

# Microbiology and Infection MBiol

## COURSE DETAILS

- A level requirements: [AAB](#)
- UCAS code: C503
- Study mode: Full-time
- Length: 4 years

## KEY DATES

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

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## Course overview

Microbiology is the study of microorganisms such as bacteria, viruses and parasites. You will study aspects of microbiology including the identification of microorganisms, how they are transmitted, how they interact with the host in disease and how they can be controlled.

## INTRODUCTION

The Master of Microbiology and Infection (MBiol) is a four-year programme, in which students first follow the three-year BSc in Microbiology and Infection, and then continue into a fourth year, subject to performance.

In the first three years, you'll study a broad range of modules which cover areas such as molecular microbiology, infectious disease and global health, immunology, therapeutics and genomics with the opportunity to specialise and carry out your own research project.

The fourth (Master's) year aims at developing enhanced research and personal skills for students seeking a high-level career in research (e. g. studying for a PhD or working in industry) or those seeking to enhance their qualification. Students will join a research team to undertake a significant research project. Students can also apply for a six-week summer research internship in the UK or overseas or apply to spend time working in industry or in other enterprises in the final year.

## WHAT YOU'LL LEARN

- Develop practical and theoretical knowledge of Microbiology with a focus on areas relevant to human health and disease.
- Develop practical skills in Microbiology, Infection and Disease

- Enhance your understanding of topical issues, ethical principles and professionalism in Microbiology & Infection
  - Become literate in finding, interpreting, evaluating and managing information
  - Communicate ideas effectively to a variety of audiences
  - Work independently and collaboratively
  - Develop critical thinking and problem-solving skills
  - Use lab equipment correctly and safely
  - Plan, initiate, and carry out projects
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# Course content

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

## YEAR ONE

In this first year, you'll gain an understanding of core concepts of biology as well as the fundamental principles of immunity, infection, and therapy. You will also study how organisms develop and function and learn about ecology and the global environment. You will develop practical skills, and you will discover how to utilise quantitative skills and study techniques.

### COMPULSORY MODULES

- Biology core concepts, principles, and fundamentals BIOS101
- Development, function, immunity, infection, and therapeutics BIOS102
- Introductory Practical Skills for Life Sciences BIOS103
- From Individuals to Ecosystem BIOS104
- Study and Communication Skills Tutorials BIOS105
- Applied Practical Research Skills for Life Sciences BIOS106

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

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## YEAR TWO

In your second year you'll expand your range of knowledge, building those essential research skills, experimental design and analysis together with professional skills preparing you for a career within or outside the area of Microbiology & Infection. You will study molecular microbiology and therapeutics, genetics and immunology, cell signalling and explore the relationship between hosts and parasites. In addition, you will have optional modules enabling you to follow your interests in drug discovery and development, physiology or metabolism.

### COMPULSORY MODULES

- Genetics, Microbiology & Infection BIOS201
- Intermediary Practical Research Skills for Life Sciences BIOS203
- Academic & professional skills tutorials BIOS205
- Practical Skills in Microbiology, Infection & Disease BIOS206
- The Cellular Basis of Health & Disease BIOS209
- Molecular Microbiology & Therapeutics BIOS218

### OPTIONAL MODULES (CHOOSE ONE)

- Parasites, Pathogens and Hosts BIOS211
- Chemistry for Life Sciences BIOS215

### OPTIONAL MODULES (CHOOSE ONE)

- Metabolism BIOS212
- Cellular and Systems Physiology BIOS214
- Drug Discovery & Development BIOS216

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

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## **YEAR THREE**

Year three will provide an unparalleled opportunity for you to learn at the cutting edge of microbiology and infection research and be taught by world-leading academics in the subjects of genomics, infectious diseases, and global challenges in infection. In addition, you will have optional modules enabling to follow your interests in cell signalling or immunology and veterinary pathology. You will also have the opportunity to take a physical or virtual placement. Central to this year is the research project where you will plan and execute your own research, analyse and critically evaluate data and communicate your research findings in your chosen specialisation.

### COMPULSORY MODULES

- Research Project BIOS301
- Introduction to the World of Work BIOS302
- Research Methods BIOS303
- Applied Microbiology and Infection BIOS314
- Genomics and Evolution of Microbes BIOS317
- Global Challenges in Infection BIOS319

### OPTIONAL MODULES (CHOOSE ONE)

- How do cells make decisions? BIOS331
- Immunology and Veterinary Pathology BIOS335

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

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## **YEAR FOUR**

The fourth year of study offers great flexibility – students may spend it entirely on campus at Liverpool, but more commonly they take up opportunities to broaden their experiences, for example a six-week research internship in the UK (in hospitals, industry or research institutes) or abroad (in our partner universities in Thailand or China). Others may elect to spend the entire fourth year on placement, in similar host institutions. Students will take core modules in research methods and statistics or informatics, together with a 60-credit research project. Students may replace the internship with other modules that cover advanced topics of global importance.

### OPTIONAL MODULES (CHOOSE ONE)

- Advanced Statistics for Biological Research LIFE707
- Informatics for Life Sciences LIFE721

OPTIONAL MODULES (Students choose either the research internship, or two of the remaining modules)

- Research Internship LIFE701
- Coding for Life Sciences LIFE733
- Cellular Biotechnology and Biological Imaging LIFE749
- Emerging Infections and Pandemic LIFE751
- Immunology LIFE728
- Diagnostics Therapeutics and Vaccines LIFE732
- Computational Biology LIFE752
- Proteomics, Metabolomics and Data Analysis LIFE754
- Synthetic Biology and Biotechnology LIFE756

## **COMPULSORY MODULES**

### **RESEARCH PROJECT (LIFE700)**

**Credits: 60 / Semester: whole session**

The School offers a range of projects that allow students to conduct research individually at Masters level under the supervision of a member of academic staff. Topics are closely allied to the research field of the supervisor, and the basis of the project may involve data collection by observation and experimentation in situ (field projects), in vitro (laboratory projects), or in silico (bioinformatics). However, all types of projects have the same learning outcomes (that is, all students should acquire the same kinds of skills; see below), achieved by in-depth study. The nature of the lab or field-based projects might be adapted if the field trips or labs access are limited due to unavoidable circumstances.

### **RESEARCH METHODS AND APPLICATIONS IN BIOLOGICAL SCIENCES (LIFE731)**

**Credits: 15 / Semester: whole session**

This module will provide students with an understanding of the processes and methods required for the successful planning and delivery of research projects. It will also introduce students to the latest, cutting edge technologies that will support their research field of interest. It will develop in students the transferrable communication skills that will enable them to disseminate their findings to both scientific and general audiences.

## **OPTIONAL MODULES**

### **CODING FOR LIFE SCIENCES (LIFE733)**

**Credits: 15 / Semester: semester 1**

This module is aimed at postgraduate students in the Life Sciences, wishing to learn about methods for use in data-intensive research. The module provides a broad introduction to the use of Python coding for performing basic tasks in the biological sciences. The student will get practical experience in writing their own Python scripts for basic bioinformatics tasks, such as manipulating DNA, RNA and protein sequences, file input/output and working with other programs, such as BLAST. There is also an introduction to data visualisation using Python, and simple techniques used in data science, including a basic introduction to machine learning.

Around 10 hours of lectures will be provided on core topics, with a strong emphasis on practical activity in workshops (totalling around 40 hours), allowing students to gain confidence in writing scripts for their own tasks. The module will be assessed by two short coding assignments, one team working coding assignment building a bioinformatics pipeline, and a data science mini-project.

### **CELLULAR BIOTECHNOLOGY AND BIOLOGICAL IMAGING (LIFE749)**

**Credits: 15 / Semester: semester 1**

Modern biotechnology and bioimaging applies novel tools and approaches to address today's global challenges.

You will learn a variety of methods in mammalian cell biotechnology as well as imaging technologies that range from the microscopic scale to cellular and organ imaging in vivo. You will develop knowledge of a diversity of cell analysis techniques. Furthermore, the use of reporter genes for various types of imaging will be explained, including imaging technologies for cell analysis on the microscopic level as well as for cell imaging and functional analysis in animal models of disease.

The lectures will convey basic knowledge and include examples of applications from actual research publications, or the lecturer's own research work, in equal measure. The students will have learning tutorials on critical appraisal of literature. There will also be a practical workshop on contemporary microscopy.

The module will be taught through a combination of lectures, workshops and practical exercises. There are two written assessments in this module.

## **EMERGING INFECTIONS AND PANDEMICS (LIFE751)**

**Credits: 15 / Semester: semester 1**

This is a key module for students on the MSc Infection and Immunity Programme and might also be taken by other MSc, MBioSci and MRes students whose interests include infection and immunology. The module is topical in light of the pandemic and will address areas of research-connected infection biology teaching across areas of broad relevance to infectious disease, as well as to coronavirus. The module includes research connected lectures, workshops and structured discussions on selected texts as student-led topics. The content will focus on areas of infectious disease that support the programme and are relevant in that: (i) they are current/topical or (ii) they address fundamental questions of general importance. In addition, students will also be supported with key research and ideas in emerging infections and pandemics, showing how interconnected nature of health and disease through integrating aspects of biology and society. The module assessments are aimed at: 1) writing a report on a selected emerging pathogen that communicates the multifactorial considerations for researchers and society 2) presentation of a key factor that contributes to or affects disease emergence and the response by society or an agency. The factor focused on will be selected from workshops and student-led discussions

## **IMMUNOLOGY (LIFE728)**

**Credits: 15 / Semester: semester 2**

This is a key module for students on the MSc Infection and Immunity Programme and might also be taken by other MSc, MBioSci and MRes students whose interests include infection and immunology. The module is topical in light of the pandemic and will address areas of research-connected immunology teaching across areas of broad relevance to infectious disease, as well as to coronavirus. The module includes research connected lectures, workshops and structured discussions on selected texts as student-led seminars. The content will focus on areas of immunology that support the programme and are relevant in that: (i) they are current/topical or (ii) they address fundamental questions of general importance. In addition, students will also be supported with key research and ideas in immune mechanisms and host defence, showing how research fields progress and our understanding of defence mechanisms develop. The module assessments are aimed at: 1) using graphics to show illustratively specific and complex immunological host-pathogen interactions and will aid skills in image design; and 2) poster presentation to demonstrate immunological interactions based on the student-led workshops on host defence and microbial evasion.

## **COMPUTATIONAL BIOLOGY (LIFE752)**

**Credits: 15 / Semester: semester 2**

With the advent of genomics and functional genomics, biology has become a quantitative data-rich discipline. This has created unprecedented opportunities in virtually every area of life sciences. With the right tools, it is now possible to address fundamentally important biological questions simply analysing already available datasets. This module is designed to prepare students for this very challenge. The module covers the most important aspects of computational biology. These range from the analysis of large datasets to infer biological mechanisms to the use of mathematical modelling to conceptualize and simulate complex biological phenomena. In addition to providing an intuitive overview of the basic theoretical principles, the module will focus on real life applications through multiple cases studies. Among these, students will learn how to identify drug targets and mechanisms of drug resistance and how to understand mathematical models of biological systems. They will then learn aspects of quantitative system pharmacology and physiologically based pharmacokinetic modelling pharmacokinetic/pharmacodynamic modelling.

The module will be taught through a combination of lectures, workshops and seminars. The module will be assessed via a written a report and a literature critique.

## **PROTEOMICS METABOLOMICS AND DATA ANALYSIS (LIFE754)**

**Credits: 15 / Semester: semester 2**

Proteomics and metabolomics represent powerful tools towards unbiased, quantitative and high-throughput analysis of biological systems. Rapid "omic" technological developments in the post-genomic era have provided insights into protein structures, biosynthesis and interactions, as well as the complex metabolic processes that are of significant importance in biological and medical research. The aims of this course are to provide a comprehensive understanding of proteomic and metabolomic techniques and related data analysis, and to illustrate how they can be applied in fundamental biological research and industrial applications. The module will be taught by lectures and workshops. The module will be assessed via two a scientific reports.

## **SYNTHETIC BIOLOGY AND BIOTECHNOLOGY (LIFE756)**

**Credits: 15 / Semester: semester 2**

Synthetic Biology and Biotechnology will provide an in-depth understanding of the grand challenges in biotechnological applications and the principles underlying synthetic biology and modern biotechnological techniques that are designed to sustainably address specific problems. The module also aims to teach tools and strategies being developed and applied in the rapidly expanding field of synthetic biology and train students with practical experience in green biotechnology.

The module will be taught through a combination of lectures and workshops. The lectures will convey basic knowledge or the lecturer's own research work. The workshops will provide students with the opportunity to analyse relevant data relevant to the biotechnology field. The module will be assessed via a scientific report and a scientific review.



## **ADVANCED STATISTICS FOR BIOLOGICAL RESEARCH (LIFE707)**

**Credits: 15 / Semester: semester 1**

Successful research in the biological sciences inevitably depends on the power that statistical inference provides for hypothesis testing. Understanding which test to use and when is the key to success. This module aims to further this understanding of, and competence in, the use of statistical techniques in the design of experiments in biological research, and in the analysis and interpretation of data.

The module is available to students who are on-campus (LIFE707) or, alternatively, who are studying on a University of Liverpool programme while off-campus (LIFE607), for example in a yearly placement in industry or while studying at an overseas University.

The learning and teaching materials are delivered as an online set of resources (available through Canvas). The module aims to provide a guide to the statistics that students will need to complete an advanced research project (M-level or PhD), and the ability to develop a research-level statistical approach to the analysis of biological data. The module will also introduce students to the powerful open access statistical software package, R.

## **RESEARCH INTERNSHIP (LIFE701)**

**Credits: 30 / Semester: semester 1**

The internship is undertaken as placement in the summer period between years 3 and 4 of the MBIolSci programme. The student will work with a research group working on a specific project or a set of related projects. A senior member of the project team will provide day today supervision. The purpose of the internship is for the student to understand the objectives of the research (in of light of the research strategy of the group or institute), how the research is conducted and managed, and how the data are recorded and analysed. The student will also learn how project design is influenced by factors such as, the business strategy of the company, the research priority areas of the country, and ultimately the funding opportunities available to support the research.

## **DIAGNOSTICS, THERAPEUTICS AND VACCINES (LIFE732)**

**Credits: 15 / Semester: semester 2**

For students with interests in infection biology, the module will enhance skills and enable critically evaluation of key concepts, technologies and multifactorial considerations circumscribing diagnostics, therapeutics and vaccines. The module is topical in light of the current pandemic. The research-connected teaching will focus on prevention, limitation and treatment of infectious disease.

The module comprises lectures, workshops and seminars and uses active-learning delivery methods to ensure students can synthesise and evaluate relative merits, attributes, issues and applications of the topics. There are two coursework assessments in the module: 1) writing a report on a selected emerging pathogen that communicates the multifactorial considerations for researchers and society 2) presentation of a key factor that contributes to or affects disease emergence and the response by society or an agency. Materials will be included on the VLE to develop digital fluency and promote assimilation and appraisal of the module content.

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

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## **HOW YOU'LL LEARN**

You will experience a range of learning environments during your studies at Liverpool. These will include student-centred activities as well as lectures, tutorials, laboratory practicals, dissection classes, fieldwork, data handling sessions and computer workshops. Some of these activities will be performed individually, such as personal research projects, and others in small tutorial or project groups, in addition to formal lectures and workshops. You will have research staff as well as your own academic adviser for individual tuition on our acclaimed tutorial programme.

## **HOW YOU'RE ASSESSED**

As well as factual knowledge and understanding, biologists need practical and organisational skills, and an ability to work both alone and with other people. We record development of these abilities through continuous assessment during each semester and by final examination.

## **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.

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# Careers and employability

As a Life Sciences graduate from the University of Liverpool, you will have an excellent set of career options ahead of you.

Typical types of roles/routes our graduates have gone on include:

- Postgraduate study: (MBiolSci, MSc, MRes, MPhil or PhD)
- Public sector – research institutes, government departments, the National Health Service, forensic science and the Environment Agency
- Commercial sectors – pharmaceutical, food, biotechnology, water and agriculture industries
- Journalists and information/liaison officers – by developments in molecular biology and biotechnology
- Teaching profession by taking a postgraduate qualification (PGCE)
- Routes to postgraduate Medicine, Dentistry or Veterinary Science.

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

*Graduate Outcomes, 2018-19.*

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# Fees and funding

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

## TUITION FEES

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

<b>International fees</b>	
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.](#)

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## 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 includes the costs associated with placements or internships, and the optional field course in Uganda.

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

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## 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](#)

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# Entry requirements

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

Your qualification	Requirements <a href="#">About our typical entry requirements</a>
A levels	<p>Typical A level offer AAB</p> <p>Applicants with the Extended Project Qualification (EPQ) are eligible for a reduction in grade requirements. For this course, the offer is <b>ABB</b> with <b>A</b> in the EPQ.</p> <p>You may automatically qualify for reduced entry requirements through our <a href="#">contextual offers scheme</a>.</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"><li>• <a href="#">Biological Sciences (with a Foundation Year) leading to BSc (Hons)</a></li></ul>
GCSE	4/C in English and 4/C in Mathematics
Subject requirements	<p>Also accepted as a second science: Environmental Science, Mathematics, Physics, Geography, Psychology, Geology and Applied Science.</p> <p>For applicants from England, where A levels in Biology, Chemistry or Physics have been taken, we will also require a pass in the Practical Endorsement</p>
BTEC Level 3 National Extended Diploma	<p>D*D*D in Applied Science with a selection of preferred units in Biology and Chemistry, to include Distinction in Units 1 and 5 (Principles and Applications of Science I and II).</p> <p>For previous BTEC (QCF) qualification:</p> <p>D*D*D in Applied Science with a selection of preferred units in Biology and Chemistry, with at least 120 Level 3 credits at Distinction.</p>

<b>Your qualification</b>	<b>Requirements</b> <a href="#">About our typical entry requirements</a>
	Please note alternative BTEC subjects are not acceptable for this programme.
BTEC Applied Science unit requirements	<a href="#">View the BTEC Applied Science unit requirements.</a>
International Baccalaureate	34 points, including 6 in Higher Level Biology, and 5 in another Higher Level Subject
Irish Leaving Certificate	H1, H1, H2, H2, H2, H3
Scottish Higher/Advanced Higher	Not accepted without Advanced Highers at grades ABB
Welsh Baccalaureate Advanced	Accepted at grade B as equivalent to a third non-science A level at grade B.
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 Biology and Chemistry. GCSE Mathematics and English grade C/4 also required.
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 <a href="#">University of Liverpool International College</a> , 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**