

CARDIFF  
UNIVERSITY

PRIFYSGOL  
CAERDYDD

# School of Mathematics

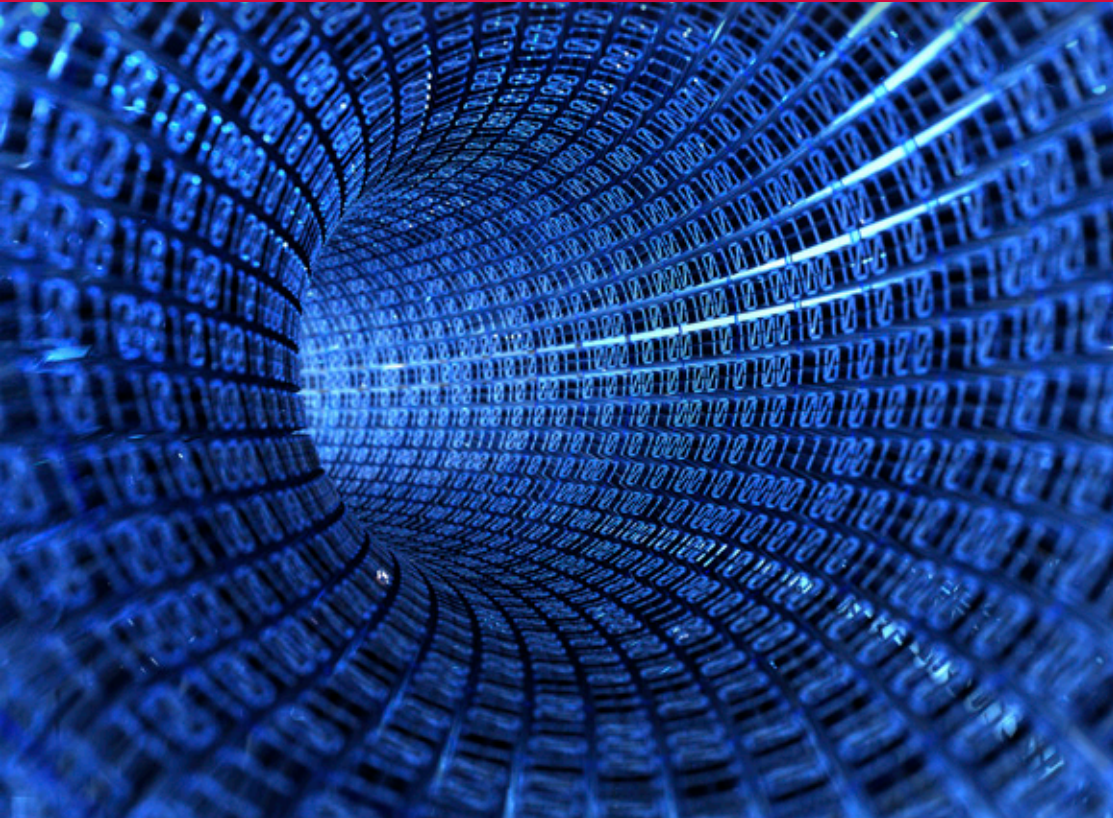
## Masters Programmes

Operational Research and Applied Statistics

Operational Research, Applied Statistics and Financial Risk

Data Science and Analytics

(in collaboration with the School of Computer Science & Informatics)



[cardiff.ac.uk/mathematics](http://cardiff.ac.uk/mathematics)

# MSc in Operational Research and Applied Statistics

## MSc in Operational Research, Applied Statistics and Financial Risk



Our innovative MSc programmes 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.

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.

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.

Our programmes give you 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.

The programmes will prepare you with essential techniques in Operational Research and Applied Statistics, and then allow you to select from optional courses in topics such as supply chain modelling, healthcare, and Statistics and Operational Research for Government (delivered with input from the Office for National Statistics and Welsh Government).

The MSc with Financial Risk, which is a unique programme combination in the UK, is for those who wish to study in greater depth risk models, particularly for application to financial markets but also to other sectors. 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.

# MSc in Data Science and Analytics



Data is increasingly cheap and ubiquitous, and is being collected on a massive scale. There is a significant and growing demand for professionals who can work efficiently and effectively with handling such complex and sizeable data and to extract insights to help inform decision-making.

Taught by experts in Statistics, Operational Research and Computer Science, this programme will help you develop both the theoretical understanding and practical experience of applying methods drawn from data science and analytics. This will equip you with a range of in-demand skills for extracting and handling 'big data', discovering and communicating meaningful patterns from the data, and applying modelling tools to help businesses and government organisations make better decisions.



This new and innovative MSc ensures the skills learned are highly transferable for use within industry, business and the public sector. Having close collaborations with many organisations that employ Data Scientists, Operational Researchers, Statisticians, Computer Scientists, and Financial Modellers, students will have the opportunity for an industrial based 3-month dissertation project, allowing you to gain real-world experience and appreciation, helping you stand out from the crowd when applying for jobs.

## Bill Oates

Chief Data Scientist  
– Office for National  
Statistics

*“As a large employer in this field at the forefront of the data revolution, we wholeheartedly welcome Cardiff University’s MSc courses, which can provide the vital analytical, statistical and computing skills that we look for when recruiting postgraduates.”*

# Programme Structure and Content

## MSc in Operational Research and Applied Statistics

## MSc in Operational Research, Applied Statistics and Financial Risk

Both programmes cover the fundamental topics of Operational Research and Applied Statistics, including the use of specialist software packages, spreadsheet modelling and computer programming skills. Topics include:

Optimisation	Inventory Control	Analysis of Variance
Computer Simulation	Scheduling	Regression Models
Queueing Systems	Heuristics	Multivariate Methods
Game Theory	Probability Theory	Non-parametric Statistics
Decision Theory	Estimation	Sample Surveys
Reliability Theory	Hypothesis Testing	Experimental Design

Students may then choose from a range of interesting and varied option modules from the list shown below.

Semester 1	Options (Select 4 modules)
<ul style="list-style-type: none"><li>Operational Research Methods</li><li>Statistical Methods</li><li>Communication and Research Skills</li></ul>	<ul style="list-style-type: none"><li>Time Series and Forecasting</li><li>Supply Chain Modelling</li><li>Statistics and Operational Research for Government</li><li>Advanced Use of Statistical Packages</li><li>Healthcare Modelling</li><li>Business and Risk Strategy*</li><li>Financial Maths and Actuarial Risk*</li><li>Credit Risk Scoring*</li></ul> <p>* Must be chosen by students on the MSc in Operational Research, Applied Statistics and Financial Risk</p>
<b>Semester 2</b>	
<ul style="list-style-type: none"><li>Computational Methods</li></ul>	
<b>Project Dissertation</b>	

Students will be eligible to include the duration of their studies towards professional accreditation of both the OR Society (CandORS status) and the Royal Statistical Society (GradStat status).

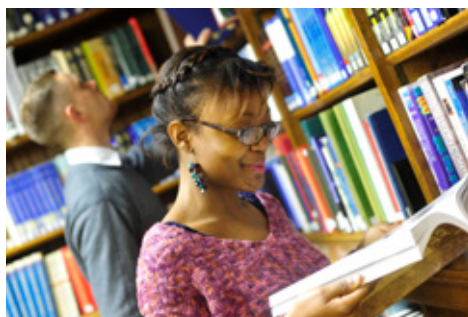
# Part Time Students

## Project Work

By adopting an efficient modular approach to teaching, part-time students will typically only need to be in the University for lectures and workshops for the equivalent of one day per week over 24 weeks each year. You will usually complete the taught component of the programme over two years with up to a further year to complete the project dissertation.

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 programme in a real-world setting, and will typically involve working with a company on a project of importance. Some of these placements will be abroad given our strong international links.

Both Cardiff Schools of Mathematics and Computer Science & Informatics already have well established links with many organisations that employ Data Scientists, Operational Researchers, Statisticians, Computer Scientists, and Financial Modellers including:



Admiral Insurance	DSTL	Office for National Statistics
Airbus Group	Ernst & Young	PWC
Aviva	GE	Roche
Bank of Ireland	Government OR Services	Sainsbury's
British Airways	Lloyds Banking Group	Transport for London
Capital One	Nationwide	Virgin Media
Deloitte	NATS	Welsh Water

**Matthew Jones**  
Head of Retail  
Decision Modelling –  
Nationwide Building  
Society

*“The financial industry is always on the lookout for talented graduates to provide the next generation of technical analyst. The MSc courses provided by Cardiff University support the development of highly sought after analytical problem solving and statistical skills. These provide a great addition to the appeal of a graduates CV to potential employers in the industry.”*

# Who is Eligible and How to Apply



Applications are welcome from people with:

A first degree (minimum second class honours) from a recognised university in a numerate subject such as Mathematics, Statistics, Computer Science, Operational Research, Management Science, Economics, Engineering, Physics or a suitable Science degree.

- ▶ A good level of English language, both written and oral (applicants whose first language is not English will normally require an IELTS score of 6.5).
- ▶ Willingness to engage with staff and students for mutual benefits.
- ▶ Motivation to establish or accelerate a career in Operational Research, Statistics, Data Science and Analytics

We recognise that appropriate work experience is an important component in deciding on an applicant's suitability, and so this will be taken into account with particular emphasis given to experience directly relevant to the programmes of study.



Cardiff University is recognised in independent government assessments as one of Britain's leading teaching and research universities. Founded by Royal Charter in 1883, the University today combines impressive facilities and a dynamic approach to teaching and research with its proud heritage of service and achievement.

The Operational Research and Statistics Group within the Cardiff School of Mathematics has a considerable international reputation and expertise. The group attracts significant research funding with many academic staff at the forefront of their research fields.

For further details of the MSc programmes, information on scholarships and how to apply please see: [cardiff.ac.uk/mathematics](http://cardiff.ac.uk/mathematics) and [coursefinder.cf.ac.uk](http://coursefinder.cf.ac.uk)

# Programme Structure and Content

## MSc in Data Science and Analytics

Technical knowledge and understanding will be developed through taught modules across both the School of Mathematics, and the School of Computer Science & Informatics. These comprise of lectures, worked examples, computer workshops and tutorials, delivered by experts in the specific field. Alongside developing the necessary knowledge for advanced scholarship in the discipline, you will be taught a number of related software packages and programming skills that are used by employers and researchers in Data Science and Analytics professions.

Machine Learning	Optimisation	Regression Models
Pattern Recognition	Heuristics	Hypothesis Testing
Data Mining	Scheduling	Multivariate Methods
Information Processing	Programming Skills	Non-parametric Statistics
Informatics	Probability Theory	Experimental Design

Students may then choose from a range of interesting and varied option modules from the list shown below.

Semester 1	Options (Select 4 modules)
<ul style="list-style-type: none"> <li>Information Processing in Python</li> </ul> OR <ul style="list-style-type: none"> <li>Informatics</li> </ul> OR <ul style="list-style-type: none"> <li>Web Application Development</li> <li>Statistical Methods</li> <li>Optimisation Methods</li> </ul>	<ul style="list-style-type: none"> <li>Web and Social Computing</li> <li>Visual Communication and Information Design</li> <li>Distributed and Cloud Computing</li> <li>Time Series and Forecasting</li> <li>Supply Chain Modelling</li> <li>Statistics and OR for Government</li> <li>Credit Risk Scoring</li> </ul>
<b>Semester 2</b> <ul style="list-style-type: none"> <li>Pattern Recognition and Data Mining</li> </ul>	
<b>Project Dissertation</b>	

Management and business based skills will be developed through a mixture of academic lectures, key skill workshops, invited industrial presentations from experienced industrialists, and the summer project that is typically spent working with a company.

# Cardiff: The City



Cardiff Bay, the city's waterfront

Lively, elegant, confident, cosmopolitan, Cardiff caters for all tastes, offering everything from the excitement of a vibrant city life to the peace and tranquillity of the nearby coast and countryside.

A city with both heritage and ambition Cardiff has a distinctive character, a good quality of life, and a growing national and international reputation.

As the capital city of Wales it is home to many national institutions including the National Museum of Wales and the much admired Millennium Stadium. The city centre skyline is testimony to its heritage and ambition, with landmark buildings ranging from the ornate civic centre to the historic Cardiff Castle.

**Amira Irshad**, Graduate

“The programme offered a suitable balance of complex theory and practical tools to help me think logically and understand how to apply techniques to real life situations, and equipped me with skills to suit a number of job disciplines. All of this helped me get my current job with the Welsh Government, where I am using my statistical knowledge to model social care improvement.”

**Leigh Perryman**, Graduate

“Taking part in the MSc programme has given me the skills and confidence to look at any problem from an analytical perspective and then utilise the many techniques that have been learnt to formulate a model, helping solve problems quickly and efficiently. I now use these skills on a day-to-day basis to help my employer reduce costs and analyse the best way forward in capital expenditure programmes.”