# UNIVERSITY OF LIVERPOOL

MMath

# Mathematical Physics with a Year Abroad

**UCAS code** FGH2

| Entry requirements | Study mode | Duration |
|---|---|---|
| A level: ABB | Full-time | 5 years |

Apply by: **29 January 2025**
Starts on: **22 September 2025**

# About this course

Combining the study of Physics and Mathematics in your degree programme will give you a strong foundation for your future career. You will learn mathematical techniques to help you deal with new ideas and will understand new concepts such as quantum mechanics and relativity. This four year courses means you will graduate with a Master's qualification.

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## Introduction

Mathematics is a fascinating, beautiful and diverse subject to study. It underpins a wide range of disciplines; from physical sciences to social science, from biology to business and finance.

Physics is the most fundamental of the sciences. New concepts, such as quantum mechanics and relativity, are introduced at degree level in order to understand nature at the deepest level. These theories have profound philosophical implications because they challenge our view of the everyday world. At the same time they have a huge impact on society since they underpin the technological revolution.

Combining the study of Physics and Mathematics in your degree programme will give you a strong mathematical training. You will learn mathematical techniques to help

you to deal with new ideas that often seem counterintuitive, such as string theory, black holes, superconductors and chaos theory.

Physics and Mathematics degrees are highly prized and our graduates have excellent career opportunities.

With this degree programme you also have the option to spend your third year abroad, an incredible opportunity to spend one academic year at one our partner universities expanding your academic and cultural horizons.

## What you'll learn

- Numeracy
- Problem solving skills
- Ability to reason and communicate clearly
- Teamwork
- Presentation skills

# Course content

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

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## Year one

In Year One you will take three core mathematics modules, a module in Newtonian Mechanics, and four physics modules. After passing the first year, you have the flexibility of transferring to Mathematics or Physics if you wish, subject to approval.

## Modules

| Compulsory modules | Credits |
|---|---|
| CALCULUS I (MATH101) | 15 |
| CALCULUS II (MATH102) | 15 |
| FOUNDATIONS OF QUANTUM PHYSICS (PHYS104) | 15 |
| INTRODUCTION TO COMPUTATIONAL PHYSICS (PHYS105) | 7.5 |
| INTRODUCTION TO LINEAR ALGEBRA (MATH103) | 15 |
| NEWTONIAN MECHANICS (MATH122) | 15 |
| PRACTICAL SKILLS FOR MATHEMATICAL PHYSICS (PHYS156) | 7.5 |
| THERMAL PHYSICS AND PROPERTIES OF MATTER (PHYS102) | 15 |
| ELECTRICITY, MAGNETISM AND WAVES (PHYS103) | 15 |

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

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## Year two

All modules in year two are compulsory.

# Modules

| Compulsory modules | Credits |
| --- | --- |
| CLASSICAL MECHANICS (MATH228) | 15 |
| COMPLEX FUNCTIONS (MATH243) | 15 |
| CONDENSED MATTER PHYSICS I (PHYS202) | 15 |
| ELECTROMAGNETISM I (PHYS201) | 15 |
| NUCLEAR AND PARTICLE PHYSICS (PHYS204) | 15 |
| QUANTUM AND ATOMIC PHYSICS I (PHYS203) | 15 |
| VECTOR CALCULUS WITH APPLICATIONS IN FLUID MECHANICS (MATH225) | 15 |
| DIFFERENTIAL EQUATIONS (MATH221) | 15 |

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

## Year abroad (year three)

You are required to spend the year abroad on an approved placement at a European or overseas partner institution.

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

## Year four

Exactly one of the modules MATH325 and PHYS361 must be taken. Exactly one of the project modules MATH334 and PHYS305 must be taken.

# Modules

| Compulsory modules | Credits |
| --- | --- |
| FURTHER METHODS OF APPLIED MATHEMATICS (MATH323) | 15 |
| RELATIVITY (MATH326) | 15 |

| Optional modules | Credits |
| --- | --- |
| QUANTUM MECHANICS (MATH325) | 15 |
| QUANTUM AND ATOMIC PHYSICS II (PHYS361) | 15 |
| MATHEMATICAL PHYSICS PROJECT (MATH334) | 15 |
| COMPUTATIONAL MODELLING (PHYS305) | 15 |
| PHYSICS INTERNSHIP (PHYS309) | 15 |
| CARTESIAN TENSORS AND MATHEMATICAL MODELS OF SOLIDS AND VISCOUS FLUIDS (MATH324) | 15 |
| SOLID STATE PHYSICS (PHYS363) | 7.5 |
| NUCLEAR PHYSICS (PHYS375) | 15 |
| PRACTICAL PHYSICS III (PHYS306) | 15 |
| MATERIALS PHYSICS AND CHARACTERISATION (PHYS387) | 7.5 |

| Optional modules | Credits |
| --- | --- |
| SEMICONDUCTOR APPLICATIONS (PHYS389) | 7.5 |
| PHYSICS DATA ANALYSIS WITH STATISTICS (PHYS392) | 15 |
| STATISTICAL THERMODYNAMICS (PHYS393) | 7.5 |
| MORE IS DIFFERENT: STATISTICAL MECHANICS, THERMODYNAMICS, AND ALL THAT (MATH327) | 15 |
| GAME THEORY (MATH331) | 15 |
| NUMERICAL METHODS FOR ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS (MATH336) | 15 |
| THE MAGIC OF COMPLEX NUMBERS: COMPLEX DYNAMICS, CHAOS AND THE MANDELBROT SET (MATH345) | 15 |
| DIFFERENTIAL GEOMETRY (MATH349) | 15 |
| INTRODUCTION TO STRING THEORY (MATH423) | 15 |
| ELECTROMAGNETISM II (PHYS370) | 15 |
| RELATIVITY AND COSMOLOGY (PHYS374) | 15 |
| PARTICLE PHYSICS (PHYS377) | 15 |
| SURFACES AND INTERFACES (PHYS381) | 7.5 |
| NUCLEAR POWER (PHYS376) | 15 |
| ENERGY GENERATION AND STORAGE (PHYS372) | 7.5 |
| MAGNETIC PROPERTIES OF SOLIDS (PHYS399) | 7.5 |

| Optional modules | Credits |
|---|---|
| INTRODUCTION TO MODERN PARTICLE THEORY (MATH431) | 15 |
| MATHEMATICAL BIOLOGY (MATH335) | 15 |
| MATHEMATICS OF NETWORKS AND EPIDEMICS (MATH338) | 15 |

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

## Year five

You will choose optional modules below to make up a total of 75 credits, with at least 37.5 credits being from MATH modules.

# Modules

| Compulsory modules | Credits |
|---|---|
| ADVANCED QUANTUM PHYSICS (PHYS480) | 15 |
| MATHEMATICAL PHYSICS PROJECT (MATH420) | 30 |

| Optional modules | Credits |
|---|---|
| LINEAR DIFFERENTIAL OPERATORS IN MATHEMATICAL PHYSICS (MATH421) | 15 |
| QUANTUM FIELD THEORY (MATH425) | 15 |
| CLASSICAL MECHANICS (PHYS470) | 15 |
| ACCELERATOR PHYSICS (PHYS481) | 15 |

| Optional modules | Credits |
| --- | --- |
| CORRELATED ELECTRON MATERIALS (PHYS486) | 7.5 |
| PHYSICAL PRINCIPLES OF MATERIALS (PHYS487) | 7.5 |
| NANOSCALE PHYSICS AND TECHNOLOGY (PHYS499) | 7.5 |
| INTRODUCTION TO STRING THEORY (MATH423) | 15 |
| ADVANCED TOPICS IN MATHEMATICAL BIOLOGY (MATH426) | 15 |
| WAVES, MATHEMATICAL MODELLING (MATH427) | 15 |
| ASYMPTOTIC METHODS FOR DIFFERENTIAL EQUATIONS (MATH433) | 15 |
| PHYSICS OF LIFE (PHYS482) | 7.5 |
| ADVANCED NUCLEAR PHYSICS (PHYS490) | 15 |
| NEUTRINOS AND DARK MATTER (PHYS492) | 7.5 |
| RELATIVISTIC QUANTUM MECHANICS AND INTERACTIONS (PHYS493) | 15 |
| INTRODUCTION TO MODERN PARTICLE THEORY (MATH431) | 15 |

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

## Teaching and assessment

# How you'll learn

Your learning activities will consist of lectures, tutorials, practical classes, problem classes, private study and supervised project work.

In year one, lectures are supplemented by a thorough system of group tutorials and computing work is carried out in supervised practical classes. Key study skills,

presentation skills and group work start in first-year tutorials and are developed later in the programme.

The emphasis in most modules is on the development of problem solving skills, which are regarded very highly by employers. Project supervision is on a one-to-one basis, apart from group projects in year two.

Your learning activities will consist of lectures, tutorials, practical classes, problem classes, private study and supervised project work.

There is a large set of modules available, some of which are taught in alternate years. MMath/MPhys students will take at least seven of these during Years three and four. There is also a compulsory project.

## How you're assessed

Most modules are assessed by a two and a half hour examination in January or May, but many have an element of coursework assessment. This might be through homework, class tests, mini-project work or key skills 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.

# Careers and employability

Physics and Mathematics degrees are highly prized and our graduates have excellent career opportunities in industrial research and development, computing, business, finance and teaching.

Typical types of work our graduates have gone onto include:

- An actuarial trainee analyst
- A graduate management trainee risk analyst
- A trainee chartered accountant.

Recent employers of our graduates are:

- Barclays Bank plc
- Deloitte
- Forrest Recruitment
- Marks and Spencer
- Mercer Human Resource Consulting Ltd.

# 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 - £9,535
Year abroad fee - £1,430 (applies to year in China)

### International fees

Full-time place, per year - £29,100
Year abroad fee - £14,550 (applies to year in China)

The tuition fees shown are correct for 2025/26 entry. Please note that the year abroad fee also applies to the year in China.

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 paying for your studies.

## 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.

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# Entry requirements

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

## A levels

ABB including Mathematics A level at grade A and Physics A level at grade B.

Applicants with the Extended Project Qualification (EPQ) are eligible for a reduction in grade requirements. For this course, the offer is **ABC** with **A** in the EPQ.

You may automatically qualify for reduced entry requirements through our contextual offers scheme. Based on your personal circumstances, you may automatically qualify for up to a two-grade reduction in the entry requirements needed for this course. When you apply, we consider a range of factors – such as where you live – to assess if you're eligible for a grade reduction. You don't have to make an application for a grade reduction – we'll do all the work.

Find out more about how we make reduced grade offers.

## T levels

T levels are not currently accepted.

## GCSE

4/C in English and 4/C in Mathematics

## Subject requirements

Applicants must have studied Mathematics at Level 3 within 2 years of the start date of their course.

For applicants from England: For science A levels that include the separately graded practical endorsement, a "Pass" is required.

## BTEC Level 3 National Extended Diploma

D*DD in relevant diploma, when combined with A Level Mathematics grade A.

## International Baccalaureate

33 including 6 at higher level in Physics and Mathematics.

### Irish Leaving Certificate

H1, H2, H2, H2, H3, H3 including H1 in Mathematics and H2 in Physics

### Scottish Higher/Advanced Higher

Advanced Highers accepted at grades ABB including grade A in Mathematics. Relevant language required for advanced level.

### Welsh Baccalaureate Advanced

Acceptable at grade B alongside AB at A level including grade A in Mathematics and grade B in Physics.

### Access

45 Level 3 credits in graded units in a relevant Diploma, including 39 at Distinction and a further 6 with at least Merit. 15 Distinctions are required in each of Mathematics and Physics.

### International qualifications

Select your country or region to view specific entry requirements.

If you hold a bachelor's degree or equivalent, but don't meet our entry requirements, you could be eligible for a Pre-Master's course. This is offered on campus at the University of Liverpool International College, in partnership with Kaplan International Pathways. It's a specialist preparation course for postgraduate study, and when you pass the Pre-Master's at the required level with good attendance, you're guaranteed entry to a University of Liverpool master's degree.

# 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

6.0 overall, with no component below 5.5

### TOEFL iBT

78 overall, with minimum scores of listening 17, writing 17, reading 17 and speaking 19. TOEFL Home Edition not accepted.

### TOEFL Paper

Grade 6 at Standard Level or grade 5 at Higher Level

### Duolingo English Test

115 overall, with speaking, reading and writing not less than 105, and listening not below 100

### Pearson PTE Academic

59 overall, with no component below 59

### LanguageCert Academic

65 overall, with no skill below 60

### Cambridge IGCSE First Language English 0500

Grade C overall, with a minimum of grade 2 in speaking and listening. Speaking and listening must be separately endorsed on the certificate.

### Cambridge IGCSE First Language English 0990

Grade 4 overall, with Merit in speaking and listening

### Cambridge IGCSE Second Language English 0510/0511

0510: Grade C overall, with a minimum of grade 2 in speaking. Speaking must be separately endorsed on the certificate. 0511: Grade C overall.

### Cambridge IGCSE Second Language English 0993/0991

0993: Grade 5 overall, with a minimum of grade 2 in speaking. Speaking must be separately endorsed on the certificate. 0991: Grade 5 overall.

### Cambridge ESOL Level 2/3 Advanced

169 overall, with no paper below 162

### LanguageCert

Grade 4 at Standard Level or grade 4 at Higher Level

# 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 |
| --- | --- | --- |
| 5.5 overall, with no component below 5.5 | 6 weeks | On campus |
| 5.5 overall, with no component below 5.0 | 10 weeks | On campus and online options available |
| 5.0 overall, with no component below 5.0 | 12 weeks | On campus and online options available |
| 5.0 overall, with no component below 4.5 | 20 weeks | On campus |
| 4.5 overall, with no component below 4.5 | 30 weeks | On campus |
| 4.0 overall, with 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 6.0 overall, with no component below 5.5, for further details.

## 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.

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