UNIVERSITY OF LIVERPOOL

MMath (Hons)

Mathematical Physics

UCAS code FGH1

Entry requirements	Study mode	Duration	
A level: ABB	Full-time	4 years	Apply by: **13 January 2027** Starts on: **27 September 2027**

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.

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. This programme also has a year abroad option, an incredible opportunity to spend an academic year at one of our partner universities. On the four-year integrated master's programme, you can go abroad either between years two and three (apply in year 2), or years three and four (apply in year three). **You will need to have an A level or equivalent in Mathematics and Physics to study this course.**

What you'll learn

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

Accreditation

Institute of Physics (IoP) and Institute of Mathematics and its Applications (IMA)

We have accreditation from the Institute of Physics (IoP) and the Institute of Mathematics and its Applications (IMA).

Both accreditations can be achieved on a conditional basis. Accreditations depend on your choice and your performance on optional modules.

Accreditation in detail

Institute of Mathematics and its Applications (IMA)

The IMA is the professional learned institute for mathematicians, supporting the advancement of mathematical knowledge and its applications to promote and enhance mathematical practice for the benefit of society.

Institute of Physics

This programme is accredited by the Institute of Physics, which means it satisfies the academic requirements for Chartered Physicist status. The Institute of Physics is the professional body for physics in the UK and Ireland.

Back to top

Course content

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

Year one

In your first year, you will take core mathematics modules, a module in Newtonian Mechanics, and 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. As part of our commitment to continuous improvement, we are currently reviewing all of our programmes. This may include refining study pathways, strengthening links with employers, integrating generative AI, developing students' research skills, and enhancing alignment with our research strengths. The course content currently shown on this page reflects the programme as it is running in September 2026. This page will be updated for students beginning in September 2027 by 1 September 2026 at the latest.

Year two

All modules in year two are compulsory.

Modules

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

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Year three

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
PHYSICS DATA ANALYSIS WITH STATISTICS (PHYS392)	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

Optional modules	Credits
CARTESIAN TENSORS AND MATHEMATICAL MODELS OF SOLIDS AND VISCOUS FLUIDS (MATH324)	15
NUCLEAR PHYSICS (PHYS375)	15
PRACTICAL PHYSICS III (PHYS306)	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
NUCLEAR POWER (PHYS376)	15
INTRODUCTION TO MODERN PARTICLE THEORY (MATH431)	15

Optional modules	Credits
MATHEMATICAL BIOLOGY (MATH335)	15
MATHEMATICS OF NETWORKS AND EPIDEMICS (MATH338)	15
PHYSICS OF PLANETS (PHYS355)	15
PHYSICS OF SOUND AND MUSIC (PHYS321)	7.5
SOLID STATE PHYSICS (PHYS302)	15
APPLICATIONS OF PHYSICS PRINCIPLES (PHYS300)	7.5
PHYSICS OF LIFE (PHYS382)	7.5
PHYSICS OF RENEWABLE ENERGY AND ELECTRONIC DEVICES (PHYS312)	15

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Year four

You will choose optional modules below to make up a total of 60 credits, with at least 30 credits being from MATH modules. We regularly review our teaching so the choice of modules may change.

Modules

Compulsory modules	Credits
ADVANCED QUANTUM PHYSICS (PHYS480)	15
DISSERTATION FOR THEORETICAL PHYSICS (MATH434)	45

Optional modules	Credits
LINEAR DIFFERENTIAL OPERATORS IN MATHEMATICAL PHYSICS (MATH421)	15
QUANTUM FIELD THEORY (MATH425)	15
CLASSICAL MECHANICS (PHYS470)	15
ACCELERATOR PHYSICS (PHYS481)	15
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
ADVANCED NUCLEAR PHYSICS (PHYS490)	15
FRONTIERS OF PARTICLE PHYSICS (PHYS492)	15
THEORETICAL FOUNDATIONS OF PARTICLE PHYSICS (PHYS493)	15
INTRODUCTION TO MODERN PARTICLE THEORY (MATH431)	15
NUMERICAL METHODS IN PHYSICS (PHYS405)	15

Optional modules	Credits
ELEMENTS OF STELLAR DYNAMICS (PHYS484)	7.5
PHYSICS OF THE RADIATIVE UNIVERSE (PHYS485)	15

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Teaching and assessment

How you'll learn

You will be taught through a diverse blend of engaging teaching methods, including lectures, tutorials, practical classes, video content, interactive learning sessions, independent study, and supervised project work.

The department of mathematical sciences offers a vibrant, stimulating, and supportive learning environment with highly motivated and exceptionally qualified staff, renowned for their world-leading research and teaching.

In year 1, lectures are supplemented by a thorough system of small-group tutorials; computing work is carried out in supervised practical classes. Key study skills, presentation skills and group work start in the first year and are developed later in the programme. The emphasis in most modules is on the development of problem-solving and critical thinking skills, which are regarded very highly by employers.

How you're assessed

Each module has an assessment scheme tailored to fit its syllabus. This might include traditional written exams, class tests, assignments, projects, group work, or online exercises with automatic marking and immediate feedback.

Liverpool Learning Framework

At Liverpool, we take a distinctive approach to education through the Liverpool Learning Framework. This means teaching that is engaging, inclusive and designed to help you succeed during your studies and beyond.

You'll develop specialist subject knowledge alongside the skills employers value most, including:

- Digital fluency
- Confidence
- Global citizenship

Our curriculum is characterised by the three Liverpool Hallmarks:

- Research-connected teaching - learning informed by the latest ideas and discoveries
- Active learning - taking part, applying knowledge and learning by doing
- Authentic assessment - assessments designed around real-world tasks and challenges

We also embed key priorities across our curriculum, including AI literacy, employability, and sustainability, helping you prepare for the future and make a positive impact in the world.

We're committed to creating a supportive and inclusive learning environment where every student can thrive.

Back to top

Careers and employability

A degree in mathematics provides access to an almost limitless range of rewarding career paths. As a graduate with a mathematics degree from the University of Liverpool, you'll have an extremely valuable set of analytical and critical thinking skills that employers value, enabling you to pursue careers in almost any field.

Graduates with a mathematics-based degree are in high demand across a broad spectrum of industries, thanks to their expertise in quantitative analysis, problem-solving, and mathematical modelling. Some of the key career paths include:

- Data Science and Analytics: Mathematics graduates are well-equipped to work as data scientists, data analysts, or business analysts. Their skills in statistical modelling, machine learning, and data interpretation are highly sought after in sectors like finance, healthcare, and tech.
- Engineering and Technology: Mathematics graduates can work in engineering roles, including systems engineering, computational modelling, and simulation. They may also contribute to software development, particularly in fields that require complex algorithms, like AI and cybersecurity.
- Operations Research and Logistics: Companies in manufacturing, transportation, and supply chain management often hire mathematics graduates to optimise processes, improve efficiency, and reduce costs. Roles include operations research analyst, supply chain planner, and logistics coordinator.
- Healthcare and Biostatistics: Mathematics is increasingly used in medical research, epidemiology, and healthcare analytics. Careers may include a biostatistician, a health data analyst, or a mathematical modeller in disease forecasting.

The versatility of a mathematics-based degree allows graduates to enter nearly any sector that requires mathematical modelling, statistical analysis, and algorithmic problem-solving. The growing demand for data-driven decision making in today's world ensures that career prospects remain strong, with opportunities for advancement and specialisation across fields.

Back to top

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 - £10,050
Year in industry fee - £2,010
Year abroad fee - £1,508 (applies to year in China)

International fees

Full-time place, per year - £32,000
Year in industry fee - £1,955
Year abroad fee - £16,000 (applies to year in China)

The UK fees shown are for the academic year 2027/28. The international fees shown are for the academic year 2026/27 and will be subject for change for the academic year 2027/28. Please be advised that tuition fees may increase each year for both UK and international students. For UK students, this will be subject to the government's regulated fee limits.

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

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. You can find information on the general and subject-specific costs you could expect to incur on our study costs webpage.

Back to top

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** from A levels, 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.

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 Diploma

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

BTEC Level 3 National Extended Diploma

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

International Baccalaureate

32 points overall with no score less than 4 including 6 in HL Mathematics and 5 in HL Physics, or pass the IB Diploma plus 6,5,5 in three HL subjects (including 6 in HL Mathematics and 5 in HL Physics).

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

B in the Welsh Baccalaureate, plus A level Mathematics at grade A and A level Physics at grade B.

Access

Pass Access to HE Diploma in a relevant subject with 45 Level 3 credits, with 33 at Distinction (including 15 credits in Mathematics and 15 credits in Physics) and 12 at Merit.

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.

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.

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

If you took a TOEFL test on or before 20 January 2026, you'll need 78 overall, with minimum scores of listening 17, writing 17, reading 17 and speaking 19. If you took a TOEFL test from 21 January 2026 onwards, when a new scoring system was introduced, you'll need 4 overall, with 4 or above in all components. TOEFL Home Edition not accepted.

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

International Baccalaureate English A: Literature or Language & Literature

Grade 4 at Standard Level or grade 4 at Higher Level

International Baccalaureate English B

Grade 6 at Standard Level or grade 5 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 or online
5.5 overall, with no component below 5.0	10 weeks	On campus or online
5.0 overall, with no component below 5.0	12 weeks	Online
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.

Back to top

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