



THE UNIVERSITY  
*of* EDINBURGH

THE UNIVERSITY  
OF EDINBURGH  
Mathematics  
POSTGRADUATE  
OPPORTUNITIES

2016 ENTRY

# THE UNIVERSITY OF EDINBURGH: INFLUENCING THE WORLD SINCE 1583

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“You are now in a place where the best courses upon Earth are within your reach . . . such an opportunity you will never again have.”

**Thomas Jefferson, American Founding Father and President** (speaking to his son-in-law, Thomas Mann Randolph, as he began his studies at Edinburgh in 1786)

The University

## Our proud history and alumni ambassadors

For more than 400 years our staff and students have been making their mark on the world. They've explored space, revolutionised surgery, won Nobel Prizes, published era-defining books, run the country, paved the way for life-saving breakthroughs and laid the foundations for solving the mysteries of the universe. By choosing further study or research at Edinburgh you will be joining a community of scholars who have been at the forefront of knowledge since 1583.

We are associated with 20 Nobel Prize winners, including physicists Peter Higgs, Charles Barkla and Max Born, medical researcher Peter Doherty, economist Sir James Mirrlees and biologist Sir Paul Nurse. Our distinguished alumni include NASA astronaut Piers Sellers, former MI5 Director-General Dame Stella Rimington, Olympians Sir Chris Hoy and Katherine Grainger and historical greats such as philosopher David Hume, physicist and mathematician James Clerk Maxwell, inventor Alexander Graham Bell and Sherlock Holmes creator Sir Arthur Conan Doyle.

## Teaching and research excellence

We are consistently ranked as one of the world's top 50 universities. We are 17th in the 2014/15 QS World University Rankings. As host to more than 30,000 students from some 137 countries, studying across 100 academic disciplines, the University of Edinburgh continues to attract the world's greatest minds. In the Research Excellence Framework (REF) 2014, 83 per cent of our research was judged world-leading or internationally excellent. We're ranked fourth in the UK for research power, based on the quality and breadth of our research. Our excellent teaching was also confirmed in the latest report from the Quality Assurance Agency, which awarded us the highest rating possible for the quality of the student learning experience.

## Collaborations and international partnerships

As an internationally renowned centre of academic excellence, Edinburgh is the site of many world-class research collaborations. Our postgraduate students are crucial to our continued success and development and, along with our staff, they forge research links through regular travel and overseas exchanges. We take pride in our partnerships with other institutions such as the California Institute of Technology (Caltech), Stanford University, the University of Melbourne, Peking University, the University of Delhi

and the University of KwaZulu-Natal – to name but a few. We are a member of both the League of European Research Universities and the Coimbra Group, giving us strong links with leading European institutions from Barcelona to Berlin.

## Linking research and commerce

Edinburgh was one of the first UK universities to actively develop commercial links with industry, government and the professions. Edinburgh Research and Innovation (ERI) has continued, for the past four decades, to develop the promotion and commercialisation of the University's research excellence. ERI assists our postgraduates in taking a first step to market, whether it is through collaborative research, licensing technology or providing consultancy services.

## Enhancing your career

We're ranked 18th in the world for the employability of our graduates.\* With one of the best track records for graduate employment in the Russell Group, we are committed to embedding employability into your teaching and learning experience. From offering access to volunteering schemes to providing support from our sector-leading Careers Service, the University provides myriad opportunities to develop your skills, knowledge and experience giving you the edge in a competitive job market.

## An inspiring destination

Your first-class education will take place in one of Europe's most striking capital cities, a UNESCO World Heritage Site that is regularly voted one of the best places in the world to live. Edinburgh enjoys a solid reputation as a centre for innovation, whether as home to the 18th-century Scottish Enlightenment, as a modern source of pioneering science, medicine and technology, or as the host of the world's largest and longest-established arts festival. You couldn't ask for a more inspiring setting in which to further your knowledge and broaden your horizons.

## Join us

Edinburgh offers unparalleled academic breadth and diversity, making it a vibrant, challenging and stimulating environment for postgraduate study. Whether you plan to change direction, enhance your existing career or develop in-depth knowledge of your area of study, the University of Edinburgh provides a world-class learning experience.

\* Latest Emerging Global Employability University Rankings

# WELCOME TO THE SCHOOL OF MATHEMATICS

By joining the University of Edinburgh's School of Mathematics, you'll follow in the footsteps of mathematical pioneers and study alongside some of the most exciting minds working in the field today.

Whether you wish to follow a taught masters programme or pursue your own line of investigation, we offer a dynamic academic environment, supported by excellent facilities.

We have an outstanding reputation for mathematics teaching and research. We were judged 'excellent' in the most recent Teaching Quality Assessment and, in the Research Excellence Framework (REF) 2014 we were ranked fifth in the UK with 83 per cent of our research rated world-leading or internationally excellent.

## Rich heritage

The School boasts a rich heritage in pioneering mathematics. Our base, the James Clerk Maxwell Building, is named after one of the most celebrated mathematicians to study at the University. The 19th-century scientist is most famous for developing classical electromagnetic theory.

## Leaders in their fields

Our status as one of the most prestigious schools in the UK for mathematics attracts highly respected staff. Many of our 50 current academics are leaders in their fields and have been recognised with international awards.

The School is home to two Fellows of the Royal Society, 14 Fellows of the Royal Society of Edinburgh and seven Philip Leverhulme Prize or Fellowship holders. Abel Prize winner and Fields medallist Professor Sir Michael Atiyah is an Honorary Professor and Professor Agata Smoktunowicz is a recent recipient of the European Mathematical Society Prize.

## Facilities and resources

You will enjoy excellent facilities, ranging from one of the world's major supercomputing hubs to generous library provision for research at the leading level, including the new Noreen and Kenneth Murray Library at King's Buildings.

Students have access to more than 1,400 computers in suites distributed across the University's sites, many of which are open 24 hours a day. In addition, if you are a research student, you will be provided with your own workspace with desk and desktop computer.

## Software support

We provide all our mathematics postgraduates with access to software packages such as Maple, Matlab and Mathematica. Research students are allocated parallel computing time on 'Eddie' – the Edinburgh Compute and Data Facility. It is also possible to arrange use of the BlueGene/Q supercomputer facility if your research requires it.

## In good company

Mathematics is a discipline of high intellect with connections stretching across all the scientific disciplines and beyond, and in Edinburgh you can be certain of thriving in a rich academic setting. Our School is one of the country's largest mathematics research communities in its own right, but you will also benefit from Edinburgh's high-level collaborations, both regional and international.

Research students will have a primary and secondary supervisor and the opportunity to network with a large and varied peer group. You will be carrying out your research in the company of eminent figures and be exposed to a steady stream of distinguished researchers from all over the world.

## Collections of the University

The University's collections are unique in their depth and diversity. Managed by the Centre for Research Collections, and housed in our Main Library at the heart of our central campus, they span more than 500,000 rare books, scientific and cultural artefacts from around the world, historically significant musical instrument collections, specialist museum collections, and manuscripts.

Highlights include the world's oldest surviving Gaelic text; a page from the final draft of Charles Darwin's *On the Origin of Species*, as well as two copies of the first edition; Adam Smith's original library; Alexander Fleming's sample of mould used to make penicillin; original quartos of Shakespeare plays, with notes in the margins from 16th-century actors; the thermometer of chemist Joseph Black; and original Sir Isaac Newton diagrams in David Gregory manuscripts of 1692.

University archivists – with a broad spectrum of expertise – make it their priority to ensure these items are accessible by our students, researchers and staff.

"I experienced an egalitarian professor-student relationship and felt that student feedback was considered carefully. A number of external guest lecturers from diverse backgrounds in industry and academia enriched the programme with their expertise. The overall productive learning atmosphere was further improved by group assignments that channelled skill transfer between students. I have won some lifetime friends."

Michel Zedler, MSc Operational Research

## Community

We are a vibrant community of more than 50 academic and related staff supervising 60 research, and many more MSc, students. While you will be immersed in academic discourse at the highest level, we also offer plenty of opportunities to make new connections, through a full calendar of social events.

You'll have the chance to meet people through the daily bustle of the Maths Hub common room, subject-specific clubs, the weekly postgraduate colloquium – where students give talks and share cake – and at many annual events, including a residential excursion to Firth Point on the banks of Loch Tay in Perthshire, where everything from cycling to canoeing is on offer.

There are opportunities to get involved with our new magazine *Contours*, which is written for the School by our students. We also have a talented team of staff and students working on a busy calendar of outreach activities, including the annual Edinburgh International Science Festival. They demonstrate to the wider community that maths is a beautiful, elegant and creative subject, which underpins a huge amount of modern society.

“The School is very supportive in organising social events to help networking. Edinburgh is an international university that attracts students from different countries and I made many friends during my first month in Edinburgh who have given me a different perspective of the world. I've also been able to make useful contacts with academics within the University and with external experts in the field.”

Sarah Farid Khwaja, PhD Mathematics



### Graduate School

For research students, our Graduate School offers a busy schedule of activities ranging from formal seminars to social events. The Graduate School runs its own website and YouTube channel, which features self-produced videos of lectures.

### Share your work with the world

Researchers are encouraged to travel and participate in conferences and seminars. You'll also be in the right place in Edinburgh to meet distinguished researchers – from all over the world – who are attracted to conferences held at the School, and the various collaborative centres based here. You'll find opportunities for networking that could have far-reaching effects on your career in mathematics.

## Employability and graduate attributes

While your research will build your knowledge and skills in your chosen field, throughout your programme you'll also gain expertise and confidence in a number of related areas, such as public speaking, presentation and written communication.

This personal and professional development, supported by services offered by the School and the University, will give you an edge when applying for academic or commercial roles.

### Institute for Academic Development

All of our postgraduate students can benefit from the University's Institute for Academic Development (IAD), which provides information, events and courses to develop the skills you will need throughout your studies and in the future.

Further information is available online: [www.ed.ac.uk/iad/postgraduates](http://www.ed.ac.uk/iad/postgraduates)

For taught postgraduates, the IAD provides a growing range of tailored study-related and transferable skills workshops, plus online advice and learning resources. These are all designed to help you settle into postgraduate life, succeed during your studies, and move confidently to the next stage of your career.

The IAD also offers one of the longest-established researcher development training packages in the UK. Our experts will help you gain the skills, knowledge and confidence needed to move on to the next stage in your career, be that in academia or beyond.

The Institute provides research students with dedicated training in topics such as research management; personal effectiveness; communication skills; public engagement, networking and teamworking; leadership; and career management. You can gain expertise in information technology and presentation skills; confidence in undertaking independent and creative research; the ability to critically evaluate source materials; and the capacity to construct intellectually rigorous arguments. By developing these broader professional skills and qualities, our postgraduate students are always in high demand.

### Careers Service

The University's award-winning Careers Service aims to expand the horizons of all our students, empowering you to make successful career decisions. It works closely with the University's Employability Consultancy to support students to take advantage of every opportunity to enhance your employability while studying.

The Service provides specialist support for postgraduate students to help with career planning and decision making. Its team of friendly experts can support you to explore different career options, identify your skills and what you want out of a career, think about effective job search strategies, and prepare for job applications and interviews.

The Service has a team dedicated to developing our already strong links with employers from all industries and employment sectors; from the world's top recruiters to small enterprises based here in Edinburgh. The team provides a programme of opportunities for students to meet employers on campus and virtually, and advertises a wide range of part-time and graduate jobs.

More information: [www.ed.ac.uk/careers/postgrad](http://www.ed.ac.uk/careers/postgrad)

### Connect.ed

Edinburgh encourages its alumni to stay in touch with current students who are interested in a similar career path. Connect.ed is a networking system run by the Careers Service that provides a confidential opportunity for alumni to share their occupational knowledge and experience with current students, who can contact them for advice and guidance on their future career.

More information: [www.ed.ac.uk/careers/connected](http://www.ed.ac.uk/careers/connected)

### Backing bright ideas

LAUNCH.ed is the University's award-winning programme for student entrepreneurs. Each year, LAUNCH.ed works with hundreds of students to assess their ideas and develop their business skills and helps many start their businesses. We have helped Edinburgh students and alumni launch almost 100 new businesses in the last three years, ranging from language tuition to robotics companies.

More information: [www.LAUNCH.ed.ac.uk](http://www.LAUNCH.ed.ac.uk)

### Learn to teach

PhD students are given leadership roles within the School, and you'll have the opportunity to spend some of your time conducting undergraduate tutorials. We'll help you with this: the University offers courses in public speaking and other teaching skills, and you'll be able to draw on the support of your peers and supervisors in research group meetings.

### A solid start

For research students, a strong foundation in the fundamentals of your chosen field is essential and in the early part of your studies you'll be offered taught courses through the Scottish Mathematical Sciences Training Centre, a consortium of seven mathematics departments. You'll take part in video-conferenced lectures, presented by staff from all participating universities.

# Taught masters programmes

[www.ed.ac.uk/pg/894](http://www.ed.ac.uk/pg/894)

## Computational Mathematical Finance

MSc 1 yr FT (2 yrs PT available for UK/EU students)  
PgDip 9 mths FT

### Programme description

This dynamic new programme aims to deliver high-quality training in the theory of mathematical finance and emphasise computational methods.

Graduates in this field are expected to have a working knowledge of advanced computational finance (including construction of algorithms and programming skills) as well as a sound knowledge of the theory of probability and stochastic analysis. These are the core theories needed in the modern valuation of complex financial instruments.

The programme delivers:

- a flexible programme of study relevant to the needs of employers such as: top investment banks, hedge funds and asset management firms;
- a solid knowledge in financial derivative pricing, risk management and portfolio management; and
- the transferable computational skills required by the modern quantitative finance world.

### Programme structure

There are two streams, a financial stream and a computational stream, each involving two taught semesters of courses and a dissertation.

#### COMPULSORY COURSES

*Discrete-Time Finance; Finance, Risk and Uncertainty; Monte Carlo Methods; Object-Oriented Programming with Applications; Research-Linked Topics; Risk-Neutral Asset Pricing; Stochastic Analysis in Finance; Stochastic Control and Dynamic Asset Allocation.*

**Computational stream:** *Numerical Methods for Stochastic Differential Equations; Numerical Partial Differential Equations.*

**Financial stream:** *Financial Risk Theory; Optimization Methods in Finance.*

#### OPTION COURSES

**Computational stream:** *Computing for Operational Research & Finance; Programming Skills.*

**Financial stream:** *Advanced Time Series Econometrics; Credit Scoring; Financial Risk Management; Numerical Methods for Stochastic Differential Equations; Numerical Partial Differential Equations; Stochastic Optimization.*

### Career opportunities

You can expect to go on to work in major financial institutions or to continue your studies by joining a PhD programme.

### Minimum entry requirements

A UK 2:1 degree, or its international equivalent ([www.ed.ac.uk/international/country](http://www.ed.ac.uk/international/country)), in mathematics or a mathematical subject such as statistics, physics or engineering. Relevant programming experience is considered essential.

### English language requirements

See page 18.

### Fees and funding

[www.ed.ac.uk/student-funding/postgraduate](http://www.ed.ac.uk/student-funding/postgraduate)  
For funding information see also page 16.

**Programme Director** Dr Sotirios Sabanis  
**Tel** +44 (0)131 650 5084  
**Email** [cmfmsc@ed.ac.uk](mailto:cmfmsc@ed.ac.uk)

[www.ed.ac.uk/pg/118](http://www.ed.ac.uk/pg/118)

## Financial Mathematics

MSc 1 yr FT

### Programme description

This masters is run jointly with Heriot-Watt University. It provides you with expertise in financial mathematics, including stochastic calculus, and a range of practical techniques for analysing financial markets. You will also learn quantitative skills for developing and managing risk that are in high demand since the recent financial crisis.

### Placements

Adding depth to your learning, our work placement programme puts you at the heart of organisations such as Aberdeen Asset Management, Barrie & Hibbert and Lloyds Banking Group.

### Programme structure

This programme involves two taught semesters of compulsory and option courses, followed by a dissertation project.

#### COMPULSORY COURSES

*Credit Risk Modelling; Derivatives Markets; Derivative Pricing and Financial Modelling; Discrete-Time Finance; Financial Markets; Special Topics 1; Special Topics 2; Stochastic Analysis in Finance.*

#### OPTION COURSES

*Deterministic Optimization Methods in Finance; Financial Econometrics; Portfolio Theory; Numerical Techniques of Partial Differential Equations; Optimization Methods in Finance; Simulation; Statistical Methods; Statistical Inference; Time Series Analysis; Stochastic Control and Dynamic Asset Allocation.*

### Career opportunities

Graduates typically work in major financial institutions or continue their studies by joining PhD programmes.

### Minimum entry requirements

A UK 2:1 degree, or its international equivalent ([www.ed.ac.uk/international/country](http://www.ed.ac.uk/international/country)), in mathematics or a mathematical subject such as statistics, physics or engineering.

### English language requirements

See page 18.

### Fees and funding

[www.ed.ac.uk/student-funding/postgraduate](http://www.ed.ac.uk/student-funding/postgraduate)  
For funding information see also page 16.

**Programme Contact** MACS PG Enquiries  
**Tel** +44 (0)131 451 4152  
**Email** [macspgenquiries@hw.ac.uk](mailto:macspgenquiries@hw.ac.uk)

[www.ed.ac.uk/pg/640](http://www.ed.ac.uk/pg/640)

## Financial Modelling & Optimization

MSc 1 yr FT (2 yrs PT available for UK/EU students)  
PgDip 9 mths FT

### Programme description

This programme gives you a flexible syllabus to suit the demands of employers that use modern financial tools and optimization techniques in areas such as the financial sector and energy markets.

We will give you sound knowledge in financial derivative pricing, portfolio optimization and financial risk management. We will also provide you with the skills to solve some of today's financial problems, which have themselves been caused by modern financial instruments. This expertise includes modern probability theory, applied statistics, stochastic analysis and optimization.

### Placements

Adding depth to your learning, our work placement programme puts you at the heart of financial organisations such as Aberdeen Asset Management, Barrie & Hibbert and Lloyds Banking Group.

### Programme structure

This programme involves two taught semesters of compulsory and option courses, followed by a dissertation project.

#### COMPULSORY COURSES

*Discrete-Time Finance; Finance, Risk and Uncertainty; Fundamentals of Optimization; Optimization Methods in Finance; Research-Linked Topics; Risk-Neutral Asset Pricing; Simulation; Stochastic Analysis in Finance.*

#### OPTION COURSES

*Advanced Time Series Econometrics; Combinatorial Optimization; Computing for Operational Research and Finance; Credit Scoring; Financial Risk Management; Financial Risk Theory; Fundamentals of Operational Research; Large Scale Optimization for Data Science; Modern Optimization Methods for Big Data Problems; Multivariate Data Analysis; Nonlinear Optimization; Numerical Partial Differential Equations; Object-Oriented Programming with Applications; Risk Analysis; Stochastic Control and Dynamic Asset Allocation; Stochastic Modelling; Stochastic Optimization.*

### Career opportunities

Graduates have gone on to work in major financial institutions or to continue their studies by joining PhD programmes.

### Minimum entry requirements

The minimum entry requirement is a UK 2:1 degree, or its international equivalent ([www.ed.ac.uk/international/country](http://www.ed.ac.uk/international/country)), in mathematics or a mathematical subject such as statistics, physics or engineering.

### English language requirements

See page 18.

### Fees and funding

[www.ed.ac.uk/student-funding/postgraduate](http://www.ed.ac.uk/student-funding/postgraduate)  
For funding information see also page 16.

**Programme Director** Dr Sotirios Sabanis  
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[www.ed.ac.uk/pg/497](http://www.ed.ac.uk/pg/497)

## Financial Operational Research

MSc 1 yr FT  
PgDip 9 mths FT

### Programme description

This programme will show you how to use mathematical techniques to model and solve real-life financial problems. Operational research is an important skill that is in high demand in the finance industry.

### Programme structure

This programme involves two taught semesters of compulsory and option courses followed by your dissertation project. Many dissertation projects are carried out as part of an external placement in industry.

#### COMPULSORY COURSES

*Computing for Operational Research and Finance; Fundamentals of Optimization; Fundamentals of Operational Research; Financial Mathematics and Investment; Financial Risk Management; Methodology, Modelling and Consulting Skills; Simulation; Stochastic Modelling.*

#### OPTION COURSES

Option courses are generally grouped into the following areas: finance, industry, optimization, and statistics.

### Career opportunities

The skills you will learn are in demand by a vast range of organisations including consultancy firms, companies with operational research departments such as airlines or telecommunications providers, financial firms and the public sector. Recent graduates have joined Capgemini, British Airways, Orange, Barrie & Hibbert and HM Revenue & Customs.

### Minimum entry requirements

A UK 2:1 degree, or its international equivalent ([www.ed.ac.uk/international/country](http://www.ed.ac.uk/international/country)), in a numerate discipline such as mathematics, engineering, computer science, physical or biological sciences, economics or business.

### English language requirements

See page 18.

### Fees and funding

[www.ed.ac.uk/student-funding/postgraduate](http://www.ed.ac.uk/student-funding/postgraduate)  
For funding information see also page 16.

**Programme Director** Dr Julian Hall  
**Tel** +44 (0)131 650 5075  
**Email** [j.a.j.hall@ed.ac.uk](mailto:j.a.j.hall@ed.ac.uk)

## See also...

Taught masters programmes in related fields are also offered by the University of Edinburgh Business School, the School of Economics, School of Informatics and the School of Physics & Astronomy.

[www.ed.ac.uk/studying/prospectus-request](http://www.ed.ac.uk/studying/prospectus-request)

[www.ed.ac.uk/pg/116](http://www.ed.ac.uk/pg/116) (Operational Research)  
[www.ed.ac.uk/pg/499](http://www.ed.ac.uk/pg/499) (OR with Computational Optimization)  
[www.ed.ac.uk/pg/498](http://www.ed.ac.uk/pg/498) (OR with Risk)

## Operational Research/ OR with Computational Optimization/OR with Risk

MSc 1 yr FT (2 yrs PT available for UK/EU students)  
PgDip 9 mths FT

### Programme description

This programme will show you how to use mathematical techniques to tackle real-life problems ranging from scheduling flights and routing mobile phone calls to managing investments and minimising risks. Operational Research (OR) is an important skill that is in high demand.

Our intensive programme allows you to specialise in an area that best suits your career goals. In addition to the general MSc in Operational Research, we offer the programmes Operational Research with Risk and Operational Research with Computational Optimization.

### Programme structure

These programmes involve two taught semesters of compulsory and option courses followed by your dissertation project. Many dissertation projects are carried out as part of an external placement in industry.

#### COMPULSORY COURSES

*Computing for Operational Research and Finance; Fundamentals of Optimization; Fundamentals of Operational Research; Methodology, Modelling and Consulting Skills; Probability and Statistics; Simulation; Stochastic Modelling.*

#### OPTION COURSES

Option courses are generally grouped into the following areas: finance, industry, optimization and statistics.

As part of your option course choices, Operational Research with Computational Optimization requires you to study a combination from *Stochastic Optimization; Combinatorial Optimization; Nonlinear Optimization; and Large Scale Optimization for Data Science*. Operational Research with Risk requires you to study a combination from *Credit Scoring; Financial Risk Management; Stochastic Optimization; The Analysis of Survival Data; Statistical Modelling; and Risk Analysis*.

### Career opportunities

The skills you will learn are in demand by a vast range of high-profile organisations including consultancy firms, companies with operational research departments such as airlines or telecommunications providers, financial firms and the public sector. Recent graduates have joined Capgemini, British Airways, Orange, Barrie & Hibbert and HM Revenue & Customs.

### Minimum entry requirements

A UK 2:1 degree, or its international equivalent ([www.ed.ac.uk/international/country](http://www.ed.ac.uk/international/country)), in a numerate discipline such as mathematics, engineering, computer science, physical or biological sciences, economics or business.

### English language requirements

See page 18.

### Fees and funding

[www.ed.ac.uk/student-funding/postgraduate](http://www.ed.ac.uk/student-funding/postgraduate)  
For funding information see also page 16.

**Programme Director** Dr Julian Hall  
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[www.ed.ac.uk/pg/660](http://www.ed.ac.uk/pg/660)

## Statistics & Operational Research

MSc 1 yr FT (2 yrs PT available for UK/EU students)

### Programme description

This programme will help you develop professionally in the theory and practice of statistics and operational research (OR), providing the foundations for a successful career.

It will prepare you for work in areas such as the medical and health industry, government, the financial sector and any other area where modern statistical tools and OR techniques are used. You will also develop the wider skills required for solving problems, working in teams and time management.

You will be able to identify appropriate statistical or operational techniques, which can be applied to practical problems, and will acquire extensive skills in modelling using the packages R for Statistics and Arena for simulation. In addition, you will acquire the ability to use high-level applications in Excel.

### Programme structure

This MSc consists of lecture-based courses and practical, lab-based courses. You will be assessed by exams, written reports and programming assignments. An industrial or academic project is written up as a dissertation.

#### COMPULSORY COURSES

*Computing for Statistics; Fundamentals of Operational Research; Fundamentals of Optimization; Likelihood and Generalised Linear Models; Methodology, Modelling and Consulting Skills; Simulation; Statistical Regression Models; Statistical Theory; Stochastic Modelling.*

#### OPTION COURSES

*The Analysis of Survival Data; Categorical Data Analysis; Clinical Trials; Computing for Operational Research and Finance; Credit Scoring; Data Analysis; Genetic Epidemiology; Large Scale Optimization for Data Science; Machine Learning & Pattern Recognition; Multivariate Data Analysis; Nonparametric Regression; Operational Research in the Airline Industry; Operational Research in Telecommunications; Risk Analysis; Stochastic Optimization; Time Series Analysis and Forecasting.*

### Career opportunities

This programme is ideal for students who wish to apply their statistics and operational research knowledge within a wide range of sectors including the medical and health sector, government and finance. The advanced problem-solving skills you will develop will be highly prized by many employers.

### Minimum entry requirements

A UK 2:1 degree, or its international equivalent ([www.ed.ac.uk/international/country](http://www.ed.ac.uk/international/country)), with a significant mathematics and statistics component.

### English language requirements

See page 18.

### Fees and funding

[www.ed.ac.uk/student-funding/postgraduate](http://www.ed.ac.uk/student-funding/postgraduate)  
For funding information see also page 16.

**Programme Director** Dr Bruce Worton  
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# Research at the School of Mathematics

As one of the best hubs in the UK for mathematics research, we can provide a truly stimulating and inspiring environment for developing your research career.

We carry out research in the following areas:

- algebra and number theory;
- computational mathematics;
- geometry and topology;
- mathematical analysis;
- mathematical physics;
- operational research and optimization;
- partial differential equations (PDEs);
- probability and stochastic analysis; and
- statistics.

## Centres and institutes

In 2005, we set up the Maxwell Institute for Mathematical Sciences, in collaboration with Heriot-Watt University. The Institute pools research from both universities to offer a research and postgraduate training environment that can attract the best mathematics talent from around the world.

With Heriot-Watt University we also created the International Centre for Mathematical Sciences (ICMS). This research institute works to develop mathematical sciences in new directions, supports and develops mathematics that is relevant and in demand from other sciences, industry and commerce and fosters collaboration between mathematics departments across Scotland.

We were granted two Engineering and Physical Sciences Research Council (EPSRC) Science and Innovation Awards, worth £3.5 million and £5 million respectively, to establish The Centre for Analysis and Nonlinear Partial Differential Equations (CANPDE) and The Centre for Numerical Algorithms and Intelligent Software (NAIS).

CANPDE is a joint project of Edinburgh and Heriot-Watt universities under the umbrella of the Maxwell Institute. NAIS was formed in 2009 when Edinburgh teamed up with Heriot-Watt and Strathclyde universities.

In March 2014, the School of Mathematics became a Centre for Doctoral Training (CDT) and now hosts the Maxwell Institute Graduate School in Analysis and its Applications (MIGSAA). MIGSAA offers a unique, fully integrated, four-year PhD programme, which will train 60 students to the highest international standards. Students receive broad training in theoretical analysis, stochastics, numerics and applications and will emerge with multiple skill-sets designed to deal with the sophisticated challenges arising in academia, industry and commerce. Our approach is founded on rigorous mathematical analysis in the context of collaboration with industry. The programme is jointly operated by the University of Edinburgh and Heriot-Watt University and students will receive PhDs awarded jointly by both institutions.

MIGSAA differs from a standard PhD degree. During the first year, you will participate in a full programme of broad academic training in the specialist areas of the CDT, including a joint taster project in the autumn and a fuller project during the summer which may align with your eventual research topic. The matching of a supervisor with your research topic is done during this first year. In subsequent years we offer high-level courses augmenting your primary

research activity, as well as a number of other activities specifically focused on the MIGSAA students, including the possibility of industrial placements and academic placements in other countries.

We offer up to 12 fully-funded places across the University of Edinburgh and Heriot-Watt University in each intake. If you are interested in our PhD programmes in Mathematical Analysis, Stochastic Analysis or Applied Mathematics then MIGSAA may be an opportunity that you do not wish to overlook.

For further information, contact MIGSAA:

**Director** Tony Carbery  
**Email** a.carbery@ed.ac.uk

**Deputy Director** Dugald Duncan  
**Email** d.b.duncan@hw.ac.uk

## Postgraduate Research Programmes

### Entry requirements for PhD

The School of Mathematics minimum entry requirements for PhD programmes are: a 1st class honours degree (or equivalent from another European or overseas university) or a 2:1 honours degree (or equivalent) plus a masters degree.

# Research opportunities

[www.ed.ac.uk/pg/509](http://www.ed.ac.uk/pg/509)

## Algebra & Number Theory

PhD 3 yrs FT (6 yrs PT available for UK/EU students)

Our algebra and number theory research group is made up of international leaders in the field who have won between them the European Mathematical Society Prize, the Whitehead Prize of the London Mathematical Society, the Waclaw Sierpinski Prize of the Polish Academy of Sciences and the Berwick Prize of the London Mathematical Society.

Our members have given invited lectures at both the International Congress of Mathematicians and the European Congress of Mathematicians.

Our research focuses on several areas: non-commutative ring theory; non-commutative algebraic geometry; the geometry of algebraic numbers; Lie-theoretic representation theory; quantum algebra; and category theory.

Much of our research is related to the areas of geometry and topology, and mathematical physics, which has led to the formation of the Hodge Institute: <http://hodge.maths.ed.ac.uk>

Through the School's membership of the Maxwell Institute, we present regular seminars, and run our own informal seminars and colloquia. We also serve on editorial boards of various international journals. All of our PhD students take part in international conferences and symposia, and in part thanks to this global exposure, many have gone on to postdoctoral positions throughout the world.

### English language requirements

See page 18.

### Fees and funding

[www.ed.ac.uk/student-funding/postgraduate](http://www.ed.ac.uk/student-funding/postgraduate)  
For funding information see also page 16.

**Contact** Graduate School Administrator  
**Email** pgresearch@maths.ed.ac.uk



THE UNIVERSITY of EDINBURGH

## Case study: Edinburgh's research with impact

### Statistical crime fighters

One of the strengths of the University's School of Mathematics and Maxwell Institute for Mathematical Sciences is the ability of our researchers to apply complex mathematical principles in order to solve seemingly unrelated problems. The innovative work of Professor Colin Aitken and his colleagues, in an area of forensic science, shows just how wide-ranging the results of their research can be.

#### Project background

Scientific evidence has a crucial role to play in the administration of justice. It is important that it be evaluated objectively and interpreted clearly for the courts, since the incorrect communication of its value leads to appeals or even miscarriages of justice. An understanding of the value of forensic evidence relies heavily on an assessment of uncertainty. However, to help a court estimate the relative likelihood of the two possibilities – of association or non-association with a crime – Aitken and his team calculated a so-called likelihood ratio (LR) that takes into account variations in forensic scientific evidence. The aim was to use Bayesian statistical methods to enable forensic scientists worldwide to interpret their data reliably.

#### Project results

The sampling protocols developed at the School of Mathematics have been widely adopted. They have been recommended to forensic laboratories by the Crown Office in Scotland, and in guidelines by the United Nations Office on Drugs and Crime. These new methods have reduced cost, increased accuracy and improved the interpretation of the value of evidence in courtrooms around the world. A senior forensic statistician at the Netherlands Forensic Institute commented: "The groundbreaking work of Aitken and others has transformed the way we evaluate forensic evidence... the LR method is the next step in the evolution from forensic craft to forensic science."

**These new methods have reduced cost, increased accuracy and improved the interpretation of the value of evidence in courtrooms around the world.**

See more online: [www.ed.ac.uk/research/impact](http://www.ed.ac.uk/research/impact)



### See also...

You may find your preferred research area in the prospectus of another School within the University, in particular the University of Edinburgh Business School or the Schools of GeoSciences, Informatics or Physics & Astronomy.

[www.ed.ac.uk/studying/prospectus-request](http://www.ed.ac.uk/studying/prospectus-request)

[www.ed.ac.uk/pg/510](http://www.ed.ac.uk/pg/510)

## Analysis

PhD 3 yrs FT (6 yrs PT available for UK/EU students)

Our analysis research group is one of the UK's top centres for research in the field, especially in linear and nonlinear PDEs and harmonic analysis. Your passion for mathematical analysis will be rewarded by contact with, and supervision by, world-leading academic staff, a rich seminar and working group programme and ultimately a qualification that boasts an internationally respected pedigree.

### Research

We have a unique focus on the interplay of classical Euclidean harmonic analysis with the modern theory of PDEs. We study harmonic analytic ideas in number theory, geometric measure theory, combinatorics, and discrete geometry and geometrically invariant inequalities; and we investigate applications of harmonic analysis to elliptic and parabolic PDEs with rough coefficients and/or on rough domains. We also study: nonlinear hyperbolic, dispersive and kinetic equations and systems arising in the classical field theories of mathematical physics, mathematical biology and, in connection with black holes, mathematical general relativity; free-boundary problems, optimal mass transportation and Monge-Ampère equations in nonlinear elasticity and other continuum theories; and well-posedness for supercritical initial value problems with noisy initial data.

### Additional resources

In addition to the School's excellent facilities, as part of the Analysis group you will have access to the activities of the CANPDE and the MIGSAA. Through seminars, mini-symposia and training courses, these stimulate and support development of research in analysis and theoretical nonlinear PDEs.

### English language requirements

See page 18.

### Fees and funding

[www.ed.ac.uk/student-funding/postgraduate](http://www.ed.ac.uk/student-funding/postgraduate)

For funding information see also page 16.

**Contact** Graduate School Administrator**Email** [pgresearch@maths.ed.ac.uk](mailto:pgresearch@maths.ed.ac.uk)[www.ed.ac.uk/pg/511](http://www.ed.ac.uk/pg/511)

## Applied & Computational Mathematics

PhD 3 yrs FT (6 yrs PT available for UK/EU students)

The Applied and Computational Mathematics research group combines expertise in dynamics, classical and statistical mechanics and advanced scientific computing techniques, to develop techniques for applications such as molecular dynamics, geophysical and astrophysical fluid dynamics and optoelectronics.

If you have a passion for applied mathematics, our facilities, people and environment will help you develop your research ideas to their full potential.

You'll have access to Edinburgh Parallel Computing Centre (EPCC), one of Europe's leading supercomputing centres, and membership of the Centre for Numerical Analysis and Intelligent Software (NAIS).

### Research environment

Our research interests are varied and include astronomical fluid dynamics, multiscale modelling and analysis, molecular dynamics, mathematical meteorology, Hamiltonian dynamics, nonlinear waves in fluids and solids, optoelectronics, signal processing, mathematical biology, exponential asymptotics and homogenisation theory.

### Valuable connections

Having access to a broad community of researchers means that your work will be well distributed and recognised. Through the NAIS collaboration, you'll create stronger networks with researchers across Scotland and have access to substantial training as well as visitor and workshop programmes in numerical analysis, computer science and high-performance computing software development.

As part of the Applied & Computational Mathematics group you will have access to the training activities provided by MIGSAA.

Strong links also exist with life scientists, chiefly through SynthSys (Synthetic and Systems Biology Edinburgh), a multidisciplinary Edinburgh-based centre whose mission is the analysis and design of biochemical systems using theoretical, computational, and biological techniques.

### English language requirements

See page 18.

### Fees and funding

[www.ed.ac.uk/student-funding/postgraduate](http://www.ed.ac.uk/student-funding/postgraduate)

For funding information see also page 16.

**Contact** Graduate School Administrator**Email** [pgresearch@maths.ed.ac.uk](mailto:pgresearch@maths.ed.ac.uk)[www.ed.ac.uk/pg/512](http://www.ed.ac.uk/pg/512)

## Geometry & Topology

PhD 3 yrs FT (6 yrs PT available for UK/EU students)

Our Geometry and Topology research group has strong links with both the Algebra & Number Theory and the Mathematical Physics research groups, as you can find at our common home in the Hodge Institute: <http://hodge.maths.ed.ac.uk>

You'll find this invaluable, as opportunities to discuss your work and expand your thinking abound. Working within one of the largest mathematics groups in the UK, you'll be completing your degree in an environment that hums with a busy graduate school life, and you'll have the chance to make your mark in seminars, workshops, clubs and outings.

Our interests include algebraic geometry, derived categories, algebraic and geometric topology, twistor theory, category theory and integrable systems.

While we can offer a large community of researchers under one roof, we believe in encouraging you to gain as broad a perspective as possible. The best way to do this is to involve yourself in the international dialogue on your research area, through attending conferences and symposia, and visiting your peers in centres of research worldwide. Throughout your studies, you'll be given opportunities to travel to events and institutions that will allow you to gain this perspective, and open up new areas of investigation.

### English language requirements

See page 18.

### Fees and funding

[www.ed.ac.uk/student-funding/postgraduate](http://www.ed.ac.uk/student-funding/postgraduate)

For funding information see also page 16.

**Contact** Graduate School Administrator**Email** [pgresearch@maths.ed.ac.uk](mailto:pgresearch@maths.ed.ac.uk)

For more information  
about research in the  
School of Mathematics,  
please visit:  
[www.maths.ed.ac.uk/  
research](http://www.maths.ed.ac.uk/research)

[www.ed.ac.uk/pg/895](http://www.ed.ac.uk/pg/895)

## Mathematical Analysis & its Applications

PhD 4 yrs FT

This programme is associated with the Maxwell Institute Graduate School in Analysis and its Applications (MIGSAA), a Centre for Doctoral Training that provides high quality instruction in analysis and the applications of analysis to a wide range of areas.

MIGSAA has been made possible by a grant from the UK's Engineering and Physical Sciences Research Council and the Scottish Funding Council. The programme is delivered in collaboration with Heriot-Watt University.

PhD study in MIGSAA may be undertaken with more than 40 supervisors and on topics ranging from pure analysis to applied mathematics relevant for scientific, engineering, environmental or social challenges. Most projects will relate to one of the following themes:

- Harmonic Analysis
- Partial Differential Equations (PDEs)
- Stochastic Processes
- Mathematical Modelling
- Atomic and Molecular Systems
- Fluid Dynamics
- Applied Probability.

Our intention is that all MIGSAA students gain awareness of the full intellectual spectrum of research in analysis and its applications, including familiarity with theoretical issues, stochastic techniques, numerical methods and examples of how analysis problems impact the sciences and engineering. Therefore we expect all students to take some training spanning these areas – even though your eventual PhD thesis may specialise in only one or two.

### Research environment

As opposed to a standard PhD, you will be admitted to the programme (rather than with a specific supervisor) and take PhD training courses and projects, which help shape your perspective, leading to a match with a supervisor in Year 1. The research project directed by the supervisor is still the centrepiece of the PhD, but this is augmented by an ongoing training programme in Years 2–4.

### Valuable connections

Mathematics is a discipline of high intellect with connections stretching across all the scientific disciplines and beyond, and in Edinburgh you can be certain of thriving in a rich academic setting. The collaboration between MIGSAA's partner institutions maximises the opportunities available for students to gain a breadth of knowledge from leading experts.

In your first year, you will be based at the International Centre for Mathematical Sciences in Edinburgh. This affords a number of opportunities to engage with the international mathematical community. You will be encouraged to travel and participate in conferences and seminars and will have opportunities to meet distinguished researchers from all over the world who are attracted to conferences held here. You'll find opportunities for networking that could have far-reaching effects on your career in mathematics.

### English language requirements

See page 18.

### Fees and funding

[www.ed.ac.uk/student-funding/postgraduate](http://www.ed.ac.uk/student-funding/postgraduate)

For funding information see also page 16.

**MIGSAA CDT Administrator****Tel** +44 (0)131 650 5955**Email** [apply2migsaa@maxwell.ac.uk](mailto:apply2migsaa@maxwell.ac.uk)

[www.ed.ac.uk/pg/513](http://www.ed.ac.uk/pg/513)

## Mathematical Physics

PhD 3 yrs FT (6 yrs PT available for UK/EU students)

Mathematical Physics is a multidisciplinary research group with close connections with the School's Algebra and Geometry & Topology groups. You'll benefit from being not only in one of the largest mathematics research groups in the UK but also part of the Edinburgh Mathematical Physics Group – a joint research collective formed in 1999 with Heriot-Watt University and now part of the Maxwell Institute.

### Research environment

Our group pursues wide-ranging interests spanning a number of disciplines. A central goal is to understand the principles behind quantum gravity, through the study of black holes, cosmologies and spacetime singularities, and via the use of holography and the interplay with quantum gauge field theory through the gauge/gravity correspondence. Particularly fruitful areas of research are the geometry of higher-dimensional black holes and their near-horizon geometries in the context of higher-dimensional generalisations of general relativity.

We're fascinated by the various manifestations of supersymmetry: in string theory, supergravity and gauge theory. This has led us to several classification results on supersymmetric supergravity backgrounds, including a recent proof of the homogeneity conjecture. In addition we study gauge theoretic moduli spaces using supersymmetry and via integrable systems techniques, displaying an interplay between the algebraic geometry of curves and their associated function theory. This research has led to computer implementations of various algebro-geometric constructions.

Recently we have made progress in some purely mathematical problems suggested by the gauge/gravity correspondence: namely, the classification of certain exotic algebraic structures related to superconformal field theories, as well as that of certain types of homogeneous supergravity backgrounds.

### Valuable connections

As well as experiencing a vibrant research environment that brings you into contact with a broad group of your peers, your membership of the Edinburgh Mathematical Physics Group will give you access to a dynamic programme of seminars, lecture courses and conferences. There is a dedicated website and blog, and a comprehensive range of graduate activities. More information: <http://empg.maths.ed.ac.uk/>

### English language requirements

See page 18.

### Fees and funding

[www.ed.ac.uk/student-funding/postgraduate](http://www.ed.ac.uk/student-funding/postgraduate)

For funding information see also page 16.

**Contact** Graduate School Administrator**Email** [pgresearch@maths.ed.ac.uk](mailto:pgresearch@maths.ed.ac.uk)[www.ed.ac.uk/pg/514](http://www.ed.ac.uk/pg/514)

## Optimization & Operational Research

PhD 3 yrs FT (6 yrs PT available for UK/EU students)

As a member of the Operational Research and Optimization research group you will also be part of the Edinburgh Research Group in Optimization (ERGO), a wider association, with our group as the focus, which includes academics at the universities of Dundee and Oxford as well as commercial organisations. Through its regular seminar series, this network provides interaction with an array of local and international institutions and industrial bodies interested in the development of operational research and optimization. As a result, you'll establish valuable relationships that will help you take your research to its optimum level.

### Research environment

Our group has as its primary focus the mathematical and computing aspects of optimization. Core technology in optimization is the solution for large sparse linear and quadratic problems, and we're able to provide world-class expertise in the two main solution methods for these: the simplex method and the interior point method.

We have interests in global optimization, decomposition methods, parallel computing, industrial applications of optimization and stochastic optimization. Our current researchers are exploring the following areas: parameter uncertainty in queuing theory and revenue management; algorithms for linear and nonlinear nonconvex smooth optimization problems; optimization methods for linear, quadratic and nonlinear programming; decomposition methods for large-scale nonlinear nonconvex constrained optimization; bundle methods; warmstarts for interior point methods; pooling problems; computational techniques for solving large-scale linear programming problems; applications of optimization in the chemical, oil and electricity industries; and efficient gradient methods for large-scale convex and nonconvex optimization problems.

### Valuable connections

Being part of the Operational Research and Optimization research group and ERGO will give you opportunities to meet and confer with academics worldwide – we're currently working with researchers in Italy, Norway, China, France, Spain and Turkey. Two of our visiting professors are world leaders in continuous optimization. In addition, researchers from our group are regularly invited to give addresses and organise workshops at major optimization conferences, join international conference committees and sit on assessment panels for European grants.

### English language requirements

See page 18.

### Fees and funding

[www.ed.ac.uk/student-funding/postgraduate](http://www.ed.ac.uk/student-funding/postgraduate)

For funding information see also page 16.

**Contact** Graduate School Administrator**Email** [pgresearch@maths.ed.ac.uk](mailto:pgresearch@maths.ed.ac.uk)[www.ed.ac.uk/pg/515](http://www.ed.ac.uk/pg/515)

## Probability & Stochastic Analysis

PhD 3 yrs FT (6 yrs PT available for UK/EU students)

Our Probability and Stochastic Analysis research group operates in what is perhaps the most widely applied area of mathematics. The financial sector, in particular, is a major focus of our research, and graduates with the right research experience can make their way into highly rewarding roles in industry. As part of our small, specialised group, you'll enjoy a research environment that features a balance between theory and practice, access to one of the most powerful computing facilities in the UK and strong links with relevant industries.

### Research

Our research focuses on the following themes: stochastic differential equations and stochastic partial differential equations (PDEs) and their applications in nonlinear filtering and stochastic control; applications of stochastic analysis of PDEs, stochastic PDEs and stochastic differential equations (accelerated numerical methods in particular).

We're also involved in the applications of probability theory, mainly to mathematical finance, particularly stochastic volatility models, equivalent martingale measures and incomplete markets. Other applications include engineering, signal procession and biological sciences.

### Valuable connections

With the financial sector being the major commercial employer of our graduates, our involvement with the Scottish Financial Risk Academy, established in conjunction with Heriot-Watt University, offers valuable industry links and training. You can benefit from short project internships with leading financial institutions, visits from leading risk scholars, and a series of knowledge exchange courses and events.

As part of the Probability & Stochastic Analysis group you will have access to the training activities provided by MIGSAA.

### Unparalleled computing

The Probability & Stochastic Analysis group also gives you access to the Edinburgh Parallel Computing Centre (EPCC), one of Europe's leading supercomputing facilities. EPCC enables high-level grid computing, data integration, and computer simulation and process optimization. We offer training in all the relevant programs required to achieve your research aims.

### Rewarding career options

Many of our graduates take up lucrative positions with high-profile financial companies. A large number also pursue careers in academia, while others apply their skills in engineering or biological sciences.

### English language requirements

See page 18.

### Fees and funding

[www.ed.ac.uk/student-funding/postgraduate](http://www.ed.ac.uk/student-funding/postgraduate)

For funding information see also page 16.

**Contact** Graduate School Administrator**Email** [pgresearch@maths.ed.ac.uk](mailto:pgresearch@maths.ed.ac.uk)[www.ed.ac.uk/pg/516](http://www.ed.ac.uk/pg/516)

## Statistics

PhD 3 yrs FT (6 yrs PT available for UK/EU students)

Our society revolves around variation, uncertainty and risk. By gaining a greater understanding of these concepts through the study of statistics, we're able to create systems and techniques that benefit areas as diverse as science, law and finance. Our Statistics research group explores a wide range of statistical theory and practice, often applying its findings in collaboration with researchers in related fields, such as informatics and biomathematics.

### Research

Our work is balanced between classical and Bayesian statistics. Our particular areas of interest include hierarchical multivariate random effects models, wavelets, non-parametric regression, resampling and extreme value theory. While the group has a strong theoretical base, we're also heavily involved in specific application areas, particularly forensic science, law, agriculture, and functional genomics data, such as gene expression microarrays.

### Valuable connections

As a research student, you'll find a wealth of expertise available to you via our links with theorists and practitioners in related fields. The University's School of Informatics, for instance, is the largest and most prestigious in the UK, and features a Machine Learning research group whose work is linked to some forms of statistical research. In addition, the Scottish Government-backed institute Biomathematics and Statistics Scotland is an associated research institute of the University. With its main base in our building, it provides access to other researchers with an interest in statistical genomics and bioinformatics, process and systems modelling and statistical methodology.

If your interest is in the expanding area of forensic statistics, you'll benefit from access to local international experts with a wide range of problems, and to our links with similarly-minded statisticians and forensic scientists around the world.

### Rewarding career options

You'll gain a qualification that is highly regarded in both academia and industry. Future career options are diverse, with past students finding positions in academic institutions, forensics, finance, law and biological and agricultural organisations.

### English language requirements

See page 18.

### Fees and funding

[www.ed.ac.uk/student-funding/postgraduate](http://www.ed.ac.uk/student-funding/postgraduate)

For funding information see also page 16.

**Contact** Graduate School Administrator**Email** [pgresearch@maths.ed.ac.uk](mailto:pgresearch@maths.ed.ac.uk)

Our involvement with the  
Scottish Financial Risk Academy  
offers valuable links and training.

# Funding

A large number of scholarships, loans and other funding schemes are available for your postgraduate studies. It is only possible to show a small selection in print. To see the full range, please visit: [www.ed.ac.uk/student-funding/postgraduate](http://www.ed.ac.uk/student-funding/postgraduate).

Awards are offered by the School of Mathematics, the College of Science & Engineering, the University of Edinburgh, the Scottish, UK and international governments and many funding bodies. Some of these offer our PhD students financial support for three and a half years and MIGSAA does so for four years, to cover both the training and PhD writing periods.

Here we list a selection of potential sources of financial support for postgraduate students applying to the School of Mathematics. The School aims to help find scholarships covering tuition and living expenses for all our PhD students.

## Tuition fee discounts

We offer a 10 per cent discount on postgraduate fees for all alumni who have graduated with an undergraduate degree from the University. We also offer a 10 per cent discount for international graduates who spent at least one semester at the University of Edinburgh as a visiting undergraduate: [www.ed.ac.uk/student-funding/discounts](http://www.ed.ac.uk/student-funding/discounts)

### Key

- Taught masters programmes
- Masters by Research programmes
- Research programmes

## Loans available for study at the University of Edinburgh

The University of Edinburgh is a participating institution in the following loans programmes, meaning we certify your student status and can help with the application process.

### • The Canada Student Loans Program ●●●

The University is eligible to certify Canadian student loan applications: [www.ed.ac.uk/student-funding/canadian-loans](http://www.ed.ac.uk/student-funding/canadian-loans)

### • The Student Awards Agency Scotland ●●

The Student Awards Agency Scotland offers eligible students postgraduate tuition fee loans for eligible programmes: [www.ed.ac.uk/student-funding/pg-loan](http://www.ed.ac.uk/student-funding/pg-loan)

### • US Student Loans ●●●

The University is eligible to certify loan applications for US loan students. Full details on eligibility and how to apply can be found online: [www.ed.ac.uk/student-funding/us-loans](http://www.ed.ac.uk/student-funding/us-loans)

## Research council awards

Research councils offer awards to masters, MPhil and PhD students in most of the Schools within the University of Edinburgh. All studentship applications to the research councils must be made through the University, through your School or College office. Awards can be made for both taught and research programmes.

Normally only those UK/EU students who have been resident in the UK for the preceding three years are eligible for a full award. For some awards, candidates who are EU nationals and are resident in the UK may be eligible for a fees-only award. [www.ed.ac.uk/student-funding/research-councils](http://www.ed.ac.uk/student-funding/research-councils)

## University of Edinburgh scholarships

The University offers a number of scholarships in partnership with the following overseas government agencies:

- **Chile ●●●**  
National Commission for Scientific and Technological Research (CONICYT): [www.conicyt.cl](http://www.conicyt.cl)
- **Colombia ●**  
Administrative Department of Science, Technology and Innovation (Colciencias): [www.colciencias.gov.co](http://www.colciencias.gov.co)
- **Ecuador ●●●**  
Secretaria Nacional de Educacion Superior, Ciencia y Tecnologia (SENESCYT): [www.educacionsuperior.gob.ec](http://www.educacionsuperior.gob.ec)
- **Iraq ●**  
Ministry of Higher Education and Scientific Research: [www.en.mohe.sr.gov.iq/](http://www.en.mohe.sr.gov.iq/)
- **Mexico ●**  
National Council of Science and Technology of the United Mexican States (CONACYT): ●●● [www.conacyt.mx](http://www.conacyt.mx)

Banco de Mexico and the Banco de Mexico's FIDERH trust (FIDERH): ●●● [www.fiderh.org.mx](http://www.fiderh.org.mx)

Fundacion Mexicana para la Educacion, la Tecnologia y la Ciencia (FUNED): ●● [www.funedx.org](http://www.funedx.org)

Other scholarship opportunities include:

- **China Scholarships Council/University of Edinburgh Scholarships (China) ●**  
A number of scholarships for PhD study to candidates who are citizens and residents of China: [www.ed.ac.uk/student-funding/china-council](http://www.ed.ac.uk/student-funding/china-council)
- **Edinburgh Global Masters Scholarships ●●**  
A number of scholarships are available to international students for masters study: [www.ed.ac.uk/student-funding/masters](http://www.ed.ac.uk/student-funding/masters)
- **Edinburgh Global Research Scholarships ●**  
These scholarships are designed to attract high-quality international research students to the University: [www.ed.ac.uk/student-funding/global-research](http://www.ed.ac.uk/student-funding/global-research)
- **EPSRC DTG, MIGSAA and School of Mathematics Studentships ●**  
All PhD applications will be considered automatically for School of Mathematics studentships. All UK PhD applicants will also be considered automatically for EPSRC DTG funding. All students, but especially UK students, applying to the Analysis, Applied & Computational Mathematics, and Probability & Stochastics research groups, are encouraged to apply separately for MIGSAA scholarship funding: [www.maths.ed.ac.uk/studying-here/pgf/funding-opportunities](http://www.maths.ed.ac.uk/studying-here/pgf/funding-opportunities) [www.maxwell.ac.uk/migsaa](http://www.maxwell.ac.uk/migsaa)

### • Eric Liddell China Saltire Scholarships (China) ●●

Ten scholarships are available to Chinese citizens who are permanent residents of mainland China who are accepted on a full-time masters degree programme: [www.ed.ac.uk/student-funding/liddell](http://www.ed.ac.uk/student-funding/liddell)

### • Highly Skilled Workforce Scholarships ●

A number of scholarships are available to UK nationals who are permanently domiciled in Scotland, and to EU nationals domiciled either on mainland EU or in Scotland, who have been accepted on an eligible full-time or part-time masters programme. The scholarships will cover the UK/EU tuition fee: [www.ed.ac.uk/student-funding/sfc-hsw](http://www.ed.ac.uk/student-funding/sfc-hsw)

### • Julius Nyerere Masters Scholarship (Tanzania) ●●

One scholarship is available to citizens of Tanzania who are normally resident in Tanzania who are accepted on a full-time masters degree programme: [www.ed.ac.uk/student-funding/nyerere](http://www.ed.ac.uk/student-funding/nyerere)

### • Richard Davidson Postgraduate Scholarship in Operational Research ●

One scholarship awarded to the most outstanding student on the Operational Research MSc. Available only to EU nationals: [www.ed.ac.uk/student-funding/davidson](http://www.ed.ac.uk/student-funding/davidson)

### • School of Mathematics MSc funding ●

Full and partial School funding of tuition fees and contributions to living expenses is awarded on merit. Select programme from: <http://msc.maths.ed.ac.uk>

### • Southern African Scholarship ●●●

One award for masters study available to students from selected southern African countries: [www.ed.ac.uk/student-funding/postgraduate/southern-africa](http://www.ed.ac.uk/student-funding/postgraduate/southern-africa)

### • UK/EU Masters Scholarships ●●

A number of scholarships for UK and EU students who have been accepted on a full-time masters degree programme: [www.ed.ac.uk/student-funding/uk-masters](http://www.ed.ac.uk/student-funding/uk-masters)

### • University of Edinburgh PhD Scholarships ●

A number of scholarships, open to UK, EU and international PhD students: [www.ed.ac.uk/student-funding/development](http://www.ed.ac.uk/student-funding/development)

## Other sources of funding

The following are examples of the many scholarships and support schemes available to students from particular countries who meet certain eligibility criteria.

- **Beit Trust ●●**  
Beit Trust Scholarships support postgraduate students from Malawi, Zambia and Zimbabwe, usually to undertake a masters degree: [www.beittrust.org.uk](http://www.beittrust.org.uk)
- **Chevening Scholarships ●●**  
A number of partial and full funding scholarships are available to one-year masters students: [www.chevening.org](http://www.chevening.org)
- **Commonwealth Scholarships ●●●**  
Scholarships available to students who are resident in any Commonwealth country, other than the UK: [www.dfid.gov.uk/cscuk](http://www.dfid.gov.uk/cscuk)
- **Fulbright Scholarships (USA) ●●●**  
Scholarships open to US graduate students in any subject wishing to study in the UK: [www.iie.org/fulbright](http://www.iie.org/fulbright)
- **Marshall Scholarships (USA) ●●●**  
Scholarships available to outstanding US students wishing to study at any UK university for at least two years: [www.marshallscholarship.org](http://www.marshallscholarship.org)
- **Scotland's Saltire Scholarships ●●**  
A number of scholarships open to students who are citizens permanently and ordinarily resident in Canada, China, India and the USA for one year of masters study: [www.ed.ac.uk/student-funding/saltire](http://www.ed.ac.uk/student-funding/saltire)
- **Silber Bequest ●●●**  
Funding is available to help prospective postgraduate students living in the UK who have been granted refugee status: [www.ed.ac.uk/student-funding/silber](http://www.ed.ac.uk/student-funding/silber)



“The Scottish Government’s initiative to attract international students from Canada, China, India and the US through the Saltire Scholarship Scheme, as well as the University of Edinburgh’s help and support for international students, has helped provide me with an opportunity that I would never have conceived of prior to starting my studies at Edinburgh.”

Robert Starr, MSc High Performance Computing, Scotland's Saltire Scholarship

# How to apply

We have an online application process for all postgraduate programmes. It's a straightforward system with full instructions, including details of any supporting documentation you need to submit.

When applying, you will set up an account, which lets you save your application and continue at another time.

Full guidance on our application system is available at: [www.ed.ac.uk/postgraduate/applying](http://www.ed.ac.uk/postgraduate/applying)

## General requirements

Our usual entrance requirement for postgraduate study is a UK 2:1 degree, or its international equivalent ([www.ed.ac.uk/international/country](http://www.ed.ac.uk/international/country)), in a subject related to your chosen programme. You will also need to meet the University's language requirements (see right).

Entry requirements for individual programmes can vary, so check the details for the specific programme you wish to apply for.

To apply for a research degree you will need a solid undergraduate degree in a mathematics-related field. If your background is not directly related to mathematics, you may still be considered – potential supervisors can advise you on this.

## References

For applications to taught programmes, the normal requirement is one reference, although an additional reference may be requested in individual cases. For applications to research programmes, two references are required. You should check the entry online for exact requirements for your intended programme of study. For general guidance on references, visit: [www.ed.ac.uk/postgraduate/references](http://www.ed.ac.uk/postgraduate/references)

## Taught programmes

### Deadlines

Some programmes have application deadlines. Please check the programme entry online for details. For all other programmes, you are encouraged to apply no later than one month prior to entry to ensure there is sufficient time to process your application. However, earlier application is recommended, particularly where there is a high demand for places or when a visa will be required. Should you wish to submit a late application, please contact us for guidance. If you are applying for funding, in most cases you will need an offer to study with us before you can make your funding application.

## Procedure

- Thoroughly explore this prospectus and our website to identify your preferred programme of study.
- We strongly advise you to contact us to discuss the programmes you wish to explore, the courses you wish to cover and if possible any areas of interest for your research dissertation. In the first instance, contact the Programme Director of the programme you are interested in.
- Check you meet all entry requirements. Check whether a separate application is needed for funding. Check any deadlines.
- Visit [www.ed.ac.uk/pg/degrees](http://www.ed.ac.uk/pg/degrees), navigate to your chosen programme, and click on Apply. Follow the instructions within the online application system, including details of documentation you must supply.

## Research programmes

### Deadlines

The deadline for applications is 31st January 2016. This will enable you to be considered for all of our available funding opportunities. Early applications are encouraged and a limited number of early offers may be made. Late applications will be considered, but priority will be given to applications received by the deadline.

### Procedure

- Thoroughly explore this prospectus and our website to identify your preferred area of research.
- Contact your potential supervisor to discuss whether they are happy to supervise your work. You can also contact the Graduate School Administrator, [pgresearch@maths.ed.ac.uk](mailto:pgresearch@maths.ed.ac.uk), or the Postgraduate Admissions Officer, Dr Pieter Blue, [p.blue@ed.ac.uk](mailto:p.blue@ed.ac.uk).
- Check you meet all entry requirements. Check any deadlines, including for funding applications.
- Visit [www.ed.ac.uk/pg/degrees](http://www.ed.ac.uk/pg/degrees), navigate to your chosen programme, and click on Apply. Follow the instructions within the online application system, including details of documentation you must supply.
- Shortlisted candidates will be interviewed, either in person in Edinburgh, or by phone, email or video call.

## Joining us from overseas

International applicants are advised to check the University's website to find out more about their visa options and our Integrated English for Academic Purposes (IEAP) programme. More information: [www.ed.ac.uk/international/ieap](http://www.ed.ac.uk/international/ieap)

## International agents

The University has certified representative agents in the following locations: Brunei, Canada, China, Gulf Region, Hong Kong, India, Japan, Jordan, Korea, Malaysia, Mexico, Nigeria, Norway, Russia, Saudi Arabia, Singapore, South Africa, South Korea, Taiwan, Thailand, Turkey, Zambia and Zimbabwe. International applicants can use an agent to help guide them through the application process if necessary. For more information visit: [www.ed.ac.uk/international/country](http://www.ed.ac.uk/international/country)

## English language requirements

Students whose first language is not English must show evidence of one of the qualifications below:

- IELTS Academic: total 6.5 (at least 6.0 in each module).
- TOEFL-iBT: total 92 (at least 20 in each module).
- PTE(A): total 61 (at least 56 in each of the Communicative Skills sections).
- CAE and CPE: total 176 (at least 169 in each module).

Please note:

- English language requirements can be affected by government policy so please ensure you visit our degree finder to check the latest requirements for your programme: [www.ed.ac.uk/pg/degrees](http://www.ed.ac.uk/pg/degrees)
- Your English language certificate must be no more than two years old at the beginning of your programme.
- We also accept recent degree-level study that was taught and assessed in English in a majority English speaking country (as defined by UK Visas & Immigration).

Please contact the Graduate School Administrator for specific details: [pgresearch@maths.ed.ac.uk](mailto:pgresearch@maths.ed.ac.uk)

Abbreviations: IELTS – International English Language Testing System; TOEFL-iBT – Test of English as a Foreign Language Internet-Based Test; PTE(A) – Pearson Test of English (Academic); CPE – Certificate of Proficiency in English; CAE – Certificate in Advanced English.

[www.ed.ac.uk/english-requirements/pg](http://www.ed.ac.uk/english-requirements/pg)

# Get in touch

## Contact us

For more information on our taught MSc programmes, please email:

**Financial Mathematics**  
[fimmisc@ed.ac.uk](mailto:fimmisc@ed.ac.uk)

**Financial Modelling & Optimization**  
[fmomsc@ed.ac.uk](mailto:fmomsc@ed.ac.uk)

**Operational Research**  
[ormsc@ed.ac.uk](mailto:ormsc@ed.ac.uk)

**Statistics & Operational Research**  
[sormsc@ed.ac.uk](mailto:sormsc@ed.ac.uk)

For more information on postgraduate research, email [pgresearch@maths.ed.ac.uk](mailto:pgresearch@maths.ed.ac.uk)

Alternatively, contact:

**Graduate School Administrator**  
Tel +44 (0)131 650 5085  
Email [pgresearch@maths.ed.ac.uk](mailto:pgresearch@maths.ed.ac.uk)

## Visit us

The University's Postgraduate Open Day is your opportunity to come and meet current staff and students. Our next campus-based Open Day takes place on Wednesday 18 November 2015. For more information, visit: [www.ed.ac.uk/postgraduate-open-day](http://www.ed.ac.uk/postgraduate-open-day)

The University also runs online information sessions for prospective postgraduate students throughout the year. For more information, visit: [www.ed.ac.uk/postgraduate/online-events](http://www.ed.ac.uk/postgraduate/online-events)

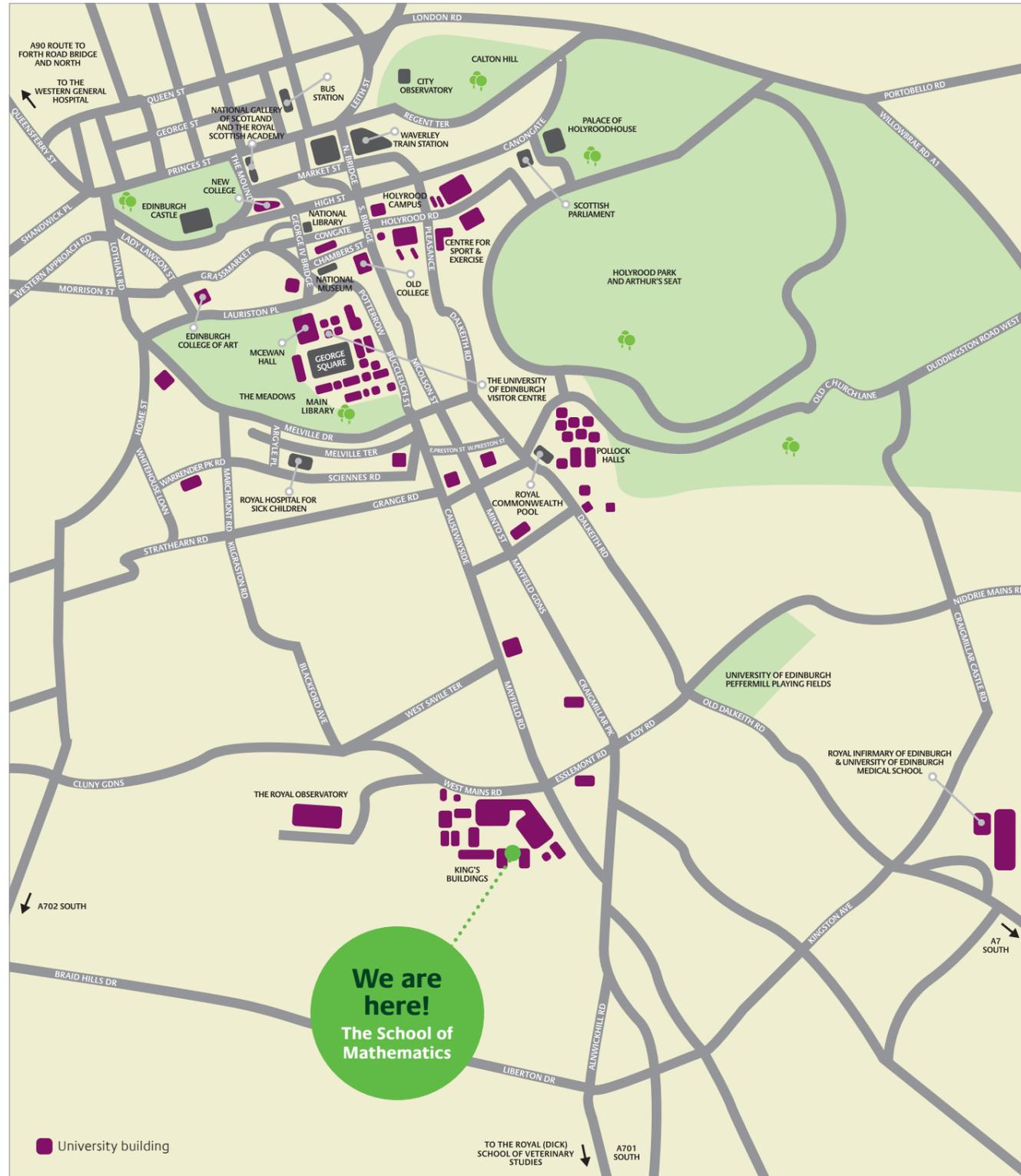
If you are interested in visiting the School outside the Open Day system as an individual, you are encouraged to contact any relevant member of staff directly to arrange a meeting or an informative video chat. Larger groups should contact George Kinnear, the Teaching & Recruitment Development Officer, to arrange a visit: [g.kinnear@ed.ac.uk](mailto:g.kinnear@ed.ac.uk).



# Campus map

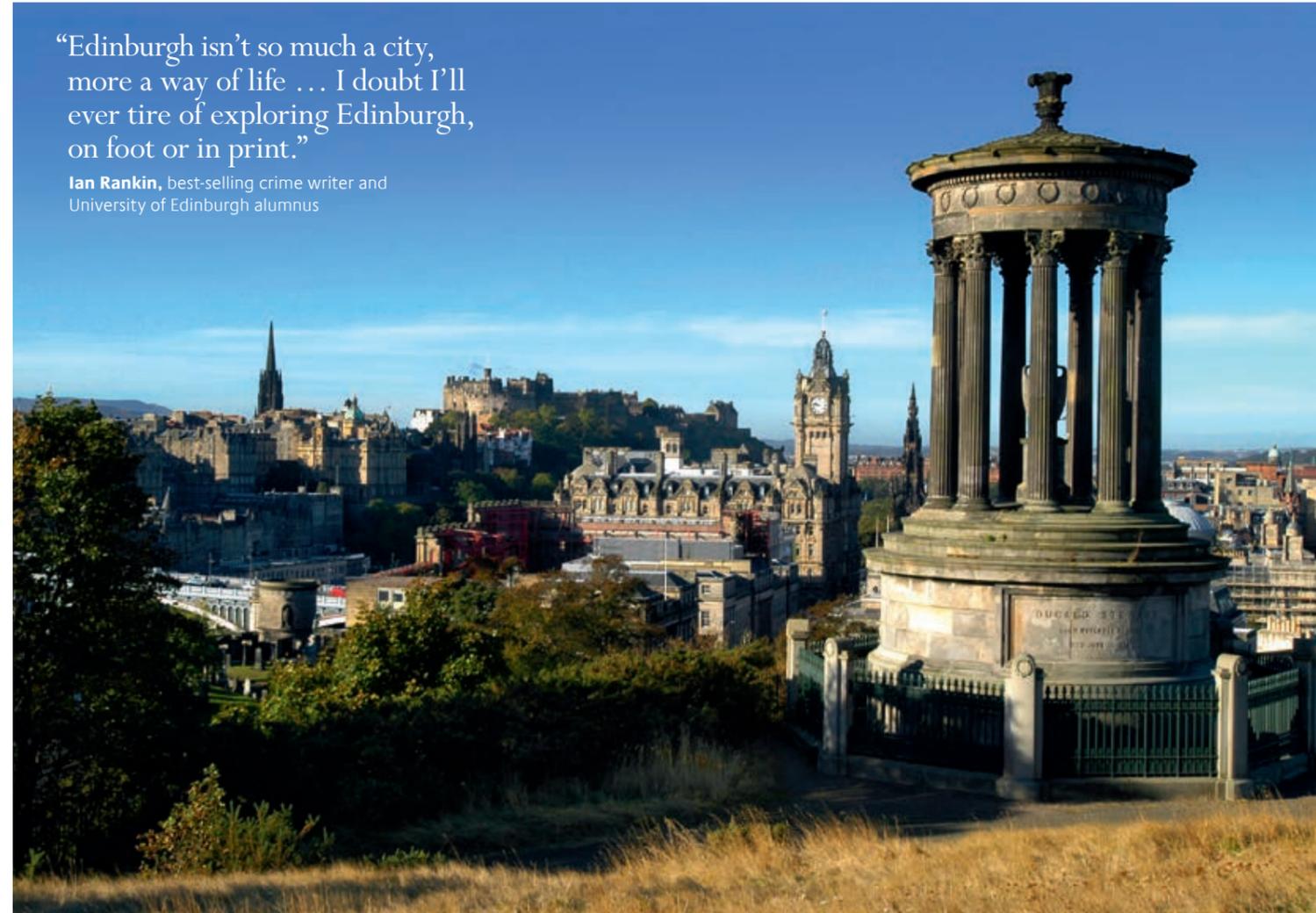
The School of Mathematics is situated in the James Clerk Maxwell Building at the University's King's Buildings campus, which is about two miles south of the city centre and well served by buses, including a free University shuttle service during semester time.

Detailed maps can be found at: [www.ed.ac.uk/maps](http://www.ed.ac.uk/maps)



“Edinburgh isn’t so much a city, more a way of life ... I doubt I’ll ever tire of exploring Edinburgh, on foot or in print.”

Ian Rankin, best-selling crime writer and University of Edinburgh alumnus



**18 Nov 2015**

**Postgraduate Open Day**

[www.ed.ac.uk/  
postgraduate-open-day](http://www.ed.ac.uk/postgraduate-open-day)

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The University's standard terms and conditions will form an essential part of any contract between the University of Edinburgh and any student offered a place here. Our full terms and conditions are available online: [www.ed.ac.uk/student-recruitment/terms-conditions](http://www.ed.ac.uk/student-recruitment/terms-conditions)

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