Lancaster University

Mathematical Sciences

Undergraduate Degrees 2026

The *beauty* of Mathematical Sciences is that it is an *ever-changing* subject.

From the moment you start your course, you will be part of a community that supports you to secure your future as a Lancaster graduate. We will welcome you to the School of Mathematical Sciences and support your transition to university life.

You will be offered regular meetings with tutors and lecturers, and our strong academic support systems are there to ensure you realise your potential. You will study and grow as a person in a vibrant and safe environment, enjoying a wide range of activities.

We will expect you to work hard, but we will help you to gain the full benefit from your efforts. We cover a broad range of topics in the earlier years, while allowing specialisation later on. The pace will stretch you and assist you to develop, and the results will be well worth it. Come and start your journey with us.

Head of School

Professor Gordon Blower

Be a part of the first generation of AI informed *maths graduates!*

Alongside the pure mathematics and statistics sections, the School of Mathematical Sciences includes a MARS section working on Mathematics for Artificial Intelligence in Real-world Systems. MARS is integrating cutting-edge AI methods and applied mathematics to tackle urgent real-world problems, such as predicting climate events, managing disease outbreaks and protecting against cyber security threats.

What does this mean for Lancaster?

With a £13 million investment from Research England, we are developing new applied mathematical approaches in AI and differential equations to represent complex natural systems; from pandemics to 3D printing, and atmospheric models to safe and secure networks of computers.

AI is revolutionising the way that we live, work and interact with the world. It is pushing the boundaries of scientific inquiry, opening up new possibilities to solve complex problems far beyond our natural abilities.

What does this mean for you?

Our research is defining a new curriculum - we're updating our modules and creating new, exciting topics that put you at the forefront of the field as we develop modern theories to address contemporary problems.

The modules you take; the projects you participate in; and the research you do will provide many opportunities for you to learn about these methods in real-world applications. This is an exciting new era for maths students, which leaves you equipped for many careers.

Our *programmes*

We offer you a suite of flexible degree schemes and a diverse range of module choices to tailor your learning to your area of interest in mathematical sciences. These tables show our typical offer for A level students. See our website for alternative qualifications such as International Baccalaureate or BTEC.

Degree title	Degree (Hons)	UCAS code	Course duration (years)	Typical A level offer (Including Mathematics at grade A)	Typical A level offer (Including Mathematics and Further Mathematics with at least one at grade A)
Mathematics	BSc	G100	3	AAA	AAB
Mathematics (Placement Year)	BSc	G102	4	AAA	AAB
Mathematics (Study Abroad)	BSc	G104	4	AAA	AAB
Mathematics	MSci	G101	4	A*AA	AAA
Mathematics (Study Abroad)	MSci	G103	5	A*AA	AAA
Mathematics and Statistics	BSc	G1G3	3	AAA	AAB
Mathematics and Statistics (Placement Year)	BSc	GCG3	4	AAA	AAB
Mathematics and Statistics (Study Abroad)	BSc	GCG4	4	AAA	AAB
Mathematics and Statistics	MSci	G1GJ	4	A*AA	AAA
Mathematics and Statistics (Study Abroad)	MSci	G1GH	5	A*AA	AAA

Degree title	Degree (Hons)	UCAS code	Course duration (years)	Typical A level offer (Including Mathematics at grade A)	Typical A level offer (Including Mathematics and Further Mathematics at grade AA)
Mathematics, Artificial Intelligence, and Real-world Systems (MARS)	BSc	G114	3	A*AA	AAA
Mathematics, Artificial Intelligence, and Real-world Systems (MARS) (Placement Year)	BSc	G115	4	A*AA	AAA
Mathematics, Artificial Intelligence, and Real-world Systems (MARS) (Study Abroad)	BSc	G116	4	A*AA	AAA

Study abroad available Industry placement available

Degree title	Degree (Hons)	UCAS code	Course duration (years)	Typical A level offer (Including Mathematics at grade A)	Typical A level offer (Including Mathematics and Further Mathematics with at least one at grade A)
Mathematics with Computer Science	BSc	GG14	3	AAA	AAB
Mathematics with Computer Science (Placement Year)	BSc	GG1L	4	AAA	AAB
Mathematics with Computer Science (Study Abroad)	BSc	GG2L	4	AAA	AAB
Mathematics with Computer Science	MSci	GG1K	4	A*AA	AAA
Mathematics with Computer Science (Study Abroad)	MSci	GG2K	5	A*AA	AAA
Mathematics with Economics	BSc	G1L1	3	AAA	AAB
Mathematics with Economics (Placement Year)	BSc	G1L2	4	AAA	AAB
Mathematics with Economics (Study Abroad)	BSc	G1L3	4	AAA	AAB
Mathematics with Philosophy	BSc	GV15	3	AAA	AAB
Mathematics with Philosophy (Placement Year)	BSc	GV16	4	AAA	AAB
Mathematics with Philosophy (Study Abroad)	BSc	GV17	4	AAA	AAB
Mathematics, Operational Research, Statistics and Economics (MORSE)	BSc	GLN0	3	AAA	AAB
Mathematics, Operational Research, Statistics and Economics (MORSE) (Industry)	BSc	GLN1	4	AAA	AAB
Mathematics, Operational Research, Statistics and Economics (MORSE) (Study Abroad)	BSc	GLN2	4	AAA	AAB
Data Science	BSc	G900	3	AAB	AAB
Data Science (Placement Year)	BSc	G901	4	AAA	AAA
Data Science (Study Abroad)	BSc	G902	4	AAA	AAA
Data Science (with Industrial Experience)	MSci	G903	4	AAA	AAA

Degree title	Degree (Hons)	UCAS code	Course duration (years)	Typical A level offer (Including Mathematics and Physics at grade AA)
Theoretical Physics with Mathematics	BSc	F3GC	3	AAA
Theoretical Physics with Mathematics	MSci	F3G1	4	AAA
Theoretical Physics with Mathematics (Study Abroad)	MSci	F3G5	5	AAA

Degree title	Degree (Hons)	UCAS code	Course duration (years)	Typical A level offer
Mathematics (with Foundation Year)	BSc	G10F	4	CCC

Study abroad available Industry placement available

Made for *learning*

Study mathematical sciences in a research environment recognised for excellence. You will learn from some of the world's leading experts in mathematics and statistics.

For the professional

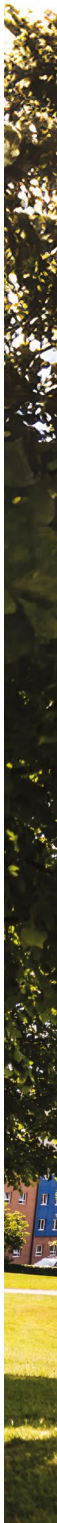
Accreditations from professional bodies are a sign of course quality. The Royal Statistical Society (RSS) and/or the Institute of Mathematics & its Applications (IMA) accredit all of our single-honours degree pathways in Mathematics, and Mathematics and Statistics. For you, this means that our degrees demonstrate both a high level of competency and professionalism in the area of mathematics. Professional bodies open doors to several networks should you choose to engage, and are well recognised by employers.

Flexible and interdisciplinary

It is possible to transfer between Mathematics, Mathematics and Statistics, and Mathematics, Artificial Intelligence, and Real-world Systems (MARS) up until the end of the first year, subject to fulfilling progression criteria.

A supportive school

We are friendly school and foster a highly supportive learning environment, making sure that you are fully supported to achieve your full academic potential. Academic staff who teach on our undergraduate programmes have dedicated office hours for student queries and for additional support. You will receive feedback on all work submitted and teaching staff are happy to discuss this with you if you have any concerns. Additionally, you will be assigned an academic advisor with whom you will meet regularly throughout your degree to discuss your academic progress.



Robert, *fourth year*

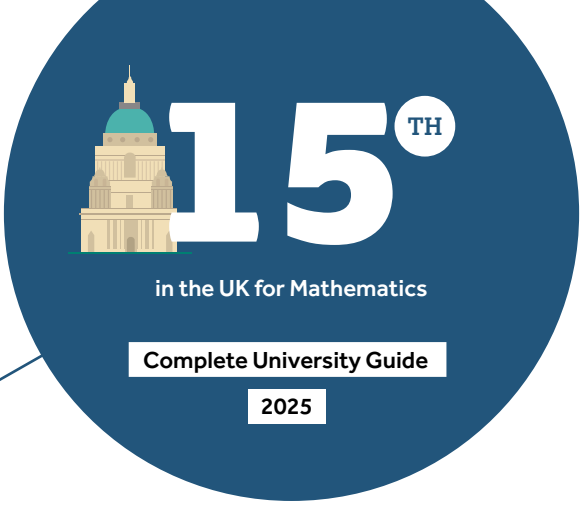
MSci (Hons) Mathematics

Lancaster is one of those places that captivates you from the moment you arrive. Campus life strikes the perfect balance, large enough to explore yet intimate enough to always spot familiar faces as you walk along the spine to your classes. Academically, the School of Mathematical Sciences provides exceptional support. The staff are incredibly approachable, down-to-earth, and genuinely invested in their students' success. The open-door policy means you can always seek help from your lecturers when you need it. These interactions inspired me not only to deepen my mathematical studies but also to extend my course from the three year BSc to the four year MSci, driven by my passion for mathematics and the strong ties I'd developed with Lancaster's supportive academic community. Lancaster University is bursting with opportunities, academically, socially, and professionally. University life is about much more than studying, it's a chance to explore, grow, and thrive. Make the absolute most of your time at Lancaster, and you'll graduate not just with a degree, but with memories and friendships for life.

10TH

in the UK for Mathematics

The Guardian University Guide 2025



Your future career

Have you ever wondered where a degree in maths can take you? The answer is anywhere! The beauty of maths is that it opens doors to many career opportunities. As a maths graduate, you will have a unique and transferable skill set sought after by employers across a wide range of sectors.

Career options

You may choose to pursue your love of numbers in a career such as accountancy, finance or banking. Or you may wish to utilise your logic and analytical skills in management roles, consultancy, civil service, education, software or statistics. Or you could find yourself in developing sectors and emerging industries such as health statistics, data science and software development. We are committed to developing your employability skills whilst you are here at Lancaster and preparing you for your next step.

Internship scheme

Undertaking relevant work experience while you are at university is extremely beneficial when applying for graduate level jobs. Through our Science and Technology Internship Scheme you can apply for paid work placements which give you the opportunity to practise the skills and knowledge learned during your degree. These opportunities can be both full- and part-time, and range from 3 months to a year.

Graduate destinations

Our graduates find that their analytical and organisational skills, plus their ability to achieve insights into problems, are greatly valued by employers in many other areas including in teaching and education, business and management, and marketing and communications.

Our recent graduates have moved into a diverse range of roles, across a variety of different sectors, including:

- Actuarial Analyst
- Analysis Engineer
- Statistical Officer
- Data Analyst
- Finance Modelling Analyst
- Trial Statistician
- Programmer
- Technology Associate
- Consultant
- Teacher

Rhys, Statistician
BSc Hons Mathematics and Statistics (Placement Year) graduate 2021
MSc Data Science graduate 2022

Lancaster University

“I’m incredibly grateful and proud of my time studying Maths at Lancaster; it has opened so many pathways for me.”

IBM

Infectious Disease Data Observatory

When I started my undergraduate degree in Mathematics and Statistics at Lancaster, I had no idea what career I would embark on. Lancaster’s core maths modules in the first years gave me an advanced, yet broad, skillset, equipping me for a placement year with IBM as a Financial Analyst. Afterwards, I craved more challenging data problems to solve, so I specialised in machine learning and statistics in the final year modules, before pursuing an MSc in Data Science also at Lancaster.

Now I work as a Statistician with the Infectious Disease Data Observatory at the University of Oxford, where I transform, analyse and visualise clinical trial data. Throughout the Maths degree, the advanced coding and critical problem solving have been standout elements, which I now use daily to logically break down tasks and code solutions. As an expert in coding, I’ve travelled to Kenya to consult on data pipelines in a malaria study, presented a new tool in Germany and been a part of several academic papers.

I’m incredibly grateful and proud of my time studying Maths at Lancaster; it has opened so many pathways for me, and will continue to, as I’m certain it will for you too.

Ellen, *MSc Data Science student*

BSc (Hons) Mathematics and Statistics (Placement Year) graduate 2024

BSc (Hons) Mathematics and Statistics (Placement Year)

> *“I came back with a clearer understanding of what my future could look like.”*

GlaxoSmithKline

MSc Data Science

In my third year I went on a placement to do Supply Chain Procurement at GSK. My role involved looking after suppliers and taking the lead on site projects to improve sustainability and allow new products to be brought to our site. This was integrated into my degree so I was supported by the University careers department and I had to do a few assignments that counted towards my final grade.

Before my placement, I was unsure what I wanted to pursue as a career so this was an amazing opportunity to start working out what I was and wasn't interested in. My placement experience allowed me to discover what the working world was like but with support from the University. I came back with a clearer understanding of what my future could look like. I have more confidence in presenting, talking to people and my writing abilities which has been really beneficial to my degree, but also to my future career prospects. Looking to the future, I am studying MSc in Data Science here at Lancaster and following this as a career path.

Gain *real-world* experience

Our placement degrees provide the opportunity to spend your third year working in industry. You can gain valuable experience which gives you a strong advantage in the job market, and often helps you to decide which career path you would like to take. You will be supported throughout the placement process, receiving advice and guidance to help you find the right opportunity and to prepare for all aspects of the application process. We'll also support you throughout your time working on placement.

Our students have taken up placements with a range of organisations including IBM, KPMG, the NHS and governments within the UK.

#51 -100

in the world for
Statistics and Operational Research

QS University World Rankings

by Subject 2024

An international *experience*

Lancaster is a truly international university, with students and staff from over 100 different countries and partner institutions around the world. Your global experience is about living and learning with people from different cultures whether through your course, your college or your Students' Union.

Study abroad

Broaden your academic horizons by spending a year studying abroad in either North America or Australasia. You'll study similar modules to those available in Lancaster while gaining an understanding of a different culture and society. For those studying on our Study Abroad programmes, you will spend Year 3 overseas, returning to Lancaster to complete your degree.
Visit **lancaster.ac.uk/study-abroad** to see a full list of the overseas institutions with whom we currently have a partnership arrangement.

Vacation travel

Alternatively, there are often shorter options in the Easter or summer vacation to destinations such as China, Germany, Ghana, India and Malaysia. These programmes include meeting local students and businesses as well as some academic study and cultural discovery.
You may also be able to attend a summer school at one of our many overseas partner universities. Find out more at **lancaster.ac.uk/your-global-experience**.

“Lancaster University will always hold a special place in my heart, even long after I graduate.”

Daniel, *graduate*

BSc (Hons) Mathematics, Operational Research, Statistics and Economics (MORSE) (Industry) 2024

Malaysia

Department for Business and Trade

Lancaster University

Studying a maths-based degree at Lancaster University is challenging but incredibly rewarding. The academic staff push students to grow and develop independent mathematical skills, but provide comprehensive support when students need it with their friendly and approachable attitude. They have also been a source of advice on my future career plans.

What I love about Lancaster University is how it’s surrounded by nature, cultivating a peaceful environment. The campus itself is beautiful, but Lancaster University is also close to the Lake District, which is simply stunning!

Studying at Lancaster University has been a fulfilling experience, where I’ve developed strong friendships and acquired new skills. Lancaster University will always hold a special place in my heart, even long after I graduate.

Mathematics

BSc, MSci Hons

Mathematics is an incredibly powerful subject that sits at the foundation of all science and technology. And, as a Mathematician, you will learn how to see the beauty of maths in everything; from patterns in nature to geometry in buildings.

You will learn about the ways in which mathematics can be used to make a real difference in society, opening you up to a huge range of career paths, from medicine and social care to energy and climate change. Our degree will enable you to become a part of a supportive community of deep thinkers that collaborate to solve problems and to prove and disprove theories.

In your first year, you will explore a wide range of topics, from multivariable calculus, probability and statistics, to logic, proofs and theorems.

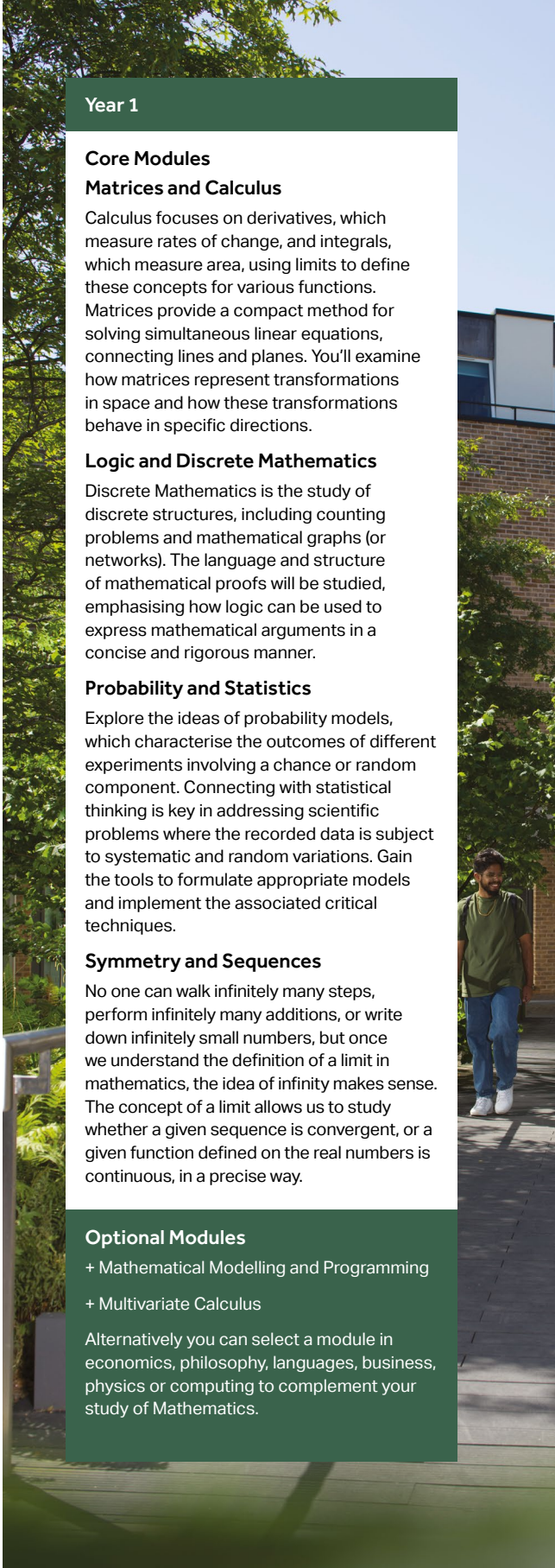
In your second year, as well as deepening your mathematical knowledge in analysis, algebra, probability and statistics, you will start to work on both individual and group projects which will enhance your research and employment skills.

As you progress into your final year, you can choose modules that appeal to your interests, enabling you to delve deeper and gain the specialist skills and knowledge needed to guide you towards a specific career pathway.

Enhancing your curriculum

We continually review and enhance our course curricula to ensure we are delivering the best possible learning experience, and to make sure that the subject knowledge and transferable skills you develop will prepare you for your future.

Information within this publication with respect to courses and modules is correct at the time of publication, and the University will make every reasonable effort to offer courses and modules as advertised. In some cases, changes may be necessary and may result in new modules or some modules and combinations being unavailable, for example as a result of student feedback, timetabling, staff changes and new research.



Year 1

Core Modules

Matrices and Calculus

Calculus focuses on derivatives, which measure rates of change, and integrals, which measure area, using limits to define these concepts for various functions. Matrices provide a compact method for solving simultaneous linear equations, connecting lines and planes. You'll examine how matrices represent transformations in space and how these transformations behave in specific directions.

Logic and Discrete Mathematics

Discrete Mathematics is the study of discrete structures, including counting problems and mathematical graphs (or networks). The language and structure of mathematical proofs will be studied, emphasising how logic can be used to express mathematical arguments in a concise and rigorous manner.

Probability and Statistics

Explore the ideas of probability models, which characterise the outcomes of different experiments involving a chance or random component. Connecting with statistical thinking is key in addressing scientific problems where the recorded data is subject to systematic and random variations. Gain the tools to formulate appropriate models and implement the associated critical techniques.

Symmetry and Sequences

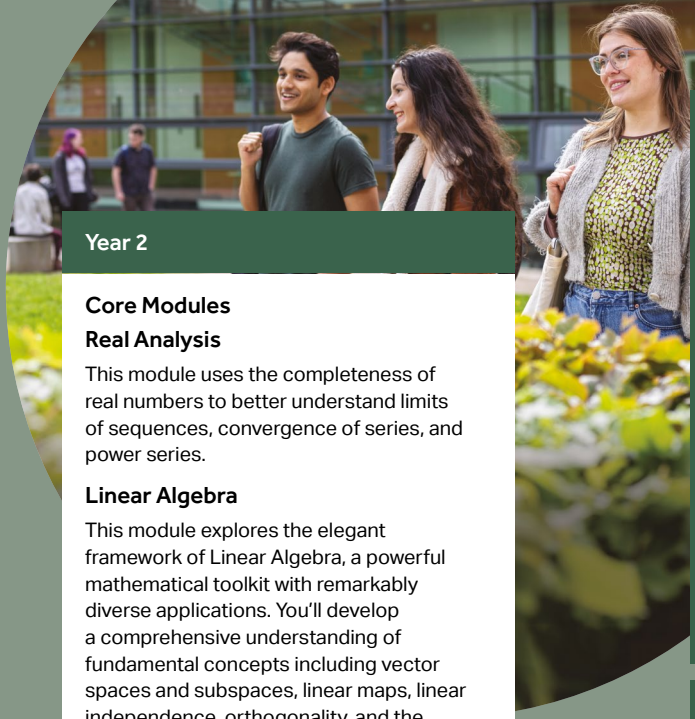
No one can walk infinitely many steps, perform infinitely many additions, or write down infinitely small numbers, but once we understand the definition of a limit in mathematics, the idea of infinity makes sense. The concept of a limit allows us to study whether a given sequence is convergent, or a given function defined on the real numbers is continuous, in a precise way.

Optional Modules

+ Mathematical Modelling and Programming

+ Multivariate Calculus

Alternatively you can select a module in economics, philosophy, languages, business, physics or computing to complement your study of Mathematics.



Year 2

Core Modules

Real Analysis

This module uses the completeness of real numbers to better understand limits of sequences, convergence of series, and power series.

Linear Algebra

This module explores the elegant framework of Linear Algebra, a powerful mathematical toolkit with remarkably diverse applications. You'll develop a comprehensive understanding of fundamental concepts including vector spaces and subspaces, linear maps, linear independence, orthogonality, and the spectral decomposition theorem.

Multivariate Probability and Statistics

You will learn about the random behaviour of multivariate random variables and asymptotic probability theory, both of which are central to statistical inference. You will then be equipped to explore one of the most fundamental statistical models, the linear regression model, and learn how to apply general statistical inference techniques to multi-parameter statistical models.

Project Skills

Researching, collaborating, writing and presenting are key skills for all mathematical sciences students. This course develops these skills and gives you the opportunity to produce a significant group project on a chosen mathematical theme.

Optional Modules

You will choose two modules from a range of options taught by experts within the School of Mathematical Sciences. Options currently include:

+ Complex Analysis
+ Abstract Algebra
+ Applied Data Science
+ Mathematics of Artificial Intelligence
+ Mathematics of Real-world Systems

Please see our website for further examples of options available to you.

Year 3

Optional modules

You will choose six modules from a range of options taught by experts within the School of Mathematical Sciences. Options currently include:

+ Metric Spaces and Topology
+ Mathematical Cryptography
+ Representation Theory
+ Graph Theory and Algorithms
+ Commutative Algebra
+ Mathematical Education

Please see our website for further examples of options available to you.

Year 4 (MSci students only)

Core Modules

Dissertation

Your dissertation represents a culmination of years of mathematical study. It will provide you with concrete evidence of your achievements that you will be able to share with others and a strong dissertation may become an entrance point to a PhD if you are interested in further study.

Optional Modules

You will choose five modules from a range of options taught by experts within the School of Mathematical Sciences. Options currently include:

+ Operators and Spectral Theory
+ Measure and Integration
+ Galois Theory
+ Topics in Modern Number Theory
+ Combinatorics
+ Lie groups and Lie algebras

Please see our website for further examples of options available to you.

Mathematics and Statistics

BSc, MSci Hons

Mathematics and statistics have a positive influence on almost all aspects of contemporary society. Our statistical experts are driving innovations in data science and AI, which are enhancing our day to day lives. As a statistician, you are open to a huge range of career paths, from developing personalised healthcare to cyber security, finance to neuroscience, epidemiology to natural hazard risk management.

In your first year, you will explore a wide range of mathematical topics, including multivariable calculus, probability and statistics, logic, proofs and theorems.

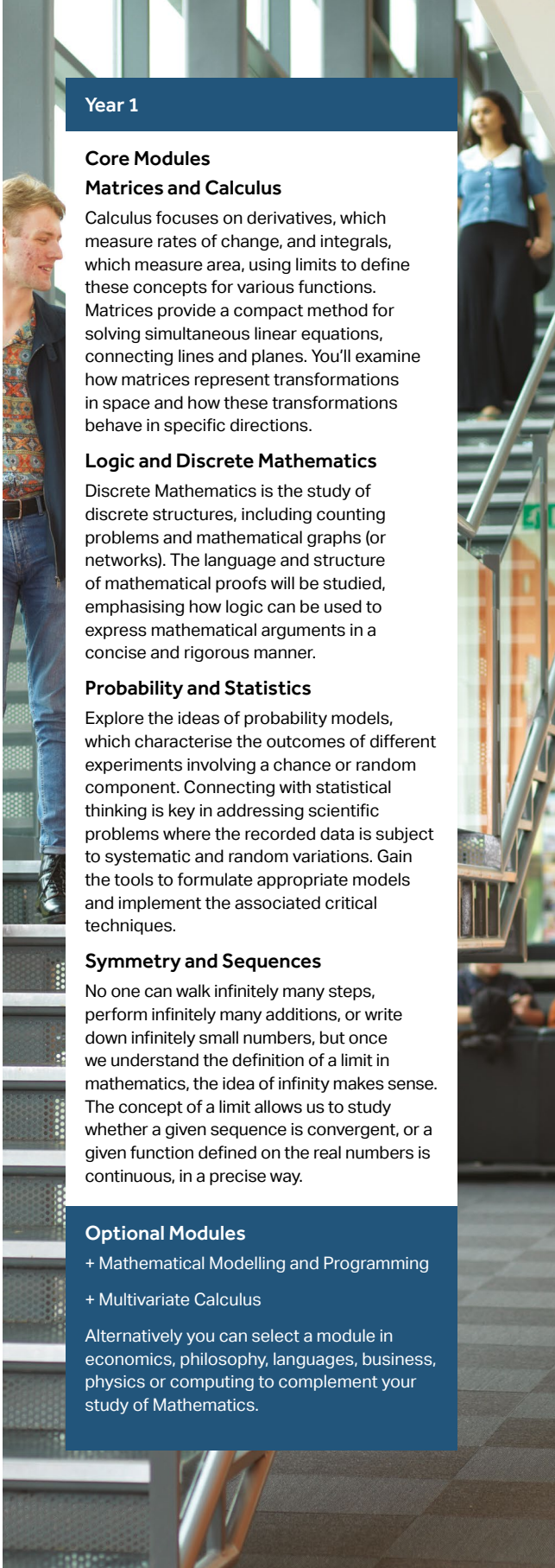
In your second year, as well as deepening your mathematical knowledge in probability and statistics, you will start to work on both individual and group projects which will enhance your research and employment skills.

In your final year, you can choose modules that appeal to your interests, enabling you to delve deeper and gain the specialist skills and knowledge needed to guide you towards a specific career pathway. You will learn how to visualise data, create reliable statistical models and machine learning algorithms, and study effective strategies for the deployment of these methods.

Enhancing your curriculum

We continually review and enhance our course curricula to ensure we are delivering the best possible learning experience, and to make sure that the subject knowledge and transferable skills you develop will prepare you for your future.

Information within this publication with respect to courses and modules is correct at the time of publication, and the University will make every reasonable effort to offer courses and modules as advertised. In some cases, changes may be necessary and may result in new modules or some modules and combinations being unavailable, for example as a result of student feedback, timetabling, staff changes and new research.



Year 1

Core Modules

Matrices and Calculus

Calculus focuses on derivatives, which measure rates of change, and integrals, which measure area, using limits to define these concepts for various functions. Matrices provide a compact method for solving simultaneous linear equations, connecting lines and planes. You'll examine how matrices represent transformations in space and how these transformations behave in specific directions.

Logic and Discrete Mathematics

Discrete Mathematics is the study of discrete structures, including counting problems and mathematical graphs (or networks). The language and structure of mathematical proofs will be studied, emphasising how logic can be used to express mathematical arguments in a concise and rigorous manner.

Probability and Statistics

Explore the ideas of probability models, which characterise the outcomes of different experiments involving a chance or random component. Connecting with statistical thinking is key in addressing scientific problems where the recorded data is subject to systematic and random variations. Gain the tools to formulate appropriate models and implement the associated critical techniques.

Symmetry and Sequences

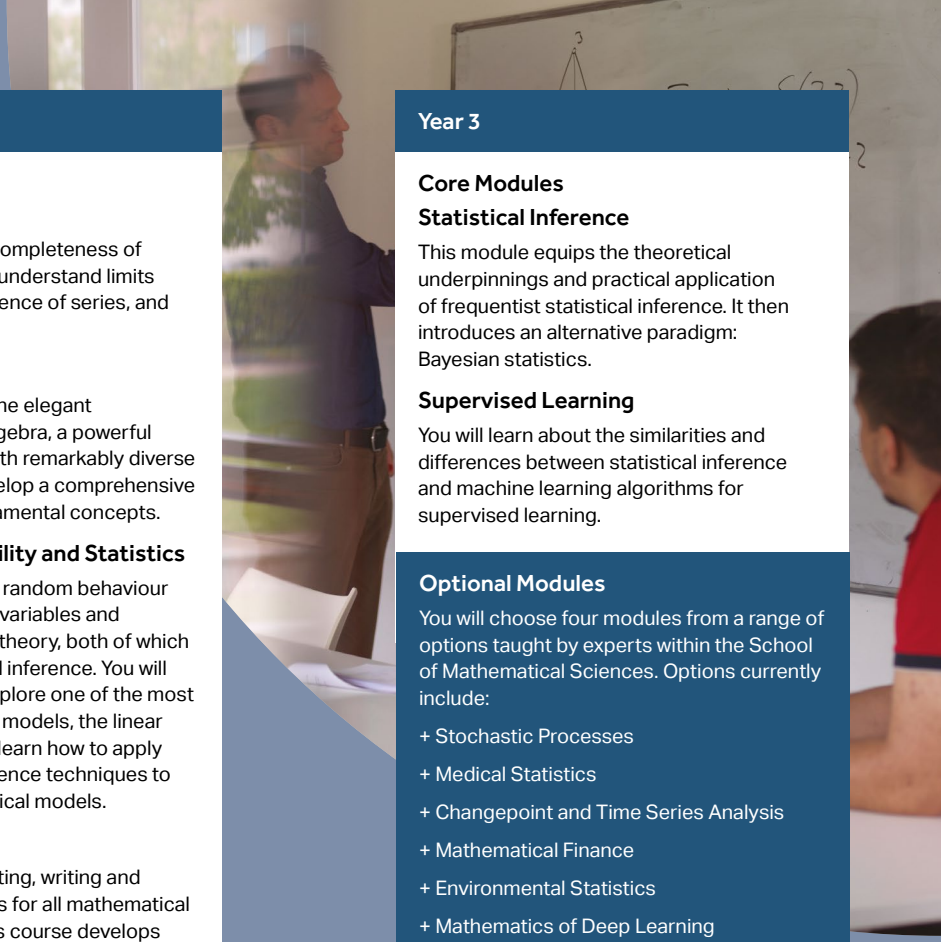
No one can walk infinitely many steps, perform infinitely many additions, or write down infinitely small numbers, but once we understand the definition of a limit in mathematics, the idea of infinity makes sense. The concept of a limit allows us to study whether a given sequence is convergent, or a given function defined on the real numbers is continuous, in a precise way.

Optional Modules

+ Mathematical Modelling and Programming

+ Multivariate Calculus

Alternatively you can select a module in economics, philosophy, languages, business, physics or computing to complement your study of Mathematics.



Year 2

Core Modules

Real Analysis

This module uses the completeness of real numbers to better understand limits of sequences, convergence of series, and power series.

Linear Algebra

This module explores the elegant framework of Linear Algebra, a powerful mathematical toolkit with remarkably diverse applications. You'll develop a comprehensive understanding of fundamental concepts.

Multivariate Probability and Statistics

You will learn about the random behaviour of multivariate random variables and asymptotic probability theory, both of which are central to statistical inference. You will then be equipped to explore one of the most fundamental statistical models, the linear regression model, and learn how to apply general statistical inference techniques to multi-parameter statistical models.

Project Skills

Researching, collaborating, writing and presenting are key skills for all mathematical sciences students. This course develops these skills and gives you the opportunity to produce a significant group project on a chosen mathematical theme.

Applied Data Science

By addressing challenges from a variety of applications such as social science, public health, industry and environmental science, you will learn how to perform and present an exploratory data analysis, deploy established statistical approaches to analyse data and draw conclusions, as well as developing judgement to critically evaluate the appropriateness of chosen methods for real-world challenges.

Optional Modules

You will choose one module from a range of options taught by experts within the School of Mathematical Sciences. Options currently include:

+ Complex Analysis
+ Abstract Algebra
+ Mathematics of Artificial Intelligence

Please see our website for further examples of options available to you.

Year 3

Core Modules

Statistical Inference

This module equips the theoretical underpinnings and practical application of frequentist statistical inference. It then introduces an alternative paradigm: Bayesian statistics.

Supervised Learning

You will learn about the similarities and differences between statistical inference and machine learning algorithms for supervised learning.

Optional Modules

You will choose four modules from a range of options taught by experts within the School of Mathematical Sciences. Options currently include:

+ Stochastic Processes
+ Medical Statistics
+ Changepoint and Time Series Analysis
+ Mathematical Finance
+ Environmental Statistics
+ Mathematics of Deep Learning

Please see our website for further examples of options available to you.

Year 4 (MSci students only)

Core Modules

Dissertation

Your dissertation represents a culmination of years of mathematical study.

Optional Modules

You will choose five modules from a range of options taught by experts within the School of Mathematical Sciences. Options currently include:

+ Estimation and Inference
+ Advanced Statistical Modelling
+ Computing and Algorithms for Statistics
+ Epidemiology and Disease Modelling
+ Machine Learning
+ Clinical Trials

Please see our website for further examples of options available to you.

Mathematics, Artificial Intelligence, and Real-world Systems (MARS)

BSc Hons

Graduate talent is needed to drive innovations which will soon be commonplace in all aspects of our lives. With a degree in Mathematics, Artificial Intelligence and Real-world Systems (MARS), you will have the tools to forge a successful and rewarding career in technologies that will dictate our futures.

In your first year, you will explore a wide range of topics, including differential equations, vector calculus, probability and statistics. In addition to this, you will learn the principles of scientific computing and gain experience working with R and Python programming languages.

As you progress into Years 2 and 3, you will learn to translate contemporary issues into mathematical problems and develop the knowledge and techniques needed to create solutions. Tools such as multivariate calculus and mathematical analysis will be used to understand the algorithms that have revolutionised machine learning and AI.

Enhancing your curriculum

We continually review and enhance our course curricula to ensure we are delivering the best possible learning experience, and to make sure that the subject knowledge and transferable skills you develop will prepare you for your future.

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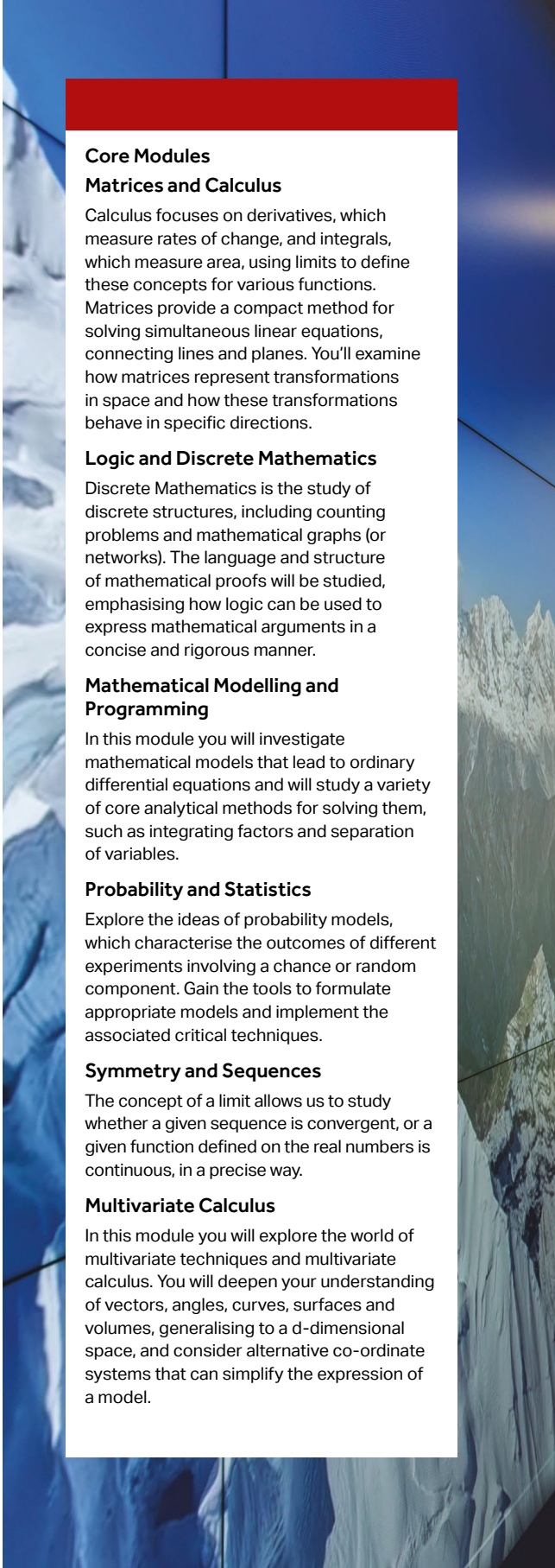


Core Modules

Matrices and Calculus

Calculus focuses on derivatives, which measure rates of change, and integrals, which measure area, using limits to define these concepts for various functions. Matrices provide a compact method for solving simultaneous linear equations, connecting lines and planes. You'll examine how matrices represent transformations in space and how these transformations behave in specific directions.

Logic and Discrete Mathematics

Discrete Mathematics is the study of discrete structures, including counting problems and mathematical graphs (or networks). The language and structure of mathematical proofs will be studied, emphasising how logic can be used to express mathematical arguments in a concise and rigorous manner.

Mathematical Modelling and Programming

In this module you will investigate mathematical models that lead to ordinary differential equations and will study a variety of core analytical methods for solving them, such as integrating factors and separation of variables.

Probability and Statistics

Explore the ideas of probability models, which characterise the outcomes of different experiments involving a chance or random component. Gain the tools to formulate appropriate models and implement the associated critical techniques.

Symmetry and Sequences

The concept of a limit allows us to study whether a given sequence is convergent, or a given function defined on the real numbers is continuous, in a precise way.

Multivariate Calculus

In this module you will explore the world of multivariate techniques and multivariate calculus. You will deepen your understanding of vectors, angles, curves, surfaces and volumes, generalising to a d-dimensional space, and consider alternative co-ordinate systems that can simplify the expression of a model.

Year 2

Core Modules

Real Analysis

This module uses the completeness of real numbers to better understand limits of sequences, convergence of series, and power series.

Linear Algebra

This module explores the elegant framework of Linear Algebra, a powerful mathematical toolkit with remarkably diverse applications. You'll develop a comprehensive understanding of fundamental concepts including vector spaces and subspaces, linear maps, linear independence, orthogonality, and the spectral decomposition theorem.

Multivariate Probability and Statistics

You will learn about the random behaviour of multivariate random variables and asymptotic probability theory, both of which are central to statistical inference. You will then be equipped to explore one of the most fundamental statistical models, the linear regression model, and learn how to apply general statistical inference techniques to multi-parameter statistical models.

Applied Data Science

By addressing challenges from a variety of applications such as social science, public health, industry and environmental science, you will learn how to perform and present an exploratory data analysis, deploy established statistical approaches to analyse data and draw conclusions, as well as developing judgement to critically evaluate the appropriateness of chosen methods for real-world challenges.

Mathematics of Artificial Intelligence

The machine learning at the heart of modern AI systems is a fundamentally mathematical subject. You will learn this mathematics by discovering how techniques are deployed in several AI systems, including the neural networks that have revolutionised the field.

Mathematics of Real-world Systems

Many real-world problems give rise to integrals and ODEs that cannot be solved analytically. You will begin with fundamental numerical methods and then you will also develop heuristic methods to characterise a system's limiting behaviour.

Year 3

Core Modules

MARS Project

You will undertake substantial industry-inspired projects, working as an individual and as part of a small group.

Optional Modules

You will choose four modules from a range of options taught by experts within the School of Mathematical Sciences. Options currently include:

+ Mathematics of Deep Learning
+ Advanced Differential Equations
+ Dynamic Modelling
+ Metric Spaces and Topology
+ Statistical Inference
+ Stochastic Processes

Please see our website for further examples of options available to you.

Mathematics with Computer Science

BSc, MSci Hons

Mathematics forms the foundations of all technology and computing. This intrinsic link provides you with limitless opportunities to experiment and innovate.

By combining the study of Mathematics with Computer Science, you will gain the specialist skills and knowledge needed to excel in this field. You will develop invaluable insight into key concepts and systems used to tackle the biggest challenges of today.

Your first year begins by guiding you through the mathematical concepts and methods that sit at the foundation of both disciplines. From multivariable calculus, probability and statistics, to logic, proofs, and theorems. Alongside this, you will be introduced to software development and the fundamentals of computer science, where you will gain essential technical knowledge and interdisciplinary skills.

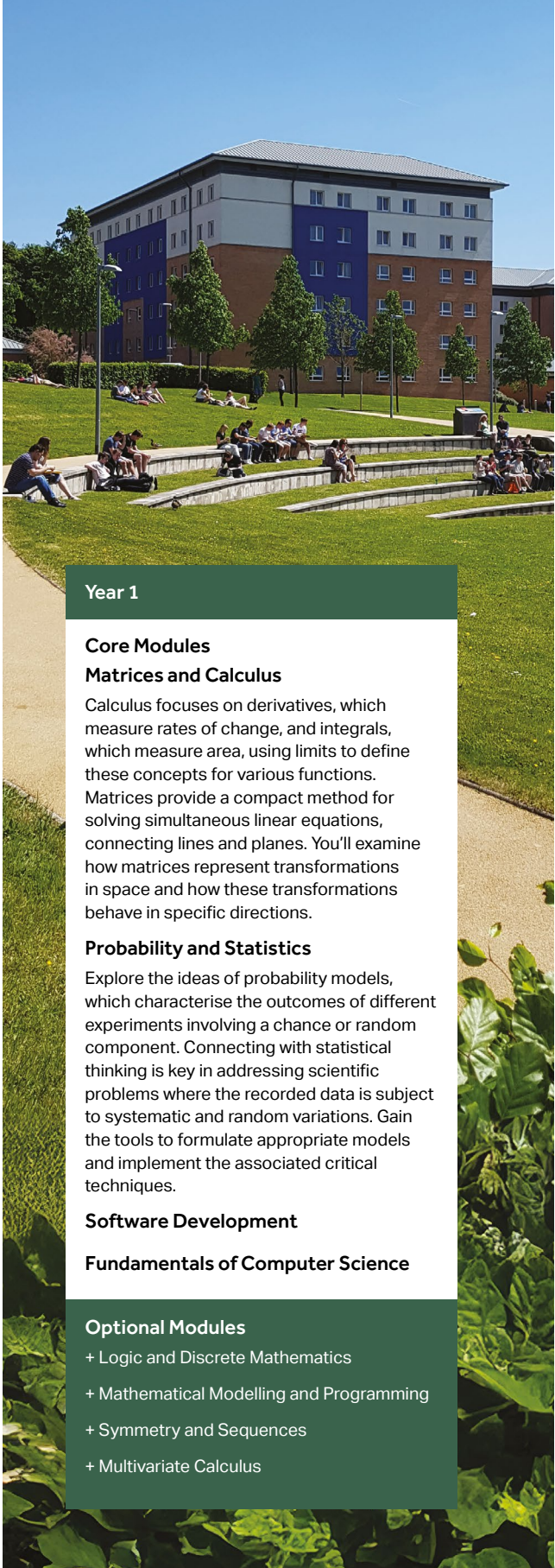
Progressing into your second year, through a range of core and optional modules, you will start to delve deeper into topics across both disciplines. As part of this, you will apply your learning in group projects inspired by real-world challenges.

Your final year is where you start to develop your interests through a wide choice of optional modules, customising your degree to suit your career ambitions.

Enhancing your curriculum

We continually review and enhance our course curricula to ensure we are delivering the best possible learning experience, and to make sure that the subject knowledge and transferable skills you develop will prepare you for your future.

Information within this publication with respect to courses and modules is correct at the time of publication, and the University will make every reasonable effort to offer courses and modules as advertised. In some cases, changes may be necessary and may result in new modules or some modules and combinations being unavailable, for example as a result of student feedback, timetabling, staff changes and new research.



Year 1

Core Modules

Matrices and Calculus

Calculus focuses on derivatives, which measure rates of change, and integrals, which measure area, using limits to define these concepts for various functions. Matrices provide a compact method for solving simultaneous linear equations, connecting lines and planes. You'll examine how matrices represent transformations in space and how these transformations behave in specific directions.

Probability and Statistics

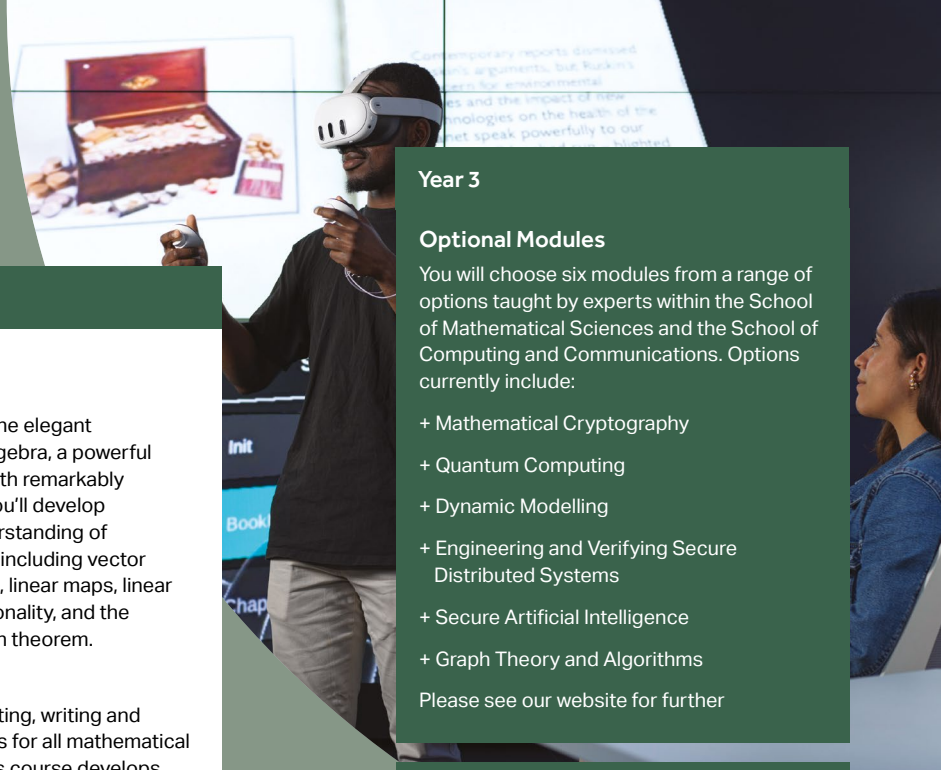
Explore the ideas of probability models, which characterise the outcomes of different experiments involving a chance or random component. Connecting with statistical thinking is key in addressing scientific problems where the recorded data is subject to systematic and random variations. Gain the tools to formulate appropriate models and implement the associated critical techniques.

Software Development

Fundamentals of Computer Science

Optional Modules

+ Logic and Discrete Mathematics
+ Mathematical Modelling and Programming
+ Symmetry and Sequences
+ Multivariate Calculus



Year 2

Core Modules

Linear Algebra

This module explores the elegant framework of Linear Algebra, a powerful mathematical toolkit with remarkably diverse applications. You'll develop a comprehensive understanding of fundamental concepts including vector spaces and subspaces, linear maps, linear independence, orthogonality, and the spectral decomposition theorem.

Project Skills

Researching, collaborating, writing and presenting are key skills for all mathematical sciences students. This course develops these skills and gives you the opportunity to produce a significant group project on a chosen mathematical theme.

Secure Systems and Data Engineering

Optional Modules

You will choose three modules from a range of options taught by experts within the School of Mathematical Sciences and the School of Computing and Communications. Options currently include:

+ Mathematics of Artificial Intelligence
+ Artificial Intelligence and Algorithms
+ Complex Analysis
+ Abstract Algebra

Please see our website for further examples of options available to you.

Year 3

Optional Modules

You will choose six modules from a range of options taught by experts within the School of Mathematical Sciences and the School of Computing and Communications. Options currently include:

+ Mathematical Cryptography
+ Quantum Computing
+ Dynamic Modelling
+ Engineering and Verifying Secure Distributed Systems
+ Secure Artificial Intelligence
+ Graph Theory and Algorithms

Please see our website for further

Year 4 (MSci students only)

Core Modules

Dissertation

Your dissertation represents a culmination of years of mathematical study. It will provide you with concrete evidence of your achievements that you will be able to share with others and a strong dissertation may become an entrance point to a PhD if you are interested in further study.

Research Methods and Innovation

Optional Modules

You will choose three modules from a range of options taught by experts within the School of Mathematical Sciences and the School of Computing and Communications. Options currently include:

+ Operators and Spectral Theory
+ Measure and Integration
+ Computing and Algorithms for Statistics
+ Epidemiology and Disease Modelling
+ Machine Learning
+ Clinical Trials

Please see our website for further examples of options available to you.

Mathematics, Operational Research, Statistics and Economics (MORSE)

BSc Hons

Our MORSE programme is designed for those who wish to apply their mathematical skills to solve real-world problems in business and industry. The combination of these influential subjects will equip you with in-demand skills that employers value, preparing you for careers like a business analyst, data scientist, operational researcher or consultant, and opening doors to academic research opportunities.

Our three-year degree begins by building your understanding of four main subjects. This includes fundamental maths and statistics topics, such as calculus, linear algebra, probability and statistics; the principles of economics and its applications; and operational research tools and techniques for business analytics.

In your second and third years you will advance your knowledge in these areas, choosing modules to suit your career interests, whilst also engaging in group and individual project work.

Enhancing your curriculum

We continually review and enhance our course curricula to ensure we are delivering the best possible learning experience, and to make sure that the subject knowledge and transferable skills you develop will prepare you for your future.

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Year 1

Core Modules

Matrices and Calculus

Calculus focuses on derivatives, which measure rates of change, and integrals, which measure area, using limits to define these concepts for various functions. Matrices provide a compact method for solving simultaneous linear equations, connecting lines and planes. You'll examine how matrices represent transformations in space and how these transformations behave in specific directions.

Probability and Statistics

Explore the ideas of probability models, which characterise the outcomes of different experiments involving a chance or random component. Connecting with statistical thinking is key in addressing scientific problems where the recorded data is subject to systematic and random variations. Gain the tools to formulate appropriate models and implement the associated critical techniques.

Principles of Microeconomics

Principles of Macroeconomics

Managing Uncertainty in Business

Computing for Business Decision Making

Year 2

Core Modules

Multivariate Probability and Statistics

You will learn about the random behaviour of multivariate random variables and asymptotic probability theory, both of which are central to statistical inference. You will then be equipped to explore one of the most fundamental statistical models, the linear regression model, and learn how to apply general statistical inference techniques to multi-parameter statistical models.

Applied Data Science

By addressing challenges from a variety of applications such as social science, public health, industry and environmental science, you will learn how to perform and present an exploratory data analysis, deploy established statistical approaches to analyse data and draw conclusions, as well as developing judgement to critically evaluate the appropriateness of chosen methods for real-world challenges.

Microeconomic Analysis

Forecasting and Machine Learning

Optimisation & Simulation

Optional Modules

You will choose one module from a range of options taught by experts within Lancaster University Management School. Options currently include:

+ Macroeconomic Analysis

+ Games and Strategic Behaviour

Please see our website for further examples of options available to you.

Year 3

Core Modules

Statistical Inference

This module builds on statistical techniques from the first two years, to equip students with an understanding of both the theoretical underpinnings and practical application of frequentist statistical inference. It then introduces an alternative paradigm: Bayesian statistics.

Optional Modules

You will choose five modules from a range of options taught by experts within the School of Mathematical Sciences and Lancaster University Management School. Options currently include:

+ Stochastic Processes

+ Mathematical Finance

+ Data Science in Economics

+ Frontiers of Economics

+ Advanced Optimisation and Simulation

+ Smart Data and Artificial Intelligence for Business

Please see our website for further examples of options available to you.

Find out more

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mathematics@lancaster.ac.uk
lancaster.ac.uk/maths