Mathematics

Essentials

Taught programmes
MSc degrees
Mathematics
Scientific Computation
Postgraduate diplomas
Mathematics
Scientific Computation

Research programmes
MPhil, PhD Mathematics

Related programmes
MSc in Corporate and Financial Risk Management (p52)
MSc in Financial Mathematics (p52)

Admissions requirements
For information on overseas qualifications that meet the admissions requirements, refer to pages 156-157
MSc and Postgraduate Diploma in Mathematics
A first- or upper second-class undergraduate honours degree in mathematics. Degree subjects with substantial mathematics content or joint mathematics degrees are also acceptable
MSc and Postgraduate Diploma in Scientific Computation
A first- or upper second-class undergraduate honours degree with an engineering, science, computing or mathematics background
MPhil and PhD
A first- or upper second-class undergraduate honours degree in mathematics

English language requirements
IELTS 6.0, with not less than 6.0 in each section. Internet TOEFL with 90 overall, with 21 in Listening, 22 in Reading, 23 in Speaking and 24 in Writing. For more information and alternative English language requirements, refer to page 156

Fees
Refer to pages 158-159 for information on fees

Further information
Mathematics, PG Admissions,
University of Sussex, Falmer,
Brighton BN1 9QH, UK
E msc@maths.sussex.ac.uk
www.sussex.ac.uk/maths

- In the 2008 Research Assessment Exercise (RAE) 90 per cent of our mathematics research was rated as recognised internationally or higher, and 50 per cent rated as internationally excellent or higher. Mathematics at Sussex was also ranked 11th in the UK in *The Guardian University Guide 2012* and in the top 20 in the UK in *The Complete University Guide 2011-12* and *The Times Good University Guide 2012*.
- Mathematics is crucial to everyday life, from being the basis of internet banking security to verifying the safety of pharmaceuticals through statistics, and offers many career options.
- In January 2009, US careers website **www.JobsRated.com** rated mathematician to be the best job out of the 200 considered.
- The Department of Mathematics is home to a group of internationally recognised researchers working in different areas of mathematics.
- Members of the Department maintain many collaborative links with other departments both in the UK and overseas.
- The Department fosters an intellectually stimulating environment in which students are encouraged to develop research interests with the support of the faculty.

Taught programmes

MSc in Mathematics
1 year full time

Mathematics at Sussex has a strong tradition and plays an important role in the current development of mathematics in areas as diverse as analysis and differential equations, mathematical biology and numerical mathematics.

This broad-based MSc concentrates on the core areas of pure, applied or numerical mathematics and provides you with a general knowledge of advanced mathematics. It offers you the opportunity to choose the mathematical orientation that best fits your tastes and aspirations.

This programme is intended as training for users of mathematics in commerce and industry, as enhancement to mathematical educators (both future and current ones looking to strengthen their curriculum), or as a preparation to pursue a higher research degree. A wide choice of topics is available for the dissertation, taken under the supervision of research-active faculty members.

Optional training in generic and transferable skills (writing, public speaking, project management and time management) is available to all our MSc students through the Science Postgraduate Support Group.

Career opportunities
Our graduates go on to careers in academia, scientific research, teaching, management, actuarial roles, financial management and analysis, programming and scientific journalism.

Programme structure
Autumn term: three or more options from Complex Analysis • Financial Portfolio Analysis • Measure and Integration • Monetary Theory Analysis • Numerical Linear Algebra • Wavelets and Data Compression. You also have a choice from a list of six other courses, ranging over pure and applied mathematics and statistics.

Spring term: three or more options from Algebraic Topology • Coding Theory • Finite Element Methods • Functional Analysis • Mathematical Models in Finance and Industry • Numerical Differential Equations. You also have a choice from a list of other courses.

Summer term and vacation: you prepare a dissertation under the supervision of a member of faculty.

MSc in Scientific Computation
1 year full time

Computation has become an essential tool in both experimental and theoretical advancement of science and engineering. Numerical simulation allows us to study complex systems that would be too expensive, dangerous or impossible to investigate experimentally. It is also the basis of all kinds of predictions in areas as varied as weather forecasting, financial analysis, risk management and climate change.

The constant advance in computer hardware and simulation algorithms allows ever greater details and realism in computer output. Mathematics at Sussex has a very strong numerical analysis and computational mathematics component, and our faculty introduce you to the theory and practice of state-of-the-art computational methods. Links with local industry (ranging from engineering to financial companies) further enhance our programme.

This MSc is aimed at those who have an interest in applied mathematics, computational sciences and technology. This is your programme of choice if you are looking to move into industry or mathematical finance, or to pursue further studies such as a PhD in applied mathematics or sciences.

Career opportunities
Our graduates go on to careers in industry such as engineering, computing, and financial and banking institutes. Some also pursue careers in scientific research, teaching, academia and management.

Programme structure
Autumn term: Numerical Linear Algebra; plus *either* Introduction to C *or* Object-Oriented Programming. You also select two options from Advanced Robotics • Complex Analysis • Computational Fluid Dynamics • Cybernetics and Neural Networks • Mechanical Dynamics

• Monetary Theory Analysis • Wavelets and Data Compression.

Spring term: Finite Element Methods • Numerical Differential Equations. You also select two options from Advanced Digital Communication • Applied Mathematical Models • Coding Theory • Computer Simulations in Physics • Functional Analysis • Heat Transfer Applications • Mathematics Models in Finance and Industry • Neural Networks • Partial Differential Equations.

Summer term and vacation: you prepare a dissertation under the supervision of a member of faculty.

Postgraduate diplomas

Programme structure

The structure is identical to that of the autumn and spring terms of the corresponding Masters programme.

Research programmes

Research degrees can be studied either full time or part time. You usually attend advanced courses, as well as undertaking research work supervised by a member of faculty.

The Department runs weekly seminars on general and specialist topics, with both national and international speakers.

Recent thesis titles

Adaptive designs for clinical trials which adjust for imbalances in prognostic factors

Analysis of dynamic models of evolving populations

Analysis of the Osher-Sole-Vese model in image processing

Combinatorial aspects of the theory of q-series

Involutive quantales

Market efficiency of horse-race betting markets with applications to spread betting

Mathematical analysis and numerical solutions of an integral equation arising from population dynamics

Mathematical models of kleptoparasitism

Near maximum distance separable codes over the field of eleven elements

Non-convex variational problems, heat flows and forward-backward diffusion equations

Numerical analysis of macroscopic critical state models for type-II superconductivity in 3D

On the efficient numerical solution of Cahn-Hilliard fluids

Ovals and arcs in finite projective planes

Quantales and noncommutative sober spaces

Sequential adaptive designs for early-phase clinical trials

Stochastic models of small populations

Career opportunities

Our research degrees provide training and experience in advanced mathematical techniques, preparing you for a position in business, industry, government or an academic institution.

Specialist facilities

Each full-time PhD student has shared office space with other postgraduates. Computing and laser printing facilities are available to all graduate students, and there is easy access to the computing facilities of the University and, via Information Technology Services, to worldwide computing networks. As researchers, PhD students have full access to high-performance computing.

The Department has its own computing research laboratory, containing several workstations and PCs. Other machines are also available within shared offices for PhD students.

Faculty research interests

Research in the Department focuses on the non-mutually exclusive areas of numerical analysis and scientific computing (Burman, Düring, Hesse, Lakkis, Madzvamuse, Styles); analysis and partial differential equations (Chlebík, Giesl, Tang, Taheri); mathematical biology (Blyuss, Giesl, Kiss, Kyrychko, Madzvamuse, Tang); and topology and geometry (Fenn, Hirschfeld). Interests of the research faculty working in these fields are briefly described here. For more information, visit **www.sussex.ac.uk/maths**

Konstantin Blyuss Mathematical biology and epidemiology; modelling of phase-change processes; nonlinear dynamics and chaos; stability of solitary waves.

Professor Erik Burman Numerical analysis and scientific computing focusing on finite element methods for complex flow problems. Design of efficient decoupling techniques for multiphysics problems.

Miroslav Chlebík Geometric measure theory with applications to calculus of variation. Non-linear partial differential equations; existence and regularity theory; blow-up phenomena.

Bertram Düring Applied and financial mathematics; modelling, numerics and optimal control of partial differential equations.

Roger Fenn Knots, links, graphs, surfaces and 3-manifolds, and low-dimensional geometric topology and associated algebra. Typical examples are generalised braids and racks.

Peter Giesl Dynamical systems. Analytical and numerical methods. Applications to biomechanics: stability of movements of the human musculoskeletal system.

Professor James Hirschfeld The combinatorics of finite projective spaces; classical algebraic and projective geometry. Links the abstract algebraic geometry of curves over finite fields with linear codes.

Mathematics faculty at Sussex look into biomechanics and the stability of movements of the human musculoskeletal system

István Kiss Mathematical modelling of infectious disease transmission and control. The implications of population contact network properties for disease invasion and epidemic control strategies.

Yuliya Kyrychko Mathematical modelling of real-life processes, delay differential equations and reaction-diffusion systems.

Omar Lakkis Numerical analysis and scientific computing. Applications to materials science and phase transition problems. Computational stochastic differential equations.

Anotida Madzvamuse Developing numerical techniques and algorithms to solve biological and medical problems. Bio-membranes; tumour growth; angiogenesis; cell deformation.

Vanessa Styles The analysis of systems of non-linear partial differential equations. The well-posedness, existence, uniqueness, regularity and long-time behaviour of solutions.

Ali Taheri Calculus of variations, partial differential equations and topology. Sobolev spaces and mapping problems; critical point theory and topological invariants.

Qi Tang Mathematical and statistical modelling of financial, corporate and technological risks; analysing inference, tracking of trend, data fitting; and Monte-Carlo simulation of risk models.