

Mathematics

At a Glance

School Facts

Head of School:
Professor A R Davies
BA (Cantab) MSc DPhil (Oxon)

Staff: 23 academic staff,
10 research staff

Doctoral Students: 31

Web Address:

www.cardiff.ac.uk/maths

Special Features

- The Cardiff School of Mathematics offers an exceptionally wide range of opportunities for postgraduate study. Staff are engaged in research projects in fields as varied as number theory, functional analysis and spectral theory, IT security, operational research, statistics, quantum field theory and general relativity. Research students in their first year follow an agreed programme of study to introduce them to research skills and methods and to advance their knowledge in their chosen field. This includes a broad choice of postgraduate courses provided through national collaborative networks such as MAGIC (pure/applied mathematics) and NATCOR (OR/statistics). Regular seminars provide insight into cutting-edge research.
- The School is based in the purpose-built Mathematics Institute – a modern building close to other university buildings and the city centre. In addition to the benefits of its location, the Mathematics Institute provides excellent facilities, including the University Mathematics Library and a coffee shop.
- Many projects undertaken by research staff in the School are funded by the public and private sectors. The leader of the Operator Algebras and Non-Commutative Geometry group co-ordinated the European Network on Non-Commutative Geometry funded by the EU TMR programme. Other sources of funding include EPSRC, Leverhulme Trust, NATO, INTAS, MOD, Wellcome Trust, GlaxoSmithKline, Procter & Gamble.
- The School is a member institution of the Welsh Institute of Mathematical and Computational Sciences (WIMSC) and also has close links with several universities and institutions abroad. These include the Institute of Advanced Study in Princeton, the Australian National University and the Australian Road Research Board in Melbourne, Ecole Supérieure d'Electricité in Gif-Sur Yvette, ETH in Zürich and universities in Canada, the Czech Republic, France, Germany, Italy, Ireland, Norway, Saudi Arabia, Japan, Malaysia and the USA.

2008 Research Assessment Quality Rating

Rating (by percentage – see page 13)	4*	3*	2*	1*	UC
Pure Mathematics	5%	35%	45%	15%	0%

Research Areas for MPhil/PhD Degrees

Pure Mathematics	Operational Research
Applied Mathematics	Probability and Statistics

Taught Programmes

MSc in Operational Research and Applied Statistics (FT/PT)
MSc in Operational Research, Applied Statistics and Risk (FT/PT)
(FT=full-time; PT=part-time)

Research Areas for MPhil/PhD Degrees

Application Information

Entry Requirements: First or upper second class UK Honours degree, or equivalent.

Duration: MPhil one year, PhD three years full-time.

Start Date: By negotiation with the School.

Number of Places: 8

Funding: Research Council Studentships.

Assessment: Submission of a thesis and an oral examination (viva voce).

Application Process: Contact the School in the first instance. Applications for most postgraduate programmes can now be submitted online – please see page 32 for details.

Contact Details

Postgraduate Admissions Officer
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Fax: +44 (0)29 2087 4199
Email: maths-pg@cardiff.ac.uk

www.cardiff.ac.uk/maths

Mathematics

Suitable for: graduates in Mathematics (or Mathematical Physics for appropriate topics).

Offers knowledge and expertise: for a career in academia, or to pursue a variety of other opportunities in which a strong mathematical background is important. Past students are on the staff of universities in the UK and abroad, and senior statisticians and managers in industry and business.

Research Areas

Cardiff welcomes applications from students interested in researching for an MPhil or a PhD in the specialist areas below. The School provides training and a high level of support, and the postgraduate community contributes substantially to the University's international reputation for research. In their first year of study, research students follow a programme of lectures and reading courses agreed with their supervisors, while working towards their MPhil or PhD.

Analysis and Differential Equations: spectral theory of ODEs and PDEs, nonrelativistic and relativistic quantum mechanics; function spaces; integral operators and interpolation theory; image processing; inequalities; direct and inverse computational spectral theory; asymptotic analysis; spectral geometry,



More online at:

www.cardiff.ac.uk/maths

quantum field theory; cryptography, steganography (information hiding, compression, copyright protection); wavelets) risk analysis.

Mathematical Physics: C^* -algebras: classification of amenable C^* -algebras by K theory and E theory; subfactors in von Neumann algebras: algebraic field theory, fusion in conformal field theory, modular invariant partition functions; statistical mechanics, combinatorics, mathematics of gravity, general relativity.

Applied Mathematics of Materials: Wave propagation in inhomogeneous media, homogenisation; memory effects; inverse problems, integral transforms; flows of ions in gaseous media; corona discharges; modelling and electric field distributions.

Numerical Analysis: analysis of spectral element and finite volume methods for solving differential equations; preconditioned iterative methods for solving linear systems of equations; numerical solution of direct and inverse eigenvalue problems for ordinary and partial differential equations; mathematical software.

Theoretical and Computational Fluid Dynamics: numerical simulation of boundary layer and wake-flow instabilities; fluid structure interaction; laminar-turbulent transition mechanisms; flow control; non-Newtonian fluid mechanics; computational rheology; linear stability analysis of viscoelastic flows; properties of the governing equations; lattice Boltzmann methods; multiphase flows.

Operational Research: modelling of traffic flow; healthcare modelling; epidemiology and public health, modelling of the spread of infectious diseases; queueing theory; scheduling and timetabling problems; metaheuristics; discrete optimisation.

Probability and Statistics: multivariate statistical analysis; time series analysis; statistical modelling in market research; optimal experimental design; stochastic global optimisation; change point detection; probabilistic methods in search and number theory; fisheries; medical statistics.

Special features of these research groups:

- Three research networks have been coordinated from Cardiff: the EU-TMR Network on Non-Commutative Geometry, the EPSRC Network on Algebraic Geometry, Boundary Conformal Field Theory and Non-Commutative Geometry, and the EPSRC Network on Spectral Theory (jointly with a group from the School of Computer Science).

- The School is part of the EPSRC Portfolio Partnership in Complex Fluids and Complex Flows, which provides substantial funding for research in these areas.
- The School is part of the EPSRC Science and Innovation funded LANCs Initiative in the Mathematical Underpinnings of Operational Research.
- Colloquia are held regularly and each research group has a weekly research seminar.
- The School hosts and participates in frequent workshops organised by WIMSC research clusters, with which the research groups are associated.
- The many collaborative projects with groups in other institutions in the UK and abroad, bring a steady stream of distinguished visitors to the School.

Taught Programmes

Application Process

Entry Requirements: See specific course entry.

Duration: One year full-time, three years part-time for MSc in Operational Research and Applied Statistics and MSc in Operational Research, Applied Statistics and Risk.

Start Date: September 2011.

Funding: A limited number of bursaries will be offered to cover fees and, in part, living expenses.

Assessment: Assessment of Stage One is by coursework and examination. Stage Two is assessed by submission of a dissertation based on an individual project.

Application Process: Applications for most postgraduate programmes can now be submitted online – please see page 32 for details.

Contact Details

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MSc in Operational Research and Applied Statistics

Suitable for: graduates in a numerate subject such as Mathematics, Operational Research, Statistics, Management Science, Economics, Engineering, Computer Science, Geography or a suitable Science degree.

Offers knowledge and expertise: for a career in areas such as Operational Research, Management Science, Statistics, Management Consultancy, Business Analytics, Logistics, Government OR/Statistics etc.

Course Description: Our innovative MSc programme will equip you with the necessary analytical skills, methods and ways of thinking to tackle and analyse complex organisational problems, help make better decisions, and to become confident statistical analysts. You will study a variety of problem-solving techniques, allowing you to build and use mathematical and statistical models, alongside skills to develop your abilities to communicate effectively to others. This programme will prepare you with essential techniques in Operational Research and Applied Statistics, and allow you to then select from a number of interesting and varied optional courses in topics such as supply chain modelling, healthcare, financial modelling, and statistics and operational research for Government (delivered with input from the Office for National Statistics and Welsh Assembly Government).

Special Features:

- Delivered by experts in the fields of Operational Research and Statistics, the skills that you will learn are highly transferable for use within industry, business and the public sector.
- We enjoy close collaboration with a number of organisations who employ Operational Researchers, Statisticians and Financial/Risk Modellers, and critical to our programmes is the opportunity for you to put the theory into practice, through case studies and project work in the 'real-world'. An important feature of the MSc is the project dissertation, allowing you to work with an external company. Studying our MSc programmes offers the possibility of exciting and rewarding career opportunities and progression.

MSc in Operational Research, Applied Statistics and Risk

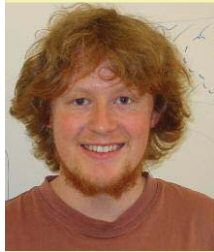
Suitable for: graduates in a numerate subject such as Mathematics, Operational Research, Statistics, Management Science, Economics, Engineering, Computer Science, Geography or a suitable Science degree.

Offers knowledge and expertise: for a career in areas such as Operational Research, Management Science, Statistics, Financial Modelling, Risk Analysis, Management Consultancy, Business Analytics, Logistics, Government OR/Statistics etc.

Course Description: Our unique and innovative MSc programme will equip you with the necessary analytical skills, methods and ways of thinking to tackle and analyse complex organisational problems, help make better decisions, and to become confident statistical analysts. As well as studying the foundations in operational research and applied statistics, you will study further topics in actuarial risk, financial modelling and credit risk scoring, and is ideal for those who wish to study in greater depth risk models, particularly for application to financial markets but also to other sectors.

Special Features:

- Our MSc in Operational Research, Applied Statistics and Risk is a unique MSc degree combination in the UK. It is ideal for those who wish to study risk models in greater depth, particularly for application to financial markets but also to other sectors.
- Delivered by experts in the fields of Operational Research and Statistics, the skills that you will learn are highly transferable for use within industry, business and the public sector.
- We enjoy close collaboration with a number of organisations who employ operational researchers, statisticians and financial/risk modellers, and critical to our programmes is the opportunity for you to put the theory into practice, through case studies and project work in the 'real-world'. An important feature of the MSc is the project dissertation, allowing you to work with an external company. Studying our MSc programmes offers the possibility of exciting and rewarding career opportunities and progression.



Christopher Rowlatt

Christopher Rowlatt is studying for a PhD in Applied Mathematics. Prior to postgraduate research, he completed a BSc in Mathematics and its Applications, also at Cardiff University.

"As an undergraduate student at Cardiff I thoroughly enjoyed the pure and applied mathematics modules. After a placement year, organised as an undergraduate, I decided I would like to do a PhD and I immediately knew the field that I would enter, Fluid Dynamics. My supervisor is very supportive and is a globally recognised expert in the field of Fluid Dynamics. Cardiff School of Mathematics is a very friendly department; I have found the staff to be very approachable and supportive throughout both my undergraduate and postgraduate studies."

MSc Projects

An important feature of the MSc programme is to undertake a project dissertation. This allows the student to apply the methods and skills acquired in the taught part of the programme in a real-world setting, and will typically involve working with a company on a project of importance. Cardiff School of Mathematics already has well established and strong links with many employers of operational researchers and applied statisticians, who regularly offer projects and/or recruit our students, including:

- Barclaycard
- British Airways
- Corus
- Department of Health
- Dstl
- EADS
- Ernst & Young
- Friends Provident
- GE Aviation
- GlaxoSmithKline
- Government OR Services
- HBOS
- Health Solutions Wales
- Lloyds Banking Group
- National Leadership and Innovation Agency for Healthcare (NLIAH)
- NATS
- Office for National Statistics
- PA Consulting
- Pfizer
- PricewaterhouseCoopers
- Roche
- South East Wales Trials Unit (SEWTU)
- Welsh Assembly Government

"As a large employer in this field, we wholeheartedly welcome the MScs now offered by Cardiff University. This is able to provide just the sort of statistics and OR skills that we look for when employing postgraduates".

Martin Brand

Director of Survey Methodology Division,
Office for National Statistics

"The Welsh Assembly Government enjoys excellent links with the Cardiff School of Mathematics. The range of topics covered within the MSc programmes will benefit students and enhance recruitment opportunities and ongoing professional development"

Kate Chamberlain

Chief Statistician, Welsh Assembly
Government