress rapidly, with a mix of theory and practical modules to give you a solid grounding in the subject.

By year three you will be a proficient chemist, and will be able to extend your knowledge in the three traditional branches of chemistry. You will also be offered a choice of optional chemistry and non-chemistry modules, or modules in science education for those interested in pursuing a career in teaching. Practical modules in year three will continue to develop your skills and knowledge learnt in the first two years. This may involve conducting mini-projects, relevant in the modern world, developing your skill set to make you industry-ready.

You will also spend a year on industrial placement acquiring experience and awareness of practical chemistry and industrial environments.

Since students enter the Department with a wide range of experience in mathematics (which is essential for studying chemistry to a high level) we provide a flexible tiered maths for chemistry course allowing you to develop your skills at your own pace.

If you decide during this first 18 months that you want to aim for a research career in Chemistry, then you can transfer to the MChem Chemistry (F102) programme provided you have obtained an average mark at the 2:1 level or above (60%).

WHAT YOU'LL LEARN

- Practical application of chemistry.
 - Material chemistry
 - Energy and catalysis
 - Functional interfaces
 - Medicine and bio-nano chemistry
 - Theoretical and computational chemistry
 - Renewable and sustainable chemistry
 - Numeracy and problem solving.
 - Experience and awareness of professional environments
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ACCREDITATION

Our BSc programmes have bachelor accreditation from the Royal Society of Chemistry (RSC) ensuring your degree with us will set you on the pathway to a successful career.

Course content

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

YEAR ONE

In the first year, you will take modules that cover the fundamentals of Inorganic, Organic and Physical Chemistry, plus necessary key skills.

Four Chemistry modules combine theoretical and practical aspects and one Chemistry module develops Quantitative and General Key Skills. You will spend three to six hours per week in the laboratory and so will receive a comprehensive training in practical aspects of the subject.

You will have a choice of 30 credits of subsidiary modules from other Departments including Environmental Sciences, Life Sciences (Anatomy, Molecular biology, Biochemistry, Pharmacology or Physiology), Mathematics, Physics and Archaeology.

There are also optional courses within chemistry covering, for example the chemistry-biology interface, and in the second semester you can opt to take a research inspired course, innovative chemistry for energy and materials, delivered by staff in the Stephenson Institute for Renewable Energy.

COMPULSORY MODULES

INTRODUCTORY INORGANIC CHEMISTRY (CHEM111)

Credits: 15 / Semester: semester 1

This module gives an introduction to the chemistry of the main group elements, using the periodic table as the underpinning framework for understanding this chemistry, and develops students' analytical chemistry skills including volumetric and spectrophotometric techniques applied to materials that are familiar in everyday life.

INTRODUCTORY ORGANIC CHEMISTRY (CHEM130)

Credits: 30 / Semester: whole session

An Introduction to Organic Chemistry consisting of lectures, workshops and laboratory classes assessed continuously and by four class tests

INTRODUCTORY PHYSICAL CHEMISTRY (CHEM152)

Credits: 15 / Semester: semester 2

This module builds on the thermodynamics and kinetics that students have studied prior to University. Learning is supported by both problem-solving workshops and undertaking experiments in the laboratory

INTRODUCTORY SPECTROSCOPY (CHEM170)

Credits: 15 / Semester: whole session

This module will provide an introduction to a variety of spectroscopic techniques. Students will explore the theory underpinning various spectroscopic methods, how they are put into practice when acquiring spectra, and the interpretation of spectra to identify unknown substances.

KEY SKILLS FOR CHEMISTS 1 (CHEM180)

Credits: 15 / Semester: whole session

The aim of this module is: (i) to equip students with the basic quantitative transferable skills required for the first year of a Chemistry degree programme. (ii) to broaden a student's perspective of chemistry whilst developing their general transferable skills focusing on communication and employability. The overarching learning outcome is for students to have the key skills that will equip them to perform well in the rest of their chemistry degree programme.

Quantitative Key Skills will be taught using a lecture/workshop format involving problem solving classes, using computers where necessary. General Key Skills will involve a series of lecture-based presentations given by staff from the Department of Chemistry and the Careers Service together with a database workshop and small group tutorials. Extensive use of online platforms will be made.

OPTIONAL MODULES

FOUNDATIONS OF MEDICINAL CHEMISTRY (CHEM141)

Credits: 15 / Semester: semester 1

This module will introduce the area of medicinal chemistry and the underpinning cellular biology where it is applied. The course will delve into the chemical aspects of molecular and cellular biology and the processes that allow life to exist, and subsequently discuss the key cellular targets of interest to a medicinal chemist in the drug design process. This material will form the foundations needed to progress onto higher years of medicinal chemistry where modern case studies and the principles of pharmacology will be looked at in greater depth.

INNOVATIVE CHEMISTRY FOR ENERGY AND MATERIALS (CHEM184)

Credits: 15 / Semester: semester 2

The module covers a wide variety of topics in the area of innovative chemistry for energy and materials. This will act as an introduction to these areas to enable the student to pursue their interests to a deeper level independently, and to provide a foundation level knowledge in materials and electrochemistry, to be expanded in subsequent core and optional chemistry modules.

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

YEAR TWO

You will learn more advanced topics within all the main branches of Chemistry and continue to develop your Quantitative and Key Skills.

Practical skills will be developed through stand-alone practical modules and you will have the opportunity to spend between six and nine hours per week in the laboratory.

COMPULSORY MODULES

COORDINATION AND ORGANOMETALLIC CHEMISTRY OF THE D-BLOCK METALS (CHEM214)

Credits: 15 / Semester: semester 2

The module introduces the descriptive coordination and organometallic chemistry and the concepts underpinning our understanding of this chemistry.

ORGANIC CHEMISTRY II (CHEM231)

Credits: 15 / Semester: semester 1

This module is the core Organic Chemistry module for Year 2 Chemistry students. It introduces important carbon-carbon bond forming reactions within a mechanistic and synthetic framework, together with exposure to a selection of stereochemical issues.

PREPARATIVE CHEMISTRY: SYNTHESIS AND CHARACTERISATION (CHEM245)

Credits: 15 / Semester: semester 1

The module presents a unified approach to the synthesis and characterisation of organic and inorganic compounds, introducing a range of synthetic techniques, experiments and analytical methods.

MEASUREMENTS IN CHEMISTRY (CHEM246)

Credits: 15 / Semester: semester 2

This is a practical module in which students learn the practice of taking physical measurements, the critical analysis and evaluation of experimental data, the application of measurements to the study of chemical phenomena and the dissemination of results.

PHYSICAL CHEMISTRY II (CHEM260)

Credits: 15 / Semester: whole session

This module expands on the fundamentals of Physical Chemistry that were introduced in Year 1. The principles and applications of thermodynamics, kinetics and spectroscopy are covered in detail with more emphasis on derivation of key results than in Year 1. Quantum mechanics is developed from the basic principles and mathematical description of quantum phenomena. It is applied to describe bonding in small molecules and in solids, and is linked to spectroscopy via detailed description of molecular energy levels and the possible transitions between these permitted by quantum mechanics.

KEY SKILLS FOR CHEMISTS 2 (CHEM280)

Credits: 15 / Semester: whole session

This module aims to (i) further develop the quantitative skills of a student, (ii) introduce students to the Chemistry Key Skill of Molecular Modelling, and (iii) maintain student development of general transferable and employability skills. The overarching learning outcome is that students will gain the necessary key skills to perform well in their chemistry degree programmes. By the end of the module students will have improved their ability to perform and apply mathematical techniques to problems in kinetics, thermodynamics, quantum mechanics and molecular symmetry. They will have developed abilities to employ force-field and Quantum Chemistry techniques in Molecular Modelling using the Spartan package. They will also have further developed their range of transferable and employability skills, including written and oral communication and team working.

OPTIONAL MODULES

AN INTRODUCTION TO MEDICINAL CHEMISTRY (CHEM248)

Credits: 7.5 / Semester: semester 2

This module introduces students to the fundamental principles that underpin modern medicinal chemistry.

APPLIED ANALYTICAL CHEMISTRY (CHEM286)

Credits: 7.5 / Semester: semester 2

This is an introductory module that aims to illustrate the fundamental theoretical principles of selected instrumental analytical techniques (NMR spectroscopy, mass-spectrometry, ICP-OE(MS) spectroscopy, separation and hyphenated techniques) in the context of their roles in industrial and academic research, to include chemical and pharmaceutical analysis.

CHEMISTRY FOR SUSTAINABLE TECHNOLOGIES (CHEM284)

Credits: 7.5 / Semester: semester 2

This module introduces the basic concepts of sustainability and sustainable development, particularly in relation to their technological underpinnings. The module will address the role of chemistry in relation to broad societal, environmental and developmental questions. The module also gives a fundamental understanding of the principles and technologies in Green Chemistry and the generation of Renewable Energy and Chemicals.

FUNCTIONAL ORGANIC MATERIALS (CHEM241)

Credits: 15 / Semester: semester 1

Organic functional materials are of increasing global importance with applications in energy, medicine and electronics. This module will highlight how functional organic materials such as high-performance polymers, crosslinked polymers and composites, and porous materials can be designed for specific applications. The module will also explain how advanced characterisation methods (including scattering techniques, gas sorption, size exclusion chromatography, thermogravimetric analysis, tensile measurement, and electron microscopy) are used in the development of modern materials. Additionally, this module will provide an introduction to polymers, outlining aspects of polymer synthesis, properties and characterisation. Some of the history, importance, and current issues of polymeric materials – such as sustainability – will be discussed to provide an understanding of the wider context. CHEM241 will be useful to chemists who wish to develop a deeper understanding of how organic compounds can be designed to provide functional materials

INORGANIC APPLICATIONS OF GROUP THEORY (CHEM316)

Credits: 7.5 / Semester: semester 2

This module shows how an understanding of the symmetry properties of molecules can be applied to the understanding of spectroscopic selection rules and bonding.

SCIENCE COMMUNICATION (CHEM390)

Credits: 15 / Semester: whole session

This module gives students the generic skills required for teaching science to school pupils from Years 5 to 7, including basic training in safeguarding. Students then work in pairs or groups of three to develop practical chemistry sessions and deliver them in the Central Teaching Laboratory to visiting groups from local schools.

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

YEAR IN INDUSTRY (YEAR THREE)

COMPULSORY MODULES

YEAR IN INDUSTRY (BSC) (CHEM350)

Credits: 120 / Semester: whole session

Students spend 1 year on an industrial placement, working at the company. Students will be given opportunities and gain confidence to apply theory and practical skills in a real-time work environment. During the placement, the student will be expected to write a literature review and a final report, but the majority of the year will be spent concentrating on the industrial placement. These activities will provide opportunities to develop the student's transferable skills and professional competence leading to enhanced employability.

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

YEAR FOUR

In your final year you will continue to study the three main branches of chemistry, organic, inorganic and physical chemistry, but the emphasis is on the application of chemistry to the modern world.

You will also further develop skills to enhance your employability and general chemistry skills, including a module on further key skills and molecular modelling.

COMPULSORY MODULES

FURTHER ORGANIC CHEMISTRY (CHEM333)

Credits: 15 / Semester: semester 1

An extension of second year organic chemistry, covering pericyclic reactions, rearrangements and fragmentations, radical reactions, uses of phosphorous, sulphur and selenium in synthetic chemistry, as well as some core physical-organic concepts.

INORGANIC MATERIALS CHEMISTRY (CHEM313)

Credits: 15 / Semester: semester 1

This module builds on the fundamental inorganic chemistry that students have studied previously to give an appreciation of the science underpinning the development of modern materials. It will discuss the fundamentals of crystalline and disordered solids, and magnetism; methods for synthesising materials; characterisation techniques; applications of inorganic materials; and the link between the chemistry, structure and function of materials.

KEY SKILLS FOR CHEMISTS 3 (CHEM385)

Credits: 7.5 / Semester: semester 1

This module aims to help Chemistry students develop skills needed for further educational opportunities (i.e. MSc/PhD) or employment in a wide range of chemical and non-chemical based sectors. During the 'Employability skills' section, students will look at a variety of employability related skills, job application exercises, interview preparation techniques and presentation experience. This will be in the form of asynchronous lectures, online and in-person workshops and in-person tutorials and will require reflective thinking and group work – this will be facilitated by the module staff and other colleagues from the institution and wider industry. During the 'database' section, students will further their knowledge of the scientific literature developed during years 1/2 by engaging with more advanced aspects of various databases and writing a scientific electronic report of an experiment the students have completed in the laboratory.

MODERN APPLICATIONS OF PHYSICAL CHEMISTRY (BSC) (CHEM352)

Credits: 15 / Semester: semester 2

The aim of this module is to reinforce and extend the students' knowledge of Physical Chemistry. Three areas of contemporary relevance in Physical Chemistry will be introduced to demonstrate the application of basic Physical Chemistry concepts to practical applications and to broaden the students' knowledge of the subject area. These areas are the Physical Chemistry of the Condensed Phase, Protein Structure and Folding and the Photochemistry of the Atmosphere. The module is delivered largely by lectures/podcasts, supplemented by tutorial workshops.

PRACTICAL CHEMISTRY YR3 (BSC) (CHEM365)

Credits: 22.5 / Semester: semester 1

In this module, students will carry out a bespoke collection of advanced experiments in three of the areas of Organic, Inorganic, Physical or Computational Chemistry.

CHEM356 – YEAR 3 CHEMISTRY PROJECT (BSC. LEVEL) (CHEM356)

Credits: 15 / Semester: semester 2

This module is a mini project for Final Year BSc Chemistry students. Students will be assigned an extended experiment on a synthetic (organic or inorganic), physical (catalysis, electrochemistry, surface science, modelling, nanoparticles) or other types of project, according to their own interests/abilities and project availability. However, the project does not necessarily have to be research or laboratory based, although these would be expected to cover the majority of cases. School outreach projects and some development projects may be available.

OPTIONAL MODULES

ADVANCED FUNCTIONAL ORGANIC MATERIALS (CHEM342)

Credits: 7.5 / Semester: semester 2

Organic functional materials are of increasing global importance with applications in energy, medicine and engineering. The module will build on content from CHEM241 to take a detailed look at recent developments in organic materials including high performance/ speciality polymers, porous materials and drug delivery systems.

BIOLOGICAL ENERGY CONVERSION PROCESSES (CHEM382)

Credits: 7.5 / Semester: semester 2

This module will focus on energy conversion processes found in nature. Energy as a commodity is described as "reducing power" or as "high energy electrons" and the concept of nutrient or fuel is introduced. Biological energy conversion processes are discussed from an evolutionary perspective, and it is described how they have contributed to the current composition of the planet's atmosphere and crust. Sustainability issues will become apparent when comparing the time scales of biogenic fuel accumulation and human consumption of fuel.

BIORENEWABLE CHEMICALS FROM BIOMASS (CHEM384)

Credits: 7.5 / Semester: semester 2

This module provides the scientific and technical foundation to understand the utilisation of biomass, the emerging renewable chemicals industry, biorefineries and the implications that these technologies will have.

CHEMISTRY FOR SUSTAINABLE TECHNOLOGIES (CHEM284)

Credits: 7.5 / Semester: semester 2

This module introduces the basic concepts of sustainability and sustainable development, particularly in relation to their technological underpinnings. The module will address the role of chemistry in relation to broad societal, environmental and developmental questions. The module also gives a fundamental understanding of the principles and technologies in Green Chemistry and the generation of Renewable Energy and Chemicals.

HETEROCYCLIC CHEMISTRY AND DRUG SYNTHESIS (CHEM338)

Credits: 7.5 / Semester: semester 2

The module presents the synthesis and reactivity of the most important classes of heterocyclic compounds and shows case studies drawn from major drug classes.

AN INTRODUCTION TO MEDICINAL CHEMISTRY (CHEM248)

Credits: 7.5 / Semester: semester 2

This module introduces students to the fundamental principles that underpin modern medicinal chemistry.

APPLIED ANALYTICAL CHEMISTRY (CHEM286)

Credits: 7.5 / Semester: semester 2

This is an introductory module that aims to illustrate the fundamental theoretical principles of selected instrumental analytical techniques (NMR spectroscopy, mass-spectrometry, ICP-OE(MS) spectroscopy, separation and hyphenated techniques) in the context of their roles in industrial and academic research, to include chemical and pharmaceutical analysis.

CHEM358 CHEMISTRY AT SURFACES (CHEM358)

Credits: 7.5 / Semester: semester 2

At the surfaces of materials, the Chemistry can be very different from that in molecules and in the bulk of materials. Having fewer neighbouring atoms and molecules than in the bulk, the surface atoms can adopt quite different bonding environments. The electronic structure is affected and therefore the reactivity of surface atoms is different. This course will introduce students to the Chemistry at surfaces, how surface structure is determined and described, what chemical processes occur at surfaces and how this knowledge is applied in particular surface chemistries and surface nanotechnology.

FURTHER ANALYTICAL CHEMISTRY (CHEM386)

Credits: 15 / Semester: semester 2

Further Analytical Chemistry provides the students with a knowledge of the principles of structural elucidation and application of various spectroscopic and spectrometric analytical techniques for identification and structural characterization of small molecules. This module will include the fundamental principles of selected instrumental analytical techniques (solution NMR spectroscopy, mass-spectrometry, separation and hyphenated techniques) in the context of their application for structural analysis in synthetic organic chemistry and catalysis.

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

HOW YOU'LL LEARN

Laboratory classes in years one and two prepare you for independent laboratory work in years three. In year three you will carry out mini research projects, applying learning in computational modelling and molecular visualisation that are introduced in year one.

You will be able to perform your own calculations to underpin final year research projects.

HOW YOU'RE ASSESSED

You are assessed by examination at the end of each semester (January and May/June) and by continuous assessment of laboratory practicals, class tests, workshops, tutorials and assignments.

You have to pass each year of study before you are allowed to progress to the following year. Re-sit opportunities are available in September at the end of years one and two. If you take an industrial placement, a minimum standard of academic performance is required before you are allowed to embark on your placements. All years of study (with the exception of year one) contribute to the final degree classification.

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.

Careers and employability

Our graduates develop a wide range of skills including numeracy, problem solving and IT in addition to scientific skills. Visits to the Department by leading companies such as GlaxoSmithKline and Unilever ensure that you make contact with prospective employers at key stages in your final year.

Typical careers of our graduates include

- assistant analyst
- development chemist
- research assistant
- site chemist.

Recent employers:

- GlaxoSmithKline
- Unilever
- IOTA Nanosolutions Ltd
- Perstorp Caprolactones
- Shell
- Towers Watson
- United Utilities.

4 IN 5 CHEMISTRY STUDENTS FIND THEIR MAIN ACTIVITY AFTER GRADUATION MEANINGFUL.

Graduate Outcomes, 2018-19.

Fees and funding

Your tuition fee covers almost everything, but you may have additional study costs to consider, such as books, specialist equipment or field trips.

TUITION FEES

UK fees (applies to Channel Islands, Isle of Man and Republic of Ireland)	
Full-time place, per year	£9,250

International fees	
Full-time place, per year	£27,200

Fees are correct for the academic year 2024/25

Tuition fees cover the cost of your teaching and assessment, operating facilities such as libraries, IT equipment, and access to academic and personal support. [Learn more about tuition fees, funding and student finance.](#)

ADDITIONAL COSTS

Lab coats and safety goggles are provided free of charge.

Find out more about the [additional study costs](#) that may apply to this course.

SCHOLARSHIPS AND BURSARIES

We offer a range of scholarships and bursaries to provide tuition fee discounts and help with living expenses while at university.

Check out our [Undergraduate Global Advancement Scholarship](#). This offers a tuition fee discount of up to £5,000 for eligible students starting an undergraduate degree from September 2024. There's also [the Liverpool Bursary](#) which is worth £2,000 per year for eligible students.

[Discover our full range of undergraduate scholarships and bursaries](#)

Entry requirements

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

Your qualification	Requirements About our typical entry requirements
A levels	<p>ABB two science A Levels including Chemistry AAB one science A Level including A in Chemistry</p> <p>Applicants with the Extended Project Qualification (EPQ) are eligible for a reduction in grade requirements. For this course, the offer is BBB with A in the EPQ.</p> <p>You may automatically qualify for reduced entry requirements through our contextual offers scheme.</p> <p>If you don't meet the entry requirements, you may be able to complete a foundation year which would allow you to progress to this course.</p> <p>Available foundation years:</p> <ul style="list-style-type: none">• Chemical Sciences BSc (Hons) (4 year route including a Foundation Year at Carmel College)
GCSE	4/C in English and 4/C in Mathematics
Subject requirements	<p>Two science A levels including Chemistry and a second science. Acceptable second sciences are: Mathematics, Further Mathematics, Physics, Biology, Geography, Geology, Computing, Computer Science and Economics.</p> <p>For applicants from England: Where a science has been taken at A level (Chemistry, Biology, Geology or Physics), a pass in the Science practical of each subject will be required.</p>
BTEC Level 3 National Extended Diploma	<p>D*DD in relevant diploma. Students will be invited to attend interview and take an assessment.</p> <p>Applicants must be completing the BTEC National Extended Diploma in Applied Science and be studying the following optional modules:</p> <ul style="list-style-type: none">• Applications of Inorganic Chemistry

Your qualification	Requirements About our typical entry requirements
	<ul style="list-style-type: none"> • Applications of Organic Chemistry • Practical Chemical Analysis. <p>For previous BTEC (QCF) qualification:</p> <p>The Applied Science pathway is acceptable and the following optional modules must be studied:</p> <ul style="list-style-type: none"> • Chemical Periodicity and its Applications • Industrial Applications of Organic Chemistry and/or Industrial Chemical Reactions • Mathematical Calculations for Science and/or Using Statistics in Science • Chemical Laboratory Techniques and/or Chemistry for Biology Technicians
International Baccalaureate	33 points including 6 points from Chemistry at higher level and 5 points from one other science at higher level
Irish Leaving Certificate	H1, H2, H2, H2, H3, H3 (including Chemistry and one other Science)
Scottish Higher/Advanced Higher	Not accepted without Advanced Highers
Welsh Baccalaureate Advanced	Accepted at grade B, including 2 science A levels at grades AB including Chemistry
Access	45 Level 3 credits in graded units in a relevant Diploma, including 30 at Distinction and a further 15 with at least Merit. 15 Distinctions are required in each of Chemistry and a Second Science. Students will be invited to attend interview and take an assessment.
International qualifications	Many countries have a different education system to that of the UK, meaning your qualifications may not meet our direct entry requirements. Although there is no direct Foundation

Your qualification	Requirements About our typical entry requirements
	Certificate route to this course, completing a Foundation Certificate, such as that offered by the University of Liverpool International College , can guarantee you a place on a number of similar courses which may interest you.

ALTERNATIVE ENTRY REQUIREMENTS

- If your qualification isn't listed here, or you're taking a combination of qualifications, [contact us](#) for advice
- [Applications from mature students](#) are welcome.

THE ORIGINAL

REDBRICK