Medicinal Chemistry with a Year in Industry BSc (Hons)

COURSE DETAILS

- A level requirements: ABB
- UCAS code: F1B3
- Study mode: Full-time
- Length: 3 years

KEY DATES

- Apply by: 31 January 2024
- Starts: 23 September 2024

Course overview

Chemistry graduates are at the heart of science, underpinning some of the world's most dynamic and exciting industries. This Medicinal Chemistry degree makes an ideal foundation for a wide range of career pathways or further study.

INTRODUCTION

Our BSc programmes offer flexibility to choose optional modules from outside Chemistry. On this course 25% of your time will be allocated to studying pharmacology and biomedical sciences.

This programme will give you a solid grounding in all aspects of chemistry combined with an introduction to pharmacology, making it ideal for a wide range of career pathways, or further postgraduate training after your degree.

The first two years of this programme are identical to the MChem Chemistry with Pharmacology (F1BF) programme. Students take designated modules in biomedical and biological sciences and medicinal chemistry. You will progress rapidly during the first two years, studying a mix of theory and practical modules to give you a solid grounding in the subject.

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.

In year three, you only take organic and practical sections of the BSc Chemistry (F100) programme and take designated pharmacology modules that aim to help you apply your

knowledge of chemistry and pharmacology to pharmaceutical problems, with particular reference to drug design and development.

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

If you decide during the first 18 months that you want to aim for a research career in chemistry, then you can transfer to the MChem Chemistry with Pharmacology (F1BF) or MChem Chemistry (F102) programmes provided you have obtained an average mark at the 2:1 level or above (60%).

WHAT YOU'LL LEARN

- Computational modelling
- Foundations of medicinal Chemistry
- Maths for Chemistry
- Key quantitative skills
- Aspects of chemical research
- How to present data effectively

ACCREDITATION

This programme has 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

COMPULSORY 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.

INTRODUCTION TO PHYSIOLOGY AND PHARMACOLOGY (LIFE106)

Credits: 15 / Semester: semester 2

This module introduces students to the fundamentals of human physiology and pharmacology and how they complement each other. The lectures will be supported with a range of learning support materials, for example multimedia and text based resources. Students will also be provided the opportunity to consolidate and extend their learning through a variety of assessments. The module will be assessed via two assessments; the first in week 6, which is a group poster worth 25% and an individual abstract for the poster worth 15%; the second at the end of the module, after week 12, which is a MCQ / MAQ assessment worth the remaining 60% for the module.

This module has a focus on the fundamental principles of physiology such has homeostasis and control of normal function, including examples such as the cardiovascular, respiratory, and nervous systems, plus others. In addition, the module introduces the underlying elements required to develop an understanding to study pharmacology in more detail. Its systems approach provides a solid foundation upon which a number of Biological and also Biomedical degrees can flourish.

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.

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

YEAR TWO

COMPULSORY 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.

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.

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.

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.

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.

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.

PRACTICAL PHARMACOLOGY (LIFE234)

Credits: 7.5 / Semester: semester 2

This module aims to provide practical experience in many of the techniques specifically used in the study of Pharmacology. It will also provide you with the specialist skills and knowledge of techniques necessary to undertake practical work and project work in Year Three. Each practical will be introduced through a 15-20 minute presentation and will run for 3 hours. The module will be assessed through a report describing the experimental techniques and main findings of one of the key practicals, and through a final online assessment aimed at evaluating student understanding of the experimental approaches, underpinning pharmacological principles and data processing/interpretation.

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.

PRINCIPLES OF PHARMACOLOGY (LIFE207)

Credits: 15 / Semester: semester 1

This module will provide an understanding of the quantitative aspects of drug action on cellular receptors and will address the relationship between drug efficacy and chemical structure.

The module will introduce the basic principles of pharmacokinetics, outline the relationship between drug concentration and response, and include an introduction to the principles of toxicity of drugs and their metabolites.

The module will provide knowledge of the molecular biology of receptors.

The lectures will be supplemented with online resources. Students will be given guided reading, and regular formative assessment exercises will enable students to evaluate their understanding of the module.

The module will be assessed by both an online test and a final examination.

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

You will study selected components from the BSc Chemistry (F100) programme plus 30 credits of modules from Pharmacology.

COMPULSORY MODULES

ANTIMICROBIAL CHEMOTHERAPY FOR CHEMISTS (LIFE348)

Credits: 15 / Semester: semester 2

This module is aimed specifically at F1B2 and F1BF students. The aim of this module is to reinforce the relevance and importance of the principles of chemotherapy learned in level 5 (antibacterial chemotherapy) and extend the application of these principles to diseases caused by viruses (e.g. HIV/AIDS) and parasites (e.g. malaria). The module will be assessed by coursework which will consist of TWO separate assessments.

Module material will be delivered primarily through a mixture of recorded and live online lectures as well as face-2-face on-campus sessions (subject to Covid-19 restrictions), supported by materials on Canvas and other web-based resources for students' independent learning. Students will be directed to key articles in the literature (textbooks, original papers and review articles) and be expected to use this material to inform their independent learning. A revision tutorial will prepare students for the second assessment (Week 13/14).

DRUG ACTION (LIFE206)

Credits: 15 / Semester: semester 2

This module aims to enable students to develop their understanding of the cardiovascular, endocrine and central nervous systems and the mechanisms by which drugs interact with physiological processes operating within each of these systems. They will also gain an appreciation of the drug development process, including clinical trials and drug regulation. The lectures will be supplemented with on-line resources. Students will be given guided reading, and regular formative assessment exercises in class will enable students to evaluate their understanding of the module. The module will be assessed by an online test and a final examination.

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.

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.

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.

MEDICINAL CHEMISTRY OF ANTI-INFECTIVES (CHEM335)

Credits: 7.5 / Semester: semester 1

This module will introduce students to the fundamental principles that underpin modern medicinal chemistry of anti-infective drugs, building on the principles taught in the introductory medicinal chemistry module CHEM248.

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

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, biorefinaries 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.

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.

CHEMISTRY RESEARCH INTERNSHIP (CHEM309)

Credits: 22.5 / Semester: semester 1

The research internship is designed to give students the experience of working in a research environment or setting that is quite different from any project work that they undertake in the laboratories in the Department of Chemistry. It should provide an insight into how students may apply skills and experiences later in their career; whether working abroad, in industry or in any other scientific setting.

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.

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.

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 year three. In year three you will carry out mini research projects.

Computational modelling and molecular visualisation are introduced as interactive animated models from year one, reinforced as a key skill in later years.

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. You are expected to perform at a 2:1 level if you wish to continue on a MChem programme.

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

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. Graduates find employment in many areas, from the pharmaceutical industry to business management.

Typical careers of our graduates include:

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

Recent employers of our graduates are:

- AstraZeneca
- GlaxoSmithKline
- IOTA Nansolutions Ltd
- Johnson Matthey
- Perstorp Caprolactones
- Shell
- Towers Watson
- Unilever
- United Utilities.

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

Graduate Outcomes, 2018-19.

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	£9,250
Year abroad fee	£1,385

International fees	
Full-time place, per year	£27,200
Year abroad fee	£13,050

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

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

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	ABB 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. You may automatically qualify for reduced entry requirements through our contextual offers scheme. 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. Available foundation years: • 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	Where Chemistry is the only science A level offered, an offer may be made at AAB including an A in Chemistry. 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.
BTEC Level 3 National Extended Diploma	D*DD in relevant diploma. Students will be invited to attend interview and take an assessment. Applicants must be completing the BTEC National Extended Diploma in Applied Science and be studying the following optional modules: • Applications of Inorganic Chemistry • Applications of Organic Chemistry • Practical Chemical Analysis.

Your qualification	**Requirements** About our typical entry requirements
	For previous BTEC (QCF) qualification: The Applied Science pathway is acceptable and the following optional modules must be studied: • 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 entry requirements. Completing your Foundation Certificate, such as that offered by the University of Liverpool International

Your qualification	Requirements About our typical entry requirements
	College, means you're guaranteed a place on your chosen course.

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