UNIVERSITY OF EXETER

MATHEMATICS

UNDERGRADUATE SUBJECT BROCHURE 2018
CORNWALL AND EXETER CAMPUSES

KEY INFORMATION AND ENTRY REQUIREMENTS

PENRYN CAMPUS, CORNWALL	UCAS CODE	TYPICAL OFFER	
Single Honours			
MSci Mathematical Sciences (Ecology and Evolution)	GF17	AAB-ABB; IB: 34-32	C
MSci Mathematical Sciences (Energy Systems and Control)	GF16	AAB-ABB; IB: 34-32	C
MSci Mathematical Sciences (Environmental Science)	GF15	AAB-ABB; IB: 34-32	C
BSc Mathematical Sciences	G140	AAB-ABB; IB: 34-32	C
Flexbile Combined Honours			
BSc Mathematics and Business	Y004	A*AA-AAB; IB: 38-34	C

C

PENRYN CAMPUS, CORNWALL
Website: **www.exeter.ac.uk/ug/maths**
Email: **cornwall@exeter.ac.uk**
Phone: **+44 (0)1326 371801**

For further details on all our entry requirements, please see our Mathematics pages at **www.exeter.ac.uk/ug/maths**

We strongly advise that you check this before attending an Open Day or making your application. Some programmes at the University require prior study of specific subjects and may also have minimum grade requirements at GCSE or equivalent, particularly in English Language and Mathematics.

International students

If you are an international student you should consult our general and subject-specific entry requirements information for A levels and the International Baccalaureate but the University also recognises a wide range of international qualifications. You can find further information about academic and English language entry requirements at **www.exeter.ac.uk/ug/international**

For information on the application, decision, offer and confirmation process, please visit **www.exeter.ac.uk/ug/applications**

You may also be interested in:

BSc/MSci Computer Science and Mathematics
Please see **www.exeter.ac.uk/ug/computer-science**

BSc/MSci Natural Sciences
Please see **www.exeter.ac.uk/ug/natural-sciences**

STREATHAM CAMPUS, EXETER	UCAS CODE	TYPICAL OFFER	
Single Honours			
MMath Mathematics	G102	A*AA-AAB; IB: 38-34	E
MMath Mathematics with Professional Experience	G104	A*AA-AAB; IB: 38-34	E
MMath Mathematics with International Study	G106	A*AA-AAB; IB: 38-34	E
MSci Mathematics	G103	A*AA-AAB; IB: 38-34	E
MSci Mathematics with Accounting	GIN5	A*AA-AAB; IB: 38-34	E
MSci Mathematics with Management	GIN6	A*AA-AAB; IB: 38-34	E
MSci Mathematics with Economics	GIN7	A*AA-AAB; IB: 38-34	E
MSci Mathematics with Finance	GIN8	A*AA-AAB; IB: 38-34	E
BSc Mathematics	G100	A*AA-AAB; IB: 38-34	E
BSc Mathematics with Accounting	GIN4	A*AA-AAB; IB: 38-34	E
BSc Mathematics with Economics	GILI	A*AA-AAB; IB: 38-34	E
BSc Mathematics with Finance	GIN3	A*AA-AAB; IB: 38-34	E
BSc Mathematics with Management	GIN2	A*AA-AAB; IB: 38-34	E
Combined Honours			
BSc Mathematics and Physics	FG31	A*AA-AAB; IB: 38-34	E

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STREATHAM CAMPUS, EXETER
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Athena SWAN Silver Award

The Athena SWAN Charter recognises and celebrates good employment practice for women working in Science, Technology, Engineering, Mathematics and Medicine (STEMM) in higher education and research. We believe it is vitally important that women are adequately represented in what has traditionally been a male-dominated area and we strive for equality. The University is proud to have held a Bronze institutional award since 2011, and we were awarded a Bronze award at departmental level in 2014, and later gained a Silver award in 2016. Find out more at **www.exeter.ac.uk/mathematics/about/swan**

MATHEMATICS

81% of Mathematics students in graduate level employment or further study within six months of graduating[1]

10th for Mathematics in *The Guardian University Guide 2016*

Unique 4-year MSci programmes include named specialisms in Accounting, Ecology and Evolution, Economics, Environmental Science, Energy Systems and Control, Finance, Climate Science, Mathematical Biology, Geophysical and Astrophysical Fluid Dynamics or Management

Opportunities to study abroad at a range of partner institutions in Europe, USA, Canada, Australia and China

Strong partnership with the Met Office including joint professors and projects in the mathematics of climate

83% of research classified as world-leading or internationally excellent[2]

Mathematics plays an integral role in many aspects of modern life. Every time you stream music and videos, you are using the mathematics of error-correcting codes to reliably download data. When you watch a TV weather forecast, you are looking at the result of sophisticated mathematical modelling of the Earth's atmosphere. In the world of art, mathematics provides inspiration for those taken aback by the intricate fractal patterns, such as the Mandelbrot set, that emerge from surprisingly simple mathematical equations.

Mathematics provides the techniques and language to handle problems from a wide variety of disciplines. It has always been essential for engineering and the physical sciences, and is becoming increasingly important in the life, environmental and social sciences. Yet mathematics is not only studied because of its applications; it has a fascination and beauty of its own, characterised by precision and logical rigour.

A mathematics degree from the University of Exeter will inspire you to fulfil your full potential and flourish – whatever your ambitions. We will encourage you to develop your critical thinking, challenge you to learn new ideas promptly and digest complex reasoning. You will be a key part of our world-class academic community, benefiting from the very latest, research-inspired teaching.

Mathematics forms a rewarding, inspiring, challenging and varied subject of study at university. Building on the mathematics from school or college, it encompasses:

- ☐ **Pure mathematics:** the study of mathematical objects such as numbers, sets and functions, leading to precise statements and rigorous proofs of their general properties;
- ☐ **Applied mathematics:** modelling and analysing phenomena ranging from the generation of the Sun's magnetic field to the spread of disease in humans. Optimisation methods can be used to solve problems in business and industry, informing decisions and policy;
- ☐ **Probability and statistics:** investigating randomness and change, including pattern recognition and data modelling, with applications to fields as diverse as climate change, insurance and risk assessment.

[1] *Destination of Leavers from Higher Education (DLHE) Survey of 2014/15 graduates*
[2] *Research Excellence Framework 2014 based on the percentage of research categorised as 4* and 3**

MATHEMATICS IN CORNWALL

By choosing to study mathematics in Cornwall you will have the opportunity to develop your core and advanced mathematical skills in an inspirational setting and apply these skills to important global challenges including biodiversity, energy security, environmental change, human health and wildlife disease.

Your studies will benefit from:

- ☐ **Research led teaching** – all academic staff are research active and draw on close links to the Environment and Sustainability Institute or the European Centre for Environment and Human Health;
- ☐ **Flexibility and choice** – many options in mathematics and across applied disciplines allow you to tailor your studies to your personal interests, eg, in ecology and evolution, energy systems, and environmental science;
- ☐ **Interactive learning and innovative assessment** – many modules draw on research-led activities that inspire inquiry and investigation. These activities include field trips, panel debates and expert-led discussions. Assessments are tailored to learning outcomes and include poster and oral presentations, computer code, technical reports and log books aimed at demonstrating your knowledge, skills and expertise;
- ☐ **Work placement** – this third-year module provides you with a valuable opportunity to put your mathematical and statistical skills into practice in the work place;
- ☐ **Inspirational location** – Cornwall is a perfect natural environment offering numerous opportunities for you to develop skills via hands-on experiences and to understand the challenges facing our planet.

Single Honours

MSci Mathematical Sciences (Ecology and Evolution)

MSci Mathematical Sciences (Energy Systems and Control)

MSci Mathematical Sciences (Environmental Science)

BSc Mathematical Sciences

The modern application of mathematics operates at the interface of multiple disciplines, and integrates data analysis, computer science, and statistics. The explosion of 'big data', in sectors including genome sequencing, 'eco-informatics', and online consumer behaviour, means there is an urgent need for mathematicians that can handle complex datasets, communicate effectively, and fully understand the techniques, pitfalls, and potential of advanced mathematical methods.

BSc Mathematical Sciences combines traditional mathematics subjects with advanced courses in statistics, programming, and data science, that will prepare students for the array of numerate and analytical professions that are found at the core of both modern research and the digital economy. There is an outward facing approach to mathematics with options available in ecology, business, engineering, social science, and environmental science. On completion of the programme students will have a deep understanding of the techniques and methods of modern mathematical sciences, and a clear insight into the industrial and scientific areas in which they are applied.

The four-year MSci degrees allow you to explore your mathematical interests to a greater depth and to obtain a higher level qualification than the standard three-year BSc degree. The first three years are essentially the same for all these programmes, while the final year of the four-year programmes involves more advanced and specialised material, allowing you to specialise in Ecology and Evolution, Environmental Science, or Energy Systems and Control.

In your fourth year you will take further advanced modules relevant to your MSci pathway, and will choose a substantial research-led M-level project supervised by a staff member in the appropriate research group. The flexibility offered in our range of MSci programmes will enable you to study a subject that reflects both your mathematical interests and career aspirations.

MSci Mathematical Sciences (Ecology and Evolution) Mathematics has played a pivotal role in advancing our understanding of ecology and evolution, building on the major scientific theories of Darwin, Fisher and others. The MSci Mathematical Sciences (Ecology and Evolution) programme offers you an opportunity to explore mathematics and statistics, and the development of underpinning theory relevant to applications in ecology and to understanding the evolution of life itself.

MSci Mathematical Sciences (Energy Systems and Control) Dwindling fossil fuel resources and international commitments to CO_2 reduction are creating an increasing need for renewable energy such as wind, solar, tidal and wave power. The MSci Mathematical Sciences (Energy Systems and Control) provides you with an opportunity to apply mathematics, statistics and computational modelling to tackle problems in energy engineering, management and policy, such as resource assessment, system optimisation and reliability. Integral to the fourth year is a combined industrial placement and research project that gives you important hands-on experience and an opportunity to put your mathematical expertise into practice.

MSci Mathematical Sciences (Environmental Science) Understanding the environment around us is becoming increasingly dependent on processing and interpreting complex data. The MSci Mathematical Sciences (Environmental Science) programme gives you the opportunity to explore applications of mathematical, statistical and data science techniques for addressing important environmental challenges – from understanding the molecular biology of diseases to geophysical phenomena in climate change.

Integral to the fourth year of both the MSci Mathematical Sciences (Ecology and Evolution) and MSci Mathematical Sciences (Environmental Science) is the Field Course, where you gain hands-on experience in solving real-life problems faced by ecologists and environmental scientists.

BSc Mathematical Sciences This programme provides you with a strong foundation in mathematics, statistics and computing, with the opportunity to apply your mathematical skills to a wide range of natural sciences and technologies – particularly in energy engineering, ecology and environmental science.

Year 1 The first year modules introduce you to the main areas of university-level mathematics, consolidating and building on the material you will have learned at A level. Alongside traditional core mathematical expertise, the Fundamentals of Interdisciplinary Mathematics module will give you problem-based learning skills around a number of important scientific themes. As a further key element of the programme you will develop skills for

analysing and interpreting complex data, for which the Information Systems module provides the foundation.

Year 2 Core modules further develop fundamental concepts in mathematics and statistics whilst optional modules open up areas of applications of mathematics in science and technology. Problem-based learnings are strengthened in *Fundamentals of Interdisciplinary Mathematics II*. Data analysis skills are further enhanced in the *Data*, *Signals and Systems* and *Statistical Modelling* modules. Progression to the third year of the MSci programmes, or transfer from BSc to MSci Mathematical Sciences, is conditional on satisfactory performance in the second year.

Year 3 In the third year, a wide range of modules are available in both mathematics and in numerous important areas of science and technology. These give you the option to specialise in a specific area of mathematical sciences or to continue with a generalist mathematics programme. MSci students also have the option of studying in the USA, Canada, Australia or New Zealand for half of the third year.

Year 4 (MSci Ecology and Evolution)
You will study modules in *Ecological Dynamics* and *Advanced Statistical Methods* as well as options in *Evolutionary and Behavioural Ecology*, and *Biodiversity and Conservation*. The field course provides you with a unique opportunity to put your mathematical skills into action. The research project allows you to make an in-depth study in a chosen area of specialisation.

Year 4 (MSci Energy Systems and Control)
You will study modules in *Optimisation and Control*, *Computational Modelling and Simulation* and further options in *Advanced Wind Energy*, *Solar Energy Research*, and *Innovation and Advanced Marine Renewable Energy*. The combined *Industrial Placement and Research Project* allows you to specialise in an area of interest and develop hands-on practical skills.

Year 4 (MSci Environmental Science)
Environmental science is data rich. Modules covered include *Computational Modelling and Simulation*, *Advanced Statistical Methods* and further options in *Climate*, *Hazards and Risk Assessment*, and *Understanding Environmental Change*. The field course provides you with a unique opportunity to put your mathematical skills into action. The research project allows you to make an in-depth study in a chosen area of specialisation.

Flexible Combined Honours

You can combine Mathematics with up to two other subjects from an extensive list; including Business Studies, Ecology, English, Geography or History. Throughout your degree you will be given regular support to help you choose the most appropriate pathway for you. Further information and the full list of available subjects can be found at **www.exeter.ac.uk/ug/flexible**

BSc Mathematics and Business
Our Combined Honours programme will allow you to develop a comprehensive understanding of mathematics, and recognise its important relation to business. Within the world of business, mathematics is the tool which enables analysis and quantification, allowing businesses to maximise their potential and prosper. You will be introduced to various sectors within the business industry, developing vital entrepreneurial skills needed for successful progression in your career. You may have the opportunity to apply your knowledge through undertaking work experience in the UK or overseas in your third year.

Year 1 (core) Business and Society; Theory and Practice of Management; Vectors and Matrices; Calculus and Geometry; Advanced Calculus; Fundamentals of Interdisciplinary Mathematics I; Dynamics; Probability and Statistics.

Year 2 (core) Project Management; Strategic Concepts for Business; Data Signals and Systems; Linear Algebra; Differential Equations; Fundamentals of Interdisciplinary Mathematics II; Vector Calculus; Statistical Modelling.

Year 3 (core) Project; Work Placement (optional) Social and Technological Innovation; Globalisation and Internationalisation; Crisis; Change and Creativity in Organisations; Graphs and Networks; Mathematical Biology; Nonlinear Systems; Partial Differential Equations; Bayesian Inference.

"The Penryn Campus provides an exceptional setting for learning. Being near to such a variety of diverse landscapes offers the perfect opportunity to become immersed in field trips, such as rockpooling at Gyllyngvase, the local beach, to collect an array of data. The lecturers and support staff are easy to approach and always willing to offer guidance, making for a friendly atmosphere."

Amy Denby, Penryn Campus

MODULES IN CORNWALL

KEY C = Core
● = Optional

For up-to-date details of all our programmes and modules, please check **www.exeter.ac.uk/ug/maths**

Year 1 Modules

Module Name	BSc Mathematics and Business	MSci/BSc Mathematical Sciences
Advanced Calculus	C	C
Business and Society	C	C
Calculus and Geometry	C	C
Dynamics	C	C
Fundamentals of Interdisciplinary Mathematics I	C	C
Information Systems	C	C
Probability and Statistics	C	C
Scientific Programming	C	C
Theory and Practice of Management	C	C
Vectors and Matrices	C	C

Year 2 Modules

Module Name	BSc Mathematics and Business	MSci/BSc Mathematical Sciences
Atmosphere and Ocean Systems	●	●
Data, Signals and Systems	C	C
Differential Equations	C	C
Electrical Energy Conversion and Transport	●	●
Evolution of Human Societies	●	●
Fundamentals of Interdisciplinary Mathematics II	C	C
Geographical Information Science and Systems	●	●
Introduction to Ecological Consultancy	●	●
Landscape Evolution	●	●
Linear Algebra	C	C
Natural Hazards and Risk	●	●
Population and Community Ecology	●	●
Project Management	C	C
Remote Sensing for Environmental Management	●	●
Statistical Modelling	C	C
Stochastic Processes	C	C
Strategic Concepts for Business	C	C
The Politics of Climate Change and Energy	●	●
Vector Calculus	C	C
Vector Calculus and Applications	●	●

Year 3 Modules

Module Name	BSc Mathematics and Business	MSci/BSc Mathematical Sciences
Animal Life History	●	●
Bayesian Inference	●	●
Coevolutionary Interactions	●	●
Crisis, Change and Creativity in Organisations	●	●
Data Analytics	C	C
Evolution and Ecology of Disease	●	●
Globalisation and Internationalisation	●	●
Graphs and Networks	●	●
Human Behavioural Ecology	●	●
Issues in Climate Change	●	●
Marine Renewable Energy and Hydropower	●	●
Mathematical Biology	●	●
Mathematical Biology and Ecology	●	●
Mathematical Sciences Project	C	C
Nonlinear Systems	●	●
Nonlinear Systems and Control	●	●
Partial Differential Equations	●	●
Project Work Placement	C	C
Smart Energy and Energy Storage Technologies	●	●
Social and Technological Innovation	●	●
Solar Power	●	●
Sustainability	●	●
Symbiosis in Marine Systems	●	●
The Behavioural Ecology of Information Use	●	●
Trends in Ecology and Evolution	●	●
Wind Power	●	●
Work Placement	C	C

Year 4 Modules (MSci)

Module Name	MSci Mathematical Sciences (Ecology and Evolution)	MSci Mathematical Sciences (Energy Systems and Control)	MSci Mathematical Sciences (Environmental Science)
Advanced Marine Renewable Energy		●	
Advanced Statistical Methods	C	●	C
Advanced Wind Energy		●	
Climate, Hazards and Risk Assessment			●
Computational Modelling and Simulation		C	C
Control and Optimisation		C	
Data Handling and Visualisation	●		●
Ecological Dynamics	C		
Ecological Responses to Climate Change			●

Module Name	MSci Mathematical Sciences (Ecology and Evolution)	MSci Mathematical Sciences (Energy Systems and Control)	MSci Mathematical Sciences (Environmental Science)
Environmental Sustainability in Practice			●
Evolutionary and Behavioural Ecology	●		
Field Course	C		C
Industrial Placement Project		C	
Marine Biodiversity and Conservation	●		
Research Project	C	C	C
Solar Energy Research and Innovation		●	
Terrestrial Biodiversity and Conservation	●		
Understanding Environmental Change			●

SMALL CLASS SIZES

With only 40 places available on BSc Mathematical Sciences, you are guaranteed a personal, interactive and rewarding learning experience. Being part of a small class will enable you to build excellent relationships with your peers and the academics teaching on the course, and receive personalised support as you develop your mathematical expertise in an inspirational setting.

MSci FIELD COURSE

The fourth-year *Field Course* module is one of the most unique and exciting elements of the MSci Mathematical Sciences pathways in Ecology and Evolution, and Environmental Science. Drawing upon the mathematical and statistical skills you have developed during your first three years, it will enable you to gather data and make real applications as you explore key environmental issues first-hand. It is a fantastic experience which will provide you with an in-depth understanding of the environment and how we interact with it.*

** field course destinations are subject to change*

MODULES IN CORNWALL CONTINUED

Year 1

Advanced Calculus	An introduction to advanced methods of calculus, whilst emphasising practical methods and problem solving in scientific applications.
Business and Society	Broaden your understanding of the relationships between business and society through a focus on responsibility. Throughout the module you will be engaging in case study work, debate and independent research.
Calculus and Geometry	You will develop knowledge and skills in calculus and geometry in two and three dimensions. The module gives an informal treatment of theorems from analysis, introducing the main properties of sequences and series, and of continuous and differentiable functions.
Dynamics	Explore Newtonian dynamics and its applications, the use of calculus and vectors in the modelling of physical systems, and applied mathematics as a tool for investigating natural and man-made systems.
Fundamentals of Interdisciplinary Mathematics I	Study the interdisciplinarity of mathematical sciences. The module is built around a number of themes, each theme starting with a plenary style colloquium from an expert scientist. These expert colloquia then inspire classroom-based work in small groups in which you will develop and apply a variety of mathematical techniques.
Information Systems	This module introduces the processes, technologies and architectures used to collect and analyse information for a variety of modern applications.
Probability and Statistics	An overview fundamental concepts in probability, and their application in statistics. These include random variables and probability distributions, as well as hypothesis testing and confidence intervals.
Scientific Programming	Understand the use and capability of computers in modern mathematical and scientific contexts, demonstrating how computers can be used to solve and visualise the solutions to a range of diverse problems in mathematical sciences.
Theory and Practice of Management	You will be introduced to the major contemporary developments in business and the most influential contemporary management theories. However, while you are encouraged to reflect on past developments, the overall focus of the module is on the likely future direction of management practice and on the key explanatory factors.
Vectors and Matrices	Develop a foundation in the concepts of vectors and matrices, together with applications to geometry and the solution of systems of linear equations.

Year 2

Data, Signals and Systems	This module looks at modern signal processing; the interplay between signals and systems – uncovering the mathematics underpinning the miniaturised digital revolution of the last couple of decades. You will develop skills needed to analyse and interpret complex data sets.
Differential Equations	Evaluate various types of ordinary and partial differential equations and a number of analytical and numerical techniques used to solve them.
Fundamentals of Interdisciplinary Mathematics II	Following from the *Fundamentals of Interdisciplinary Mathematics I*, you will continue to work in small groups, you will begin to integrate more advanced mathematical and statistical modelling tools with key questions and issues from scientific applications.
Linear Algebra	This module focuses on vector spaces and linear systems, giving a rigorous treatment of algebraic techniques. The material of this module underpins several subsequent modules.
Project Management	Managing projects is an everyday part of working and academic life. Learning the basic skills of how to organise your time, resources and effort (if you are running your own project) and those of a team, if you are managing a multi-faceted project, is essential for your future career.
Statistical Modelling	An introduction to the concepts of experimental design and statistical modelling. You will learn how to use a range of statistical models for analysing data, including linear and multiple regression, and mixed-effects models.
Stochastic Processes	Evaluate the role of randomness in dynamical processes is key to understanding many complex, real-world systems. In this module you will be introduced to a variety of models of correlated random processes, such as Markov chains.
Strategic Concepts for Business	Examine and evaluate how strategy is currently practiced in a wide variety of contexts from strategy formulation through to strategy execution on multiple organisational levels.
Vector Calculus and Applications	This module provides an introduction to vector calculus and its applications, especially fluid dynamics. Physical applications include meteorology and oceanography.

MODULES IN CORNWALL CONTINUED

Year 3

Bayesian Inference	The task of inferring physical, ecological and biological processes from observed data is challenging, such as dealing with missing data and hidden processes. The Bayesian framework provides a powerful means for overcoming some of these challenges. In this module you will learn the principles of Bayesian analysis and related computational tools.
Crisis, Change and Creativity in Organisations	This module examines how organisations cope with crises and manage profound change. The complex cultural, political and ethical issues faced by change agents will be examined in detail.
Data Analytics	In this module you will develop skills and techniques needed to turn complex data sets into useful information from across scientific and business applications.
Globalisation and Internationalisation	Develop a better understanding of management and leadership in an international context and increase your awareness of the various forces influencing and transforming the competitive landscape of the global economy.
Graphs and Networks	The theory of networks and graphs is a mathematical framework for the study of a range of applications, from studying the spread of rumours on twitter, to finding the optimal route through a city. This module will introduce you to the key concepts and results.
Mathematical Biology and Ecology	This module considers the application of mathematics within biological sciences. You will examine population dynamics; harvesting models; competitive exclusion of species; simple analysis of reaction kinetics; biological waves and diffusion driven instabilities; effects of geometry; and pattern formation on animals.
Mathematical Sciences Project	The project consists of a piece of work in an area of the mathematical sciences and is supervised jointly from mathematics and the relevant applications area. You may work individually or, ideally, with a student from the applied discipline.
Nonlinear Systems and Control	Energy-like functions play a key role in the qualitative study of the dynamical behaviour of nonlinear systems, replacing algebraic tools like eigenvalues so important for linear systems. Mechanical systems and electrical circuits have naturally defined energy. Energy can be manipulated via external control and especially feedback control. This module will develop a conceptual framework interwoven with several case studies.
Partial Differential Equations	The laws of physics are formulated in terms of PDEs, so the subject is of great importance in the physical sciences. However, the application of these equations extends into the modelling of subjects as diverse as ecology and economics.
Social and Technological Innovation	Examine different ways in which social and technological innovations have revolutionised how we do business and in turn how society operates.
Work Placement	To provide work experience you will work during the summer on an industrial or research oriented project. This gives you the opportunity to apply your mathematical and statistical skills in the real world.

Year 4 (MSci)

Advanced Statistical Methods	In this module you will explore key challenges in fitting models to complex, spatio-temporal data. In particular you will focus on the use of the Bayesian framework, which provides a powerful tool with which to tackle many of these key challenges. You will learn how to build likelihoods for various models and also study recent advances in model-fitting techniques.
Computational Modelling and Simulation	Renewable energies involve complex interactions of technology and the natural environment, such as marine structures in hostile conditions. In this module you will study and apply physical modelling techniques and simulation approaches, for example computational fluid dynamics for wave energy devices.
Control and Optimisation	Optimisation and control lie at the core of renewable energy systems. In this module you will explore the key techniques needed to optimise and stabilise integrated technologies. You will use case studies from wave energy, wind and solar power and anaerobic digestion to motivate the mathematical tools developed.
Data Handling and Visualisation	One of the most fundamental tasks in the life and environmental sciences is to interpret and draw conclusion based on experimental or observational data. In this module you will explore the key issues surrounding the analysis, interpretation and presentation of multivariate and large data sets.
Ecological Dynamics	Key advances in our understanding of ecological processes, such as multi-species or predator/prey interaction, island biogeography, or critical transitions in ecosystems, have been based on mathematical theories. In this module you will learn about the classical and current theories in ecology and how they can be used to explore the dynamic processes underlying observed patterns and phenomena.
Field Course*	Ever wanted to collect meaningful data while watching African wildlife do its thing on the savannah? In this course you will spend two weeks in Kenya witnessing much of the fascinating wildlife of Africa first-hand while also learning how to design, carry out and interpret your very own data collection and modelling study. You will be trained to take systematic, ecological observations in the field and then carry out a mathematical research project based on these observations.
Industrial Placement	To provide work experience within the energy sector, you will work on a real industrial project, established during the summer placement stage, but the execution of which is extended through into the academic year. This provides an opportunity for in-depth academic study, analysis and design. The module aims to encourage the use of creativity, imagination and initiative, and professional conduct and discipline in executing the project.
Research Project	This project consists of a piece of work in an area of the mathematical sciences which you will undertake individually under the supervision of a member of staff. Projects might involve working on a practical problem, or developing or using computer programmes and packages. Others involve reviewing a theoretical area or tackling a novel theoretical problem. The aim is to extend the knowledge acquired in formal modules and strengthen skills in research and report writing.

** field course destinations are subject to change*

WORK PLACEMENT

The third-year *Work Placement* module is a key component of the Mathematical Sciences degree. It provides a unique opportunity to put your learning into practice whilst gaining valuable experience in the work place.

MATHEMATICS IN EXETER E

By choosing a degree in mathematics at Exeter, you will find plenty to interest and excite you before specialising in those areas that particularly appeal to your mathematical interests and career aspirations. As well as developing your mathematical knowledge, you will also enhance your ability to think clearly and logically and get to the heart of a complex problem.

We offer a wide choice of degree programmes, allowing you to study mathematics on its own or with a subsidiary subject such as accounting, economics, management or finance, or with engineering or physics. You could also follow our Flexible Combined Honours Scheme to widen your options further to include other subjects taught at the University; for example you could combine mathematics with biology, geography or a foreign language.

We have excellent links with employers, locally and nationally, and encourage our students to carry out work placements. You'll find this contributes significantly to your career development. Employers also come to the University to provide careers advice, give guest lectures and help students to find placements. Mathematics graduates from Exeter are highly valued by employers in a broad range of sectors.

Single Honours

MMath Mathematics

MSci Mathematics
(Climate Science)

MSci Mathematics
(Mathematical Biology)

MSci Mathematics
(Geophysical and Astrophysical Fluid Dynamics)

BSc Mathematics

Gain a strong foundation in all the main areas of mathematics: pure mathematics, applied mathematics and statistics/optimisation. Through optional modules you can choose to specialise in one area of mathematics or to continue with a broad-based programme.

The four-year MMath and MSci degrees allow you to explore your mathematical interests to a greater depth and to obtain a higher level qualification than the standard three-year BSc degree. They are an excellent preparation for a career as a professional mathematician. The first three years are essentially the same for all these programmes, while the final year of the four-year programmes involves more advanced and specialised material.

MMath Mathematics This programme is particularly suitable for those who are considering postgraduate work in mathematics or who are interested in a career that makes extensive use of advanced mathematical techniques in the academic, industrial or commercial sectors. Students taking MMath Mathematics with Professional Experience undertake a commercial or industrial work placement during the summer vacation at the end of their second year, and then complete a project module based around this during their third year. Students taking MMath Mathematics with International Study spend one semester of their third year studying at an agreed partner university abroad.

MSci Mathematics This programme prepares you to work in a named area of science of major contemporary importance which depends heavily on mathematical tools and models. There are currently three streams: Climate Science, Mathematical Biology, and Geophysical and Astrophysical Fluid Dynamics.

MSci Mathematics (Climate Science) Climate change is one of the biggest challenges we face and mathematical models are essential in understanding and predicting the behaviour of the climate system. The MSci Mathematics (Climate Science) programme gives you the opportunity to see how different areas of mathematics, such as fluid dynamics, statistics and numerical computing, contribute to understanding the climate and the impact of human activity upon it. Graduates of this programme will be well equipped to work in climate modelling and related areas, for instance in the Met Office.

MSci Mathematics (Mathematical Biology) With the completion of the Human Genome Programme, there is a huge potential for advances in medicine, and biological research more generally, by exploiting the newly-available genetic data. Extracting useful information, however, is a difficult problem requiring sophisticated techniques from mathematics and computer science. This is just one of the vital contributions mathematics is making to modern biological research which is covered in the MSci Mathematics (Mathematical Biology). As more and more high-tech companies are set up to exploit applications of the bioinformatics revolution, there are likely to be many career opportunities for graduates of this programme in commercial and academic environments.

MSci Mathematics (Geophysical and Astrophysical Fluid Dynamics) This programme will enable you to see how different areas of mathematics contribute to our understanding of the fluid dynamics of atmospheres and oceans, and fluid flows in astrophysical systems (where magnetic phenomena may also be important). Graduates of this programme will be well equipped to work in meteorology, atmospheric science, oceanography and related areas.

MATHEMATICS IN EXETER CONTINUED

BSc Mathematics: This programme gives you a strong foundation in all the main areas of mathematics, allowing you to specialise in one or more areas if you wish. It will equip you for a wide range of careers where analytical thinking and problem-solving skills are important.

Year 1 The first year modules introduce you to all the main areas of university-level mathematics, consolidating and building on the material you will have learned at A level. The *Mathematical Investigations* module includes group work to tackle open-ended problems in mathematics under the supervision of a member of staff.

Year 2 Core modules cover concepts and techniques that are widely used in many areas of mathematics, while optional modules give you the opportunity to learn about more specialised topics. In addition, you can take up to 30 credits of optional modules outside of your immediate programme.

Year 3 In the third year, a wide range of modules are available, including *Mathematics: History and Culture*. These, together with electives available in the second and third years, give you the opportunity to specialise in one area of mathematics, or to continue with a broad-based course. MMath and MSci students also have the option of studying in the USA, Canada, Australia or New Zealand for half of the third year. Progression to the third year of the MMath or MSci is conditional on a satisfactory performance in the second year.

Year 4 (MMath) In the final year, you will learn about research in mathematics and will undertake an individual project, supervised by a member of academic staff. You will also be able to choose options from a range of subjects in mathematics and its applications.

Year 4 (MSci Climate Science) The advanced mathematics modules you will take will include topics such as the mathematics of human-induced climate change; the fluid dynamics of atmospheres and oceans; and mathematical modelling of weather and climate.

Year 4 (MSci Mathematical Biology) Mathematics modules cover the mathematical analysis of biological systems and the key mathematical tools for systems biology, including techniques for understanding the stability of networks and systems. You will also take a module in molecular biology.

Year 4 (MSci Geophysical and Astrophysical Fluid Dynamics) You will take advanced mathematics modules, including modules covering various aspects of fluid dynamics and magnetohydrodynamics.

Mathematics with Business programmes

Our programmes that combine mathematics with business subjects utilise the expertise from both the Mathematics department and the Business School. You will gain a firm foundation in mathematics and also acquire in-depth knowledge and understanding of the business area of your choice. The combination of skills developed during these programmes make graduates very attractive to a wide range of employers.

At least 25 per cent of the credits are taken in the business subject. After the first year this proportion may be increased through your choice of optional modules. Previous study of the business subject is not necessary.

Details of the mathematics modules studied on each programme, along with the compulsory Business School modules, are given towards the back of this brochure. After the first year, additional modules from the Business School may be taken as electives.

BSc/MSci Mathematics with Accounting

This programme is designed for students who are interested in following a career in accountancy or in going on to obtain professional accounting qualifications prior to entering a career in business. In addition to giving you the skills and subject knowledge of a mathematics graduate, this programme gives you an understanding of financial reporting and management accounting in a market economy.

BSc/MSci Mathematics with Economics

Modern economics covers a wide range of topics from inflation to the control of monopoly power, from the study of developing countries to the finance of multinational companies. In addition to giving you the skills and subject knowledge of a mathematics graduate, this degree programme reflects that breadth of interest in a flexible course designed to suit you if you wish to study a broad curriculum or to specialise in a particular area.

BSc/MSci Mathematics with Finance

Both our BSc and MSci will equip you with the skills and subject knowledge of a mathematics graduate, whilst providing a solid foundation of finance, should you wish to follow a career in this direction. It introduces advanced financial techniques such as derivatives pricing, risk management and portfolio management. Our graduates find employment with financial institutions such as banks, insurance companies, pension funds, investment and unit trusts, as well as stock-broking and financial advisory work.

BSc/MSci Mathematics with Management

For those interested in a management career, but who still desire a detailed understanding of mathematics, should consider either a BSc or MSci in this topic. It provides you with a detailed understanding of the relationship of management theories and practice to the functional areas of business, whilst gaining invaluable mathematics skills. You will gain detailed knowledge of mathematics and management, and the range of skills necessary for high employability in the administrative and managerial job market.

Combined Honours

BSc Mathematics and Physics

Mathematics and physics have always been closely interconnected, with mathematics providing the language and tools for the development of physical theories, and physics often providing the motivation or inspiration for new discoveries in mathematics. Exeter is an exciting place to study mathematics and physics. Recently £5.4 million has been invested in ultra-fast lasers, nano-fabrication, bio-imaging, lecture theatres, computing facilities and also our own astronomical observatory. In addition to this is the £1 million supercomputer located in the Physics department.

You can find out more about physics at **www.exeter.ac.uk/ug/physics**

Flexible Combined Honours

This innovative Flexible Combined Honours scheme enables you to combine modules from a number of different fields of study not otherwise available through an existing Combined Honours programme. You can combine mathematics with up to two other subjects from an extensive list; for example Geography, Biology or a modern language. Throughout your degree you will be given regular support to help you choose the most appropriate pathway for you. Further information and the full list of available subjects can be found at **www.exeter.ac.uk/ug/flexible**

"I came to an Open Day and was impressed by the variety offered by Exeter; there were comprehensive and challenging courses offered in all of the main areas of mathematics. In particular, the University has very close contact with the Met Office, giving its Mathematics degrees an edge for mathematicians interested in learning more about the mathematics behind our climate and weather.

The lecturers are friendly and the facilities are up-to-date and well maintained. Also, MathSoc is one of the most active academic societies on campus; they work really hard to make sure we, as a subject, are engaged with one another, whether that be through intramural sport, social media, academic events or social events. Combining this with the amount of contact hours we have, you really get to know the people you're studying with, which is a massive plus.

I originally came to the University on a three-year BSc course, but switched to the four-year MSci because I've enjoyed my experience here so much that I didn't want it to end. In a highly competitive graduate job market, I figured I'd kill two birds with one stone; spend another year at uni and come out with a Masters!"

Louis Tsiattalou, MSci Mathematics (Geophysical and Astrophysical Fluid Dynamics)

MODULES IN EXETER E

KEY
C = Core
● = Optional
+ = Taught by the Business School

For up-to-date details of all our programmes and modules, please check **www.exeter.ac.uk/ug/maths**

Year 1 Modules

Module Name	MMath/ BSc/MSci Mathematics	BSc/MSci Mathematics with Accounting	BSc/MSci Mathematics with Economics	BSc/MSci Mathematics with Finance	BSc/MSci Mathematics with Management	BSc Mathematics and Physics
Introduction to Financial Accounting+		C				
Introduction to Management Accounting+		C				
Mathematical Modelling	C					
Methods	C	C	C	C	C	
Microeconomics I+			C	C		
Probability, Statistics and Data	C	C	C	C	C	
Structures	C	C	C	C	C	C
Theory and Practice of Management+					C	

Year 2 Modules

Module Name	MMath/ BSc/MSci Mathematics	BSc/MSci Mathematics with Accounting	BSc/MSci Mathematics with Economics	BSc/MSci Mathematics with Finance	BSc/MSci Mathematics with Management	BSc Mathematics and Physics
Algebra	C	C	C	C	C	C
Ambassadors for Science	●	●	●	●	●	●
Differential Equations and Vector Calculus	C	C	C	C	C	C
Financial Accounting		C				
Financial Markets and Decisions+				C		
Intermediate Management Accounting		C				
Introduction to Finance+				C		
Microeconomics II+			C	C		
Numerics, Data and Modelling	●					●
Operations Management+					C	
Real and Complex Analysis	C	C	C	C	C	C
Statistical Modelling and Inference	●	●	●	●	●	

* *available on MMath Mathematics with Professional Experience programme only*
▲ *available on MMath Mathematics with International Study programme only*

Year 3 Modules

In the third year, a wide range of modules are available on all programmes, which give you the opportunity to specialise in one area of mathematics, or to continue with a broad-based programme. Those listed below are examples of some of the modules available. Full details can be found on our website at **www.exeter.ac.uk/ug/maths**

Module Name	MMath/ BSc/MSci Mathematics	BSc/MSci Mathematics with Accounting	BSc/MSci Mathematics with Economics	BSc/MSci Mathematics with Finance	BSc/MSci Mathematics with Management	BSc Mathematics and Physics
Advanced Statistical Modelling	●	●	●	●	●	●
Applications of Geometry and Topology	●	●	●	●	●	●
Bayesian Statistics, Philosophy and Practice	C	C	C	C	C	●
Combinatorics	●	●	●	●	●	●
Commercial and Industrial Experience	●	●	●	●	●	●
Computational Nonlinear Dynamics	C	C	C	C	C	●
Cryptography	●	●	●	●	●	●
Fluid Dynamics	●	●	●	●	●	●
Galois Theory	●	●	●	●	●	●
Graphs, Networks and Algorithms	●	●	●	●	●	●
Mathematical Biology and Ecology	●	●	●	●	●	●
Mathematics Group Project	●	●	●	●	●	●
Mathematics: History and Culture	●	●	●	●	●	●
Mathematics of Climate Change	●	●	●	●	●	●
Nonlinear Systems and Control	●	●	●	●	●	●
Number Theory	●	●	●	●	●	●
Partial Differential Equations (PDEs)	●	●	●	●	●	●
Professional Experience*	●					
Research in Mathematical Sciences	●	●	●	●	●	●
Statistical Inference	●	●	●	●	●	●
Stochastic Processes	●	●	●	●	●	●
Semester of Mathematical Studies Abroad▲	●					
Topology and Metric Spaces	C	C	C	C	C	●

MODULES IN EXETER CONTINUED E

KEY
C = Core
● = Optional
+ = Taught by the Business School

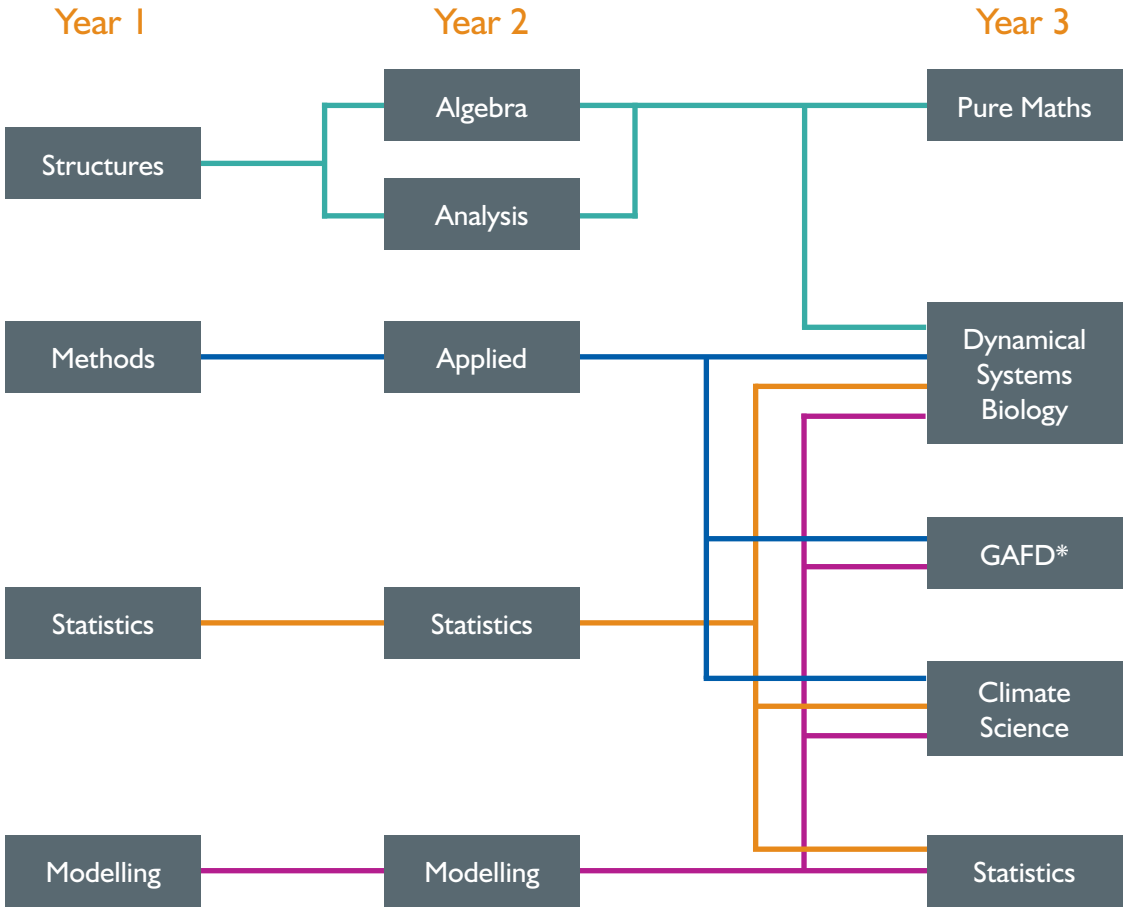
For up-to-date details of all our programmes and modules, please check **www.exeter.ac.uk/ug/maths**

Year 4 Modules

Module Name	MMath Mathematics	MSci Mathematics (Climate Science)	MSci Mathematics (Mathematical Biology)	MSci Mathematics (Geophysical and Astrophysical Fluid Dynamics)	MSci Mathematics with Accounting/ Economics/ Finance/ Management
Advanced Econometrics+					●
Algebraic Curves	●	●	●	●	
Algebraic Number Theory	●	●	●	●	
Analysis and Computation for Finance					C
Computation and Numerical Analysis	●	C	C	C	
Derivatives Pricing+					●
Dynamics and Evolution of Biological Systems	●	●	C	●	
Dynamical Systems and Chaos	●	●	●	●	●
Financial Modelling+					C
Fluid Dynamics of Atmospheres and Oceans	●	C	●	C	
Introduction to Molecular Biology			C		
Magnetic Fields and Fluid Flows	●	●	●	C	
Mathematical Modelling in Biology and Medicine	●	●	C	●	●
Mathematical Theory of Option Pricing	●	●	●	●	C
Mathematics, Business and Finance Project					C
Methods for Stochastics and Finance	●	●	●	●	C
Modelling the Weather and Climate	●	C	●	●	
Modules in Geography		●			
Modules in Physics				●	
Project	C	C	C	C	C
Quantitative and Research Techniques+					●
Statistical Modelling in Space and Time	●	●	●	●	
The Climate System	●	C	●	●	
Waves, Instabilities and Turbulence	●	●	●	C	

MATHEMATICS PATHWAYS

Mathematics modules are organised into streams, particularly in Years 1 and 2. These then open out into a wide choice of related modules in Years 3 and 4, many linked to staff research interests. This structure will enable you to choose options, as you move through the degree programme, to match your mathematical interests and career aspirations.



* *Geophysical and Astrophysical Fluid Dynamics*

MODULES IN EXETER CONTINUED E

Year 1

Structures	A key success of mathematics throughout its history has been its ability to unify and generalise disparate situations exhibiting similar mathematical properties through the use of abstract algebraic structures. In this module, you will explore key developments along that journey, including the theory of groups and vector spaces, and you will learn how to develop proofs and present your reasoning clearly.
Methods	This module will introduce you to key mathematical tools and techniques essential to your further studies. This will include differential and integral calculus, computing limits and convergence of sequences and series, real and complex geometry and the fundamentals of vectors and matrix algebra.
Probability, Statistics and Data	Statistics is concerned with both the practice of analysing data to learn about the world, and also the theory that underpins the methods and models used for data collection and analysis. In this module, you will learn about the key ideas of statistical modelling and inference, in which probability is used to quantify uncertainty. You will also gain experience of employing these ideas to analyse data using advanced statistical software.
Mathematical Modelling	This module will introduce you to the theory and tools for analysing real physical systems, including pendulums, planetary motion and predator-prey models. As part of a team, you will explore this theory with computer-generated models, developing your programming skills, and writing up your findings and conclusions of your investigations of the models you develop.
Introduction to Financial Accounting	This module provides a broad understanding of introductory financial reporting.
Introduction to Management Accounting	Management accounting provides information which supports business decisions, whether it is setting selling prices, or understanding costs, assessing performance, and investing in new products. This module considers costs and revenues, and how they can be measured and used to calculate profit and help make decisions.
Microeconomics I	This module equips students with key tools for conducting microeconomic analysis and introduces students to a number of policy applications. The specific topics include consumption and production theories, perfectly competitive markets, market power, game theory, risk and uncertainty, and market failures.
Theory and Practice of Management	The aim of this module is to investigate both the nature of organisations and the practice of management. The module examines the history of, principles, and current issues in management and organisation studies.

Year 2

Ambassadors for Science	In this module you identify a suitable ambassadorial role within your discipline (eg, academic tutoring, peer mentoring, outreach) and prepare a portfolio to showcase your work, reflecting on both the practical aspects of your ambassadorial work, as well as the underpinning theory in the educational and subject literature.
Real and Complex Analysis	Real and complex analysis represent two of the most useful and beautiful theories in mathematics. Developed in response to the crisis in mathematics during the 18th and 19th centuries by Gauss, Cauchy and Riemann, analysis is a powerful tool that makes precise the notions of limit, convergence, continuity and differentiability – and studies the real and complex topologies that permit a rigorous approach to studying these concepts. In this module, you will develop your understanding of these powerful techniques.
Differential Equations and Vector Calculus	Differential equations are at the heart of nearly all modern applications of mathematics to natural phenomena, whether describing the motion of a spring or predicting tomorrow's weather. In this module, you will learn key methods of differential equations and vector calculus and apply them to analyse real-world problems. This module is essential for anyone wishing to specialise in applied mathematics in Years 3 and 4.
Algebra	In this module, you will explore some of the key techniques of modern algebra, including the theory of abstract vector spaces and ring theory. Whilst the roots of these topics lie in the arithmetic and geometry studied by the earliest mathematicians, much of the unifying power of this subject lies in the modern axiomatic treatment of this material dating from the 19th and 20th century. This material is essential to the study of many of our pure mathematics modules at levels 3 and M.
Statistical Modelling and Inference	Statistical modelling lies at the heart of modern data analysis, helping us to describe and predict the real world. Statistical inference is the way that we use data and other information to learn about and apply statistical models. In this module, you will learn the theory underpinning modern statistical methods and apply these using statistical software to analyse and draw conclusions from a range of real-world data sets.
Numerics, Data and Modelling	The role of the mathematician has changed significantly with the ubiquity and processing power of modern computers. Drawing on the modelling techniques learned in the first year, you will analyse these more closely, understanding the mathematics that underpins them and the extent to which they are appropriate in different situations. You will also work together to develop and analyse your own computer models, including studying the performance of the underlying algorithms and the limits of their predictive power.
Financial Accounting	Financial accounting is that branch of accounting that focuses on producing information for external users of financial reports, including shareholders and creditors. This module will introduce you to the International Financial Reporting Standards (IFRS) and the tools needed to engage with a wide variety of financial statement items.

Intermediate Management Accounting	Managers have to decide on the price of a product, determine the optimum production plan under resource constraints, make operational and strategic investment decisions and advise on the acceptance or otherwise of a project. This module will equip you with the relevant tools and techniques to deal with these issues.
Microeconomics II	The module is designed to equip you with the key microeconomic principles necessary for the analysis of a range of basic economic problems and policies.
Introduction to Finance and Accounting	This module will develop your understanding of financial markets. Topics covered include the role of the stock markets and the mechanics of investment, principles of investment, and the present value model of investment.
Financial Markets and Decisions	This module presents the theory of decision-making under risk and the economics of information, discussing applications of the theory in the areas of banking and finance. Topics covered include expected utility theory, CAPM, adverse selection, moral hazard, the Modigilani-Miller theorems and the incentive effects of debt and equity. Applications are discussed including auctions and insurance.
Operations Management	Operations management is applicable in manufacturing and all aspects of the service sector. This module covers the design of the product/service; the control of the product/service; and improving how the product/service is delivered.

Year 3

The following modules are available as options in Year 3 on all Mathematics programmes:

Advanced Statistical Modelling	The introduction of generalised linear models by Nelder and Wedderburn in 1972 was a milestone in statistical modelling. This module describes the underlying theory and provides a general introduction to the application of the commonly used models in practical settings.
Applications of Geometry and Topology	This module develops concepts and techniques from the geometry and topology of curves and surfaces, and shows how they can be applied in a number of areas, including the study of knots, DNA, and the behaviour of soap bubbles.
Bayesian statistics, Philosophy and Practice	Since the 1980s, computational advances and novel algorithms have seen Bayesian methods explode in popularity, today underpinning modern techniques in data analytics, pattern recognition and machine learning as well as numerous inferential procedures used across science, social science and the humanities.
Combinatorics	This module introduces you to the basic notions of combinatorics with an emphasis on enumerative questions. The relations of combinatorics to other branches of mathematics, notably probability theory, algebra and matrix theory, are stressed.
Commercial and Industrial Experience	This module is available as an elective to all students in the College, and provides practical work experience in a business or commercial setting that is of direct relevance to your degree programme.
Computational Nonlinear Dynamics	In this module you will use theory and mathematical methods from Stages 1 and 2 (calculus, dynamics, differential equations, numerics and scientific computing) to solve realistic problems as they occur in nonlinear dynamics in engineering and science.
Cryptography	Cryptography is the science of encryption. We focus on two encryption algorithms – symmetric and public key algorithms. Encryption algorithms have huge commercial value. Security of internet transactions relies on the highest levels of encryption.
Fluid Dynamics	Fluid Dynamics looks at the flow of incompressible fluids with both viscosity and inertia. Topics covered will include: some exact solutions of the Navier-Stokes equation; Stokes flow; introduction to boundary layer theory; and Kelvin's theorem and vortex stretching.
Galois Theory	Galois theory has its historical roots in the study of polynomial equations, and explains why there can be no formula (analogous to the well-known quadratic formula) for solving equations of degree 5 or higher. From the perspective of modern abstract algebra, it is about using groups to understand extensions of fields.
Graphs, Networks and Algorithms	This module gives an introduction to the theory of graphs and the use of graphs and networks in applied problems. The aim is to present the central results of modern graph theory together with the algorithms that are used to solve network optimisation problems.
Mathematical Biology and Ecology	This module considers the application of mathematics within the biosciences. We examine population dynamics; harvesting models; competitive exclusion of species; simple analysis of reaction kinetics; biological waves and diffusion driven instabilities; effects of geometry; and pattern formation on animals.
Mathematics Group Project	This module is compulsory for BSc Mathematics students who do not take *Commercial and Industrial Experience*. It provides you with an opportunity to work as part of a team, conduct research on an open mathematical problem, and enhance key skills such as communication and project management.
Mathematics: History and Culture	This module provides an appreciation of the history and philosophy of mathematics and its place in human history and culture. It develops skills in research, essay-writing and presentation.
Mathematics of Climate Change	This module will provide a background in the mathematics underlying human-induced climate change. Topics of study will include ocean circulation, the greenhouse effect, the effects of the solar radiation on climate, and climate change and variability, with a view to understanding predictions of future climate change.
Nonlinear Systems and Control	Energy-like functions play a key role in the qualitative study of the dynamical behaviour of nonlinear systems, replacing algebraic tools like eigenvalues so important for linear systems. Mechanical systems and electrical circuits have naturally defined energy. Energy can be manipulated via external control and especially feedback control. This module will develop a conceptual framework interwoven with several case studies.
Number Theory	One of the oldest and most popular areas of mathematics, number theory deals with problems about whole numbers (integers). This module provides a solid foundation for further work in number theory, with modern answers to ancient problems and modern applications of classical ideas.

MODULES IN EXETER CONTINUED

Partial Differential Equations (PDEs)	The laws of physics are formulated in terms of PDEs, so the subject is of great practical importance. However, the application of these equations extends into the modelling of subjects as diverse as ecology and economics. The module will be illustrated using MAPLE as a convenient tool for visualising solutions to real problems.
Research in Mathematical Sciences	This module is compulsory for MMath and MSci students who do not take the study abroad option. It enables you to engage with mathematical and scientific research literature and equips you with the core skills needed to undertake an individual project in the fourth year. You'll select two from a number of themes, such as pure mathematics, climate research, and mathematical biology.
Statistical Inference	Statistical models help us to describe and predict the real world. Statistical inference is the way we use data and other information to learn about and apply our models. This module introduces some of the main approaches to statistical inference and explains their associated procedures. Simple computer simulations are also used to illustrate basic concepts and as a tool for comparing procedures.
Stochastic Processes	The probability models considered in this module show how the behaviour of a system is time dependent. A large number of practical systems within industry, commerce, finance, biology, nuclear physics and epidemiology can be described and analysed using the techniques developed in this module.
Topology and Metric Spaces	This course aims to give an introduction to topology and metric spaces as well as applications to basic concepts of measure theory. With this module you will have the opportunity to further refine your skills in problem-solving, axiomatic reasoning and the formulation of mathematical proofs.
Professional Experience	This module is only available to students on the MMath Mathematics with Professional Experience programme. It provides practical work experience in a business or commercial setting that is of direct relevance to your degree programme, followed by a project exploring the interface between mathematical theory and applications to your work experience.
Semester of Mathematical Studies Abroad	This module is only available to students on the MMath Mathematics with International Study programme. You'll spend half a year at an agreed partner university abroad, normally where the language of instruction is English. It provides the opportunity to gain knowledge of mathematical material that is not covered at Exeter, or that is studied from a new perspective.

Business School modules available in Year 3 on the MSci Mathematics, Business and Finance, and BSc Mathematics with Accounting/Economics/Finance/Management programmes include the following:

Investment Analysis and Portfolio Management	The explosion of interest in capital markets throughout both the developed and developing worlds has produced a demand for new financial products and a more rigorous understanding of existing instruments, such as bonds or equities. This module will develop analytical methods for valuing and managing financial instruments and will introduce the practical workings of financial markets while also giving you a disciplined but practical training in the investment analysis of companies.
Financial Management	This module looks at the key financial questions which are faced by the directors and managers of firms; the principal investment questions faced by individuals; and selected topics which are also related to these areas.
Financial Markets and Decisions 1 and 2	These modules present the theory of decision-making under risk and the economics of information, discussing applications of the theory in the areas of banking and finance. The topics covered include expected utility theory, adverse selection, moral hazard, the Modigilani-Miller theorems and the incentive effects of debt and equity. Applications are discussed including auctions and insurance.
Strategic Management	This module looks at the 21st century competitive landscape from a strategic management perspective and assesses how global and technological influences shape it. You'll develop the ability to analyse strategic issues from a number of broad functional perspectives, study strategic competitiveness, competitive advantage, strategic intent and mission, and evaluate their contribution to the strategic management process.

Year 4 (MMath and MSci)

Algebraic Curves	This module covers a central area of classical algebraic geometry, looking at properties of curves in affine and projective space. An important idea is that of birational equivalence: a curve which intersects itself or has some other kind of singularity can always be transformed to an equivalent, non-singular curve.
Algebraic Number Theory	This module investigates fields which are obtained by adjoining roots of polynomials to the rational numbers, and the rings of algebraic integers within them. It explains how properties of the usual integers, such as the existence and uniqueness of prime factorisations, must be modified in these more general rings.
Analysis and Computation for Finance	This module provides an understanding of modern methods of numerical approximation and financial modelling. You will develop practical skills in the use of computers in financial modelling.
Analytic Number Theory	The study of properties of the integer numbers, in particular of prime numbers, is one of the most ancient topics in mathematics. Analytic number theory is the area of mathematics that uses methods from mathematical analysis to solve problems about the integers.
Computational Finance with C++	Numerical and computational methods are used widely in the field of quantitative finance. In this module you will study some of the most important of these methods, with an emphasis on Monte Carlo and lattice methods for option pricing.
Dynamical Systems and Chaos	This module will provide you with a good understanding of asymptotic behaviour of nonlinear dynamics. You'll be exposed to qualitative and quantitative methods for dynamical systems, including nonlinear ordinary differential equations, maps and chaos.
Fluid Dynamics of Atmospheres and Oceans	This module lays the foundations for an understanding of large scale weather patterns and ocean circulation. It will introduce you to the kinds of dynamics that can occur in stratified and rotating fluids, and introduce key concepts, such as conservation and balance, that are used to understand and analyse such flows.

Introduction to C++	C++ is a powerful programming language and one of the most popular languages used in quantitative finance. This module introduces you to the basics of programming in C/C++ and object-oriented programming.
Magnetic Fields and Fluid Flows	This module deals with the motion of electrically conducting fluids in the presence of magnetic fields, a subject known as magnetohydrodynamics (MHD). MHD flows play a crucial role in the dynamics of a variety of astrophysical systems (including stars, planets, accretion discs and galaxies). In this module you will see how the mutual interaction of the fluid flow and the electromagnetic field reveals a variety of new and interesting phenomena.
Mathematical Modelling in Biology and Medicine	This Natural Sciences module applies mathematical modelling to biology and medicine and will introduce you to advanced topics in biochemical networks, physiology, epidemiology and biomedical data analysis.
Mathematical Theory of Option Pricing	The fundamental work of Black and Scholes made it possible to calculate a fair price for an option to buy or sell shares for a specified price at a future date. This module covers the mathematics behind this, and looks at analytic and computational methods for pricing these and more elaborate options.
Methods for Stochastics and Finance	This module explores a diverse range of mathematical topics, ranging from matrix algebra to differential systems and stochastic calculus, and emphasises their applications to financial modelling.
Modelling the Weather and Climate	This module shows how physical and dynamical processes are represented in numerical weather and climate models. Particular emphasis is given to the representation of fluid motions which are smaller than the grid-box of the climate model. Understanding these components provides a key to improving future climate models.
Project	This project consists of a piece of work in an area of the mathematical sciences which you will undertake individually under the supervision of a member of staff. You can select your project from a list of topics provided each year, or suggest your own topic. Some projects involve working on a practical problem, some involve developing or using computer programmes and packages, and others involve reviewing a theoretical area or tackling a theoretical problem. The aim is to extend the knowledge acquired in formal modules and strengthen skills in research and report writing.
Statistical Modelling in Space and Time	Previous modules in statistics have treated data as independent and identically distributed, but real world data is not like that. In particular data collected in space and time can be highly correlated. In this module you will look at methods of modelling such dependent data. Furthermore, you will examine how to model data as a field in n-dimensions, and the particular problems associated with time series.
The Climate System	This module is designed to give an overview of the key physical processes determining the behaviour of the Earth's atmosphere. Topics covered include the surface energy balance, the structure and thermodynamics of the atmosphere, and the main components of the general circulation.
Waves, Instabilities and Turbulence	Waves and turbulence are both ubiquitous phenomena in fluid flows, and both are often associated with instability of simpler flows. They arise in many important theoretical and practical applications, ranging from Engineering to Meteorology and Astrophysics. This module will extend the students' ability to formulate fluid flow problems in terms of partial differential equations, and develop a range of mathematical techniques for analysing the fluid behaviour.

LEARNING AND TEACHING

Mathematics at Exeter combines a breadth of academic expertise with a caring and supportive learning environment. All our degrees involve a combination of teaching methods, including lectures, seminars, workshops and tutorials. Most modules in mathematics involve three one-hour lectures per week, so you would typically have 12 lectures per week.

In the first year there are regular tutorial classes and example classes for each module, except for those involving computing or project work. Thus in the first year you would typically have around 15 contact hours per week. In addition to this, you are expected to spend about 20 hours per week in private study.

The tutorials and exercise classes enable you to discuss the lecture material and coursework problems. Further support is available at lunchtime mathematics and computing surgeries. The *Mathematical Modelling* module includes group work to tackle open-ended problems in mathematics under the supervision of a member of staff. You are also encouraged to discuss any problems or questions that may arise with the lecturer. All lecturers have advertised office hours or an 'open door' policy, so are available to provide help. Working through examples and solving problems is a vital part of learning mathematics so coursework is set in each module.

We're actively engaged in introducing new methods of learning and teaching, including increasing use of interactive computer-based approaches to learning through our virtual learning environment where the details of all modules are stored in an easily navigable website. Students can access detailed information about modules and learning outcomes and interact through activities such as the discussion forums.

Computer software

Computers are an essential tool in all areas of mathematics and using them to investigate particular examples can often help you in understanding mathematical concepts. Many of our modules involve some element of computing, using software such as the programming languages Python and MATLAB, the computer algebra system MAPLE, or the statistical package R.

Projects

Project work provides a way of developing and demonstrating your skills in communication and presentation while investigating a particular area of mathematics. For MMath and MSci students, an individual project in the final year is compulsory. This involves individual study and weekly meetings with a project supervisor throughout the year. Projects are assessed via the project dissertation and a short oral exam. Usually students select a project from a list of topics offered but it is also possible for you to suggest a topic of your own.

Personal and professional skills

We provide skills development sessions in your first two years which include an induction week in the first year and a number of career related training sessions in your second year. You will also undertake personal development planning and an annual self-appraisal with your personal tutor.

Optional work placements

All our undergraduate students can choose to take an optional *Commercial and Industrial Experience* module during the vacation before the third year (subject to availability). This is a very rewarding opportunity that allows you to gain paid work experience while earning credits towards your degree. Following the placement you write a report on your experience which, alongside a report from the employer, enables you to count your placement as a third-year optional module.

Electives

All our degree programmes give you the opportunity to take modules from other Colleges within the University and to count these towards your degree. These electives allow you to study areas outside the subject, for example to improve your foreign language skills. Electives are available subject to timetabling constraints and to students fulfilling the relevant prerequisites.

Taking modules outside of your programme

Depending on your programme you may take up to 30 credits in another subject (subject to academic approval and timetabling), for instance a language or business module, to develop career-related skills or widen your intellectual horizons. If you achieve at least 60 credits in a language via our Foreign Language Centre you may be able to have the words 'with proficiency in' and the language added to your degree title. Further details about the FLC can be found at **www.exeter.ac.uk/flc**

Research-inspired teaching

We believe that every student benefits from being part of a culture that is inspired by research and being taught by experts. You will learn mathematics from people who are participating in the discovery of new mathematical knowledge and the development of novel applications.

All our academic staff are active in internationally-recognised research across a wide range of topics in mathematics. Our mathematics research groups are engaged in international quality research in various areas of pure and applied mathematics, in particular climate and environmental modelling, geophysical and astrophysical fluid dynamics, dynamical systems and control, number theory and statistical modelling. We have increasingly close collaborations with the UK Met Office. In the 2014 Research Excellence Framework 83 per cent of our research was classified as world-leading or internationally excellent.

You can find out much more about our research on our website at **www.exeter.ac.uk/emps/research**

Academic support

Our strong tutorial system, involving personal tutors, tutorial classes for first- and second-year modules, plus mathematics and computing surgeries, means that help and advice is readily available, both on your academic work and on more general issues. The Director of Education for Mathematics ensures that the course runs smoothly, and will monitor your progress and advise you on your choice of pathways. You will be assigned a personal tutor, who will provide support when necessary, and act as a reference contact for you after the completion of your degree.

Facilities

We have benefited from a £3 million investment in academic and social facilities including completely refitted lecture theatres and teaching spaces, a major expansion and upgrading of our undergraduate computer facilities and social space.

Assessment

Assessment for all degrees is through a combination of exams and coursework. Exams are the more important part of the process, but the coursework will help you to work steadily throughout your degree. This is particularly important in mathematics where the subject matter develops logically from fairly simple beginnings.

For many modules the assessment is based solely on examinations, while in other modules coursework typically contributes 20 per cent except in the final year of the MMath MSci programmes. In the third and fourth year, several modules allow you to undertake significant supervised project work to contribute to your overall degree classification.

Your first year doesn't count towards your final degree classification, but you do have to pass it in order to progress. If you study a three-year programme, assessments in the final two years both count towards your classification, and if you study a four-year programme then the final three years all contribute.

Scholarships

The Lawrence Scholarship is available to top performing students undertaking a four-year undergraduate degree programme in the College of Engineering, Mathematics and Physical Sciences. Full details of scholarships are available at **www.exeter.ac.uk/emps/undergraduate/funding**

CAREERS

A degree from Exeter is highly valued by employers. Management and personal skills are built into our programmes and our students take advantage of the wide range of extracurricular and personal development opportunities offered by the University, from study abroad (for certain programmes) to volunteering and playing an active role in student societies.

We have excellent links with employers and support students to consider their careers from an early stage. Our Employability Officer is active in developing aspects of our programmes and services that improve the employability of our students. We also have a dedicated Careers Consultant who provides specific services such as careers workshops tailored to careers in mathematics and support in matters such as applications and job interview skills. The Career Zone runs several careers fairs throughout the year and these have been particularly successful in putting major UK employers in touch with Exeter students. Relevant employers visit the department from the first year to meet with students, with the aim of helping them to develop their career ideas at an early enough stage to help with module choices and placement decisions.

Each year a number of our graduating students choose to undertake further study and there is a fast track application process for Exeter students to our postgraduate programmes. Of those choosing the postgraduate route, around half choose to remain at Exeter, which reflects well on their satisfaction with the University and the range of courses available.

A wide range of employers from industries as diverse as banking, insurance, medical, transport, power generation, software, and the armed forces, know the department as a provider of excellent graduates who are able to apply their problem solving and analytical skills in the real world.

For further information about what the careers service offers, please see **www.exeter.ac.uk/ug/careers**

Examples of the destinations of our recent graduates:

Employers

Coutts & Co // KPMG // QinetiQ // The Met Office // British Airways // Ocado // EY // Lloyds TSB // NHS // MSDL // Kelloggs // Royal Bank of Canada

Occupations

Business Analyst // Account Manager // Bond Processor // Corporate Actuarial Analyst // IT Consultant // Market Data Administrator // Software Engineer // Sports Data Analyst // Research Scientist // Web Analyst // Actuarial Consultant // Transport Planner // Regulatory Control Analyst

Examples of further study followed by our graduates:

- MSc Environmental Economics
- PGCE Secondary Maths
- MSc Modern Applications of Mathematics
- MSc Economics
- MSc Financial Mathematics
- MSc Advanced Mathematics
- MRes Mathematics in the Living Environment
- PGCE Primary Maths
- MSc Finance
- MSc Computational Science and Modelling
- MSc Applied Mathematics
- CIMA
- MSc Applied Statistics

ABOUT THE UNIVERSITY OF EXETER

Top 1% of universities worldwide *(Times Higher Education)*

9th in *The Times and The Sunday Times Good University Guide 2017*

Six months after graduation, 94% of our first degree graduates were in employment or further study *(HESA 2014/15)*

Our teaching is inspired by our research, 98% of which is of international quality *(2014 Research Excellence Framework)*

We have 21,000 students from 181 countries, and they are the most satisfied in the Russell Group *(NSS)*

VISIT US TO FIND OUT MORE

Open Days

You can register your interest now for our Open Days and receive priority access to book your place*; visit **www.exeter.ac.uk/opendays**

** Pre-registration only guarantees priority access to the booking system and is not an absolute guarantee of a place at any of our Open Days. Booking is essential and is on a first-come, first-served basis.*

Exeter campuses:
Friday 2 June 2017
Saturday 3 June 2017
Saturday 2 September 2017

Penryn Campus, Cornwall:
Saturday 10 June 2017
Saturday 23 September 2017

Campus Tours

We run campus tours at the Streatham Campus each weekday during term time and at the Penryn Campus on Wednesday and Friday afternoons. You will be shown round by a current student, who will give you a first-hand account of what it's like to live and study at the University.

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email: cornwall@exeter.ac.uk

www.exeter.ac.uk/ug/maths

This document forms part of the University's Undergraduate Prospectus. Every effort has been made to ensure that the information contained in the Prospectus is correct at the time of going to print. The University will endeavour to deliver programmes and other services in accordance with the descriptions provided on the website and in this prospectus. The University reserves the right to make variations to programme content, entry requirements and methods of delivery and to discontinue, merge or combine programmes, both before and after a student's admission to the University. Full terms and conditions can be found at **www.exeter.ac.uk/undergraduate/applications/disclaimer**

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