Studying Mathematics

at University of Galway

Mathematics has developed from counting, calculating and measurement through the use of abstraction and logical reasoning. At a practical level, mathematics underpins many other disciplines such as Physics, Economics and Engineering, along with newer areas like Molecular Biology and Quantum Computing. Mathematics is the language for the logical study of the structure of our world. The School of Mathematical & Statistical Sciences offers programmes in Financial Mathematics and Economics, Mathematics and Education, Mathematical Science and the opportunity to study Applied Mathematics, Computer Science and Data Science in various courses.

www.universityofgalway.ie/science-engineering/school-of-maths/

Financial Mathematics and Economics

This programme consists of courses in Mathematics, Probability and Statistics, Economics and Computer Science. It gives a rigorous training in the area of Financial Mathematics (including Actuarial), which has widespread applications in a number of diverse areas. This programme is perfect for students who have an aptitude for Mathematics but are also interested in examining economic factors that underlie decision-making by individuals and by society. The programme is also attractive to those who are interested in statistics, risk and uncertainty and in applying mathematical knowledge to future uncertainties.

Course Facts

Bachelor of Science (Financial Mathematics and Economics)	
CAO Code:	GY309
Entry Points (2023):	509
Duration:	4 years
Average intake:	Around 60
Entry requirements	Minimum Grade H5 in two subjects and passes in four other subjects at O6/H7 level in the Leaving Certificate, including Irish, English, Mathematics, a third language or a laboratory science subject (i.e. Chemistry, Physics, Biology, Physics with Chemistry (joint) or Agricultural Science) and any two other subjects recognised for entry purposes. A H5 or O1 in Mathematics is required.
Additional requirements	The programme is an inter-college programme of the College of Science and Engineering and the College of Business, Public Policy and Law. The entry requirements of either College may be applied, whichever is the more advantageous to the applicant.

Did you know?

Students who graduate with the B.Sc. in Financial Mathematics and Economics and who subsequently enroll for professional actuarial exams may be granted some actuarial exams exemptions.
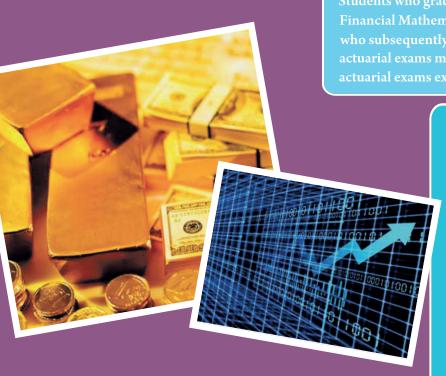
Did you know?

Prof Alan Ahearne was formerly on the Central Bank Commission and currently serves as Economic Adviser to the Taoiseach.

The BSc. Financial Mathematics and Economics programme has among the highest proportion of graduates working in relevant employment of all denominated degrees within the College of Science and Engineering at University of Galway.

Graduates from this degree can convert it into an actuarial degree with a dedicated one-year postgraduate programme.

Students are not expected to have studied Economics in the Leaving Certificate.

Course Outline

Year 1
- Mathematics
- Financial Management
- Economics
- Computer Science
- Statistics and Probability
- Mathematics of Finance
- Mathematical Methods

Year 2
- Mathematics
- Microeconomics
- Statistics and Probability
- Computer Science
- Macroeconomics
- Introduction to Financial Economics
- Mathematical Methods

Year 3
- Business Finance
- Microeconomics & Public Policy
- Macroeconomics & Public Policy
- Economics of Finance Markets
- Money & Banking
- Groups
- Metric Spaces
- **Topology**
- Actuarial Mathematics
- Modelling
- Nonlinear Systems
- Applied Regression Models

Year 4
- Networks
- Derivatives and Risk Management
- Numerical Analysis
- Actuarial Mathematics
- Differential equations with financial derivatives
- Measure Theory
- Statistical modelling
- Economics' electives
- Final year project

Find out more:

School of Mathematical & Statistical Sciences
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Career opportunities

The employment prospects for graduates in Financial Mathematics and Economics are excellent. There are challenging and financially rewarding opportunities in different areas including the financial services industry, the actuarial profession, in the public sector and in areas such as accountancy, tax or economics.

Further education

Honours graduates can pursue higher degrees in a wide range of related disciplines, including mathematics, actuarial science, financial economics, financial mathematics, statistics, economics and applied mathematics.

What our students say…

Sarah Morahan
(2014 Graduate)

"My overall experience of the program was fantastic, the summer (internship obtained through the Financial Mathematics & Economics programme) couldn't have been better. It was such a great opportunity to get to work at Global Excess Partners while at the same time getting the experience of living in New York. I learned a lot about their line of work in the property casualty insurance industry and everyone was very friendly and helpful."

Kevin Keenan
(2013 Graduate)

"Financial Mathematics and Economics has been a challenging but highly rewarding course. The small close knit class helps to develop essential skills for the real world. Excellent employment opportunities exist for hard working motivated students. The broad range of mathematics and economics subjects makes the Financial Mathematics & Economics programme a highly recognized degree and makes all past students proud when they say they have graduated from the Financial Mathematics and Economics programme."

Martin Pfützner, Actuary
Head of Capital Modelling
Aspen Insurance UK
London
(2005 Graduate)

"I must admit that when I started my Financial Mathematics & Economics degree back in 2001, I didn't have a clear idea of what I wanted to do afterwards. But thanks to some excellent career advice from my lecturers, and thanks to the broad exposure the course gave me to fields like investments, quantitative finance, banking and actuarial science, I was able to make a well-informed career decision – eventually setting out to become a general insurance actuary in London.
Due to the large overlap between my degree and the actuarial exam syllabus, I was able to qualify significantly quicker than many other candidates. Moreover, I found that my degree had left me well-equipped with the quantitative, statistical and computer programming skills I need as an actuary – exactly the skillset I look for today when recruiting graduates."

Mathematics and Education

The BA in Mathematics and Education provides a unique opportunity for students passionate about mathematics to pursue a four-year full-time honours mathematics degree programme that incorporates a highly regarded teaching qualification. Graduates of the programme are high quality mathematicians, and are recognised by the Teaching Council of Ireland as qualified second level teachers of Mathematics and Applied Mathematics.

Course Facts

Bachelor of Arts (Mathematics and Education)	
CAO Code:	GY109
Entry points (2023):	418
Duration:	4 years
Average intake:	25
Entry requirements	Minimum Grade H5 in two subjects and passes in four other subjects at O6/H7 level in the Leaving Certificate, including Irish, English, another language and three other subjects recognised for entry purposes. A H5 or O1 Grade in Mathematics is also a requirement.
Additional requirements	Students will have to satisfy the Garda/police vetting requirements.

International Links

The BA in Mathematics and Education has links with teacher education institutions throughout Europe and with international centres of excellence in mathematics education research.

Further Study

As a BA in Mathematics and Education graduate, you will be well positioned for further study in postgraduate programmes that focus on mathematics, statistics, applied mathematics and education.

Did you know?

Graduates of the programme will be recognised by the Teaching Council of Ireland as qualified post-primary teachers of Mathematics and Applied Mathematics

No previous Applied Mathematics experience required!

Course Outline

Year 1
- History and Structure of Irish Education
- Principles of Second-Level Mathematics
- Introduction to Educational Sciences
- Practical Teaching Programme 1 (work placement component)
- Algebra and Analysis I and II
- Skills of Mathematics
- Introduction to Applied Mathematics I and II
- Skills of Applied Mathematics

Year 2
- Philosophical Foundations of Education
- Mathematics Methodology and Skills of Teaching
- Practical Teaching Programme 2 (work placement component)
- Mechanics I
- Differential Forms
- Probability and Statistics
- Linear Algebra
- Geometry

Year 3
- Curriculum and Assessment
- Practical Teaching Programme 3 (work placement component)
- Professional Studies: Integrated Project
- Psychology, Sociology and Catering for Diversity
- Research Literacies for Professional Development & Lifelong Learning
- Mathematical Modelling I
- Groups
- Discrete Mathematics
- Mechanics II
- Complex Analysis
- One Mathematics elective

Year 4
- Block Teaching Practice (work placement component)
- Practical Teaching Programme: Integrated Project
- Final-Year Symposium
- Final Year Project in Mathematics plus four Mathematics electives OR six Mathematics electives
- Mathematics electives may include: Metric Spaces; Measure Theory; Applied Statistics; Topology; Advanced Statistical Methods for Business; Functional Analysis; Ring Theory; Fields & Applications; Cryptography; Advanced Group Theory; Mathematical Molecular Biology; Networks; Numerical Analysis; Mathematical Modelling II; Non-linear Systems.

What our students say ...

**Mary Scahill
(2016 Graduate)
BA (Mathematics and Education)**

"This degree equipped me not only to be an excellent mathematics teacher but also gave me options for other careers or further study. The broad range of modules, coupled with the invaluable practical teaching programme, made for a dynamic, challenging and rewarding experience."

Key Fact

This is the only four-year undergraduate degree programme available in Ireland that offers a concurrent degree-level qualification in both mathematics and mathematics teaching. Is féidir cuid den chlár a bhaint amach trí Ghaeilge. You learn how to explore and teach mathematics with modern software tools such as GeoGebra, Maple, Sage and R.

Work placement

As part of the programme you will undertake a school placement component each year. In total you will complete 100 hours teaching between Years 1-3, and 13 weeks in a post-primary school in Year 4.

Career prospects

Our graduates are keenly sought for teaching positions in Ireland and abroad. As a graduate of mathematics, a huge variety of career options is available, including further or higher education, academic or industrial research, ICT, finance, actuarial work, meteorology, scientific journalism and many more.

Find out more:

**School of Mathematical & Statistical Sciences
E kevin.jennings@universityofgalway.ie
www.universityofgalway.ie/science-engineering/school-of-maths/**
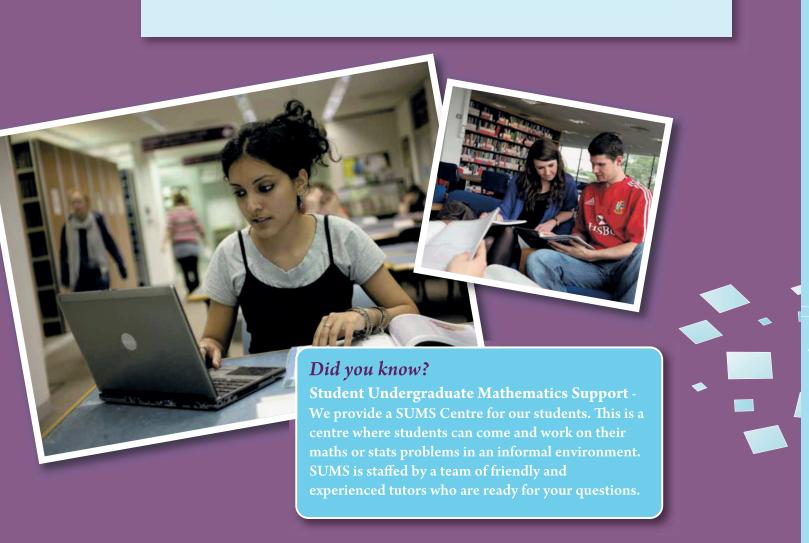
**School of Education
E kathy.osullivan@universityofgalway.ie
www.universityofgalway.ie/education**

Mathematical Science

The Bachelor of Science (Mathematical Science) is a four year honours degree programme that covers diverse aspects of Mathematics and its applications, giving students a solid foundation in the Mathematical Sciences. As students advance through the programme they will have the opportunity to specialise in subjects such as Mathematics, Applied Mathematics, Financial Mathematics, Computer Science, Statistics, Bioinformatics and Data Science.

Course Facts

Bachelor of Science (Mathematical Science)	
CAO Code:	GY319
Entry points (2023):	566
Duration:	4 years
Average intake:	20
Entry requirements	Minimum Grade H5 in two subjects and passes in four other subjects at O6/H7 level in the Leaving Certificate including a minimum of H5 or O1 in Mathematics, and O6 /H7 Level in Irish and English.

Did you know?

Student Undergraduate Mathematics Support - We provide a SUMS Centre for our students. This is a centre where students can come and work on their maths or stats problems in an informal environment. SUMS is staffed by a team of friendly and experienced tutors who are ready for your questions.

Course Outline

Year 1
- Applied Mathematics
- Computer Science
- Mathematics
- Probability and Statistics
- One of: Biology, Chemistry, Physics

Year 2
Curriculum core consists of components from the following subjects:
- Linear Algebra
- Discrete Mathematics
- Analysis
- Probability
- Statistical Inference
- Mechanics
- Mathematical Methods

Up to one third of second-year curriculum content can be selected from a list of additional options. Some options are offered from within the School such as Mathematical Molecular Biology, Programming and Operating Systems, Algorithms and Scientific Computing, Object Oriented Programming and some options are available from other Science subjects, subject to first year prerequisites.

Year 3 and 4
Selection of specialised subjects from chosen areas of the Mathematical Sciences of Mathematics, Statistics, Applied Mathematics and Computing. Choices are flexible and possibilities include:

- Metric spaces, Topology, Groups, Measure Theory, Functional Analysis, Rings, Field Theory, Numerical Analysis, Applied Statistics, Stochastic Processes, Annuities & Life Assurance, Actuarial Mathematics, Life Contingencies, Bioinformatics, Cryptography, Mathematical and Logical aspects of Computing, **Scientific Computing, Multi-media Development, Databases,** Object Oriented Programming, Advanced programming, Artificial Intelligence, Neural Network, Graphics and Image Processing, Human Computer Interaction, **Machine Learning and Datamining, Non Linear Systems, Non Linear Elasticity, Quantum Mechanics, Partial Differential Equations, Electromagnetism, Fluid Mechanics, Modelling, Cosmology and General Relativity, Euclidean and Non-Euclidean Geometry.**

- Final Year Project

Career opportunities

Career opportunities for graduates in the Mathematical Sciences are very diverse. Our graduates are employed in many different sectors such as Financial and Actuarial services, Teaching, IT, Pharmaceuticals, Clinical research, Meteorology and in the Civil Service.

Further education

Graduates have a broad range of options for postgraduate work available to them. Opportunities for postgraduate research including MSc or PhD programmes exist at University of Galway and further afield in all areas of the Mathematical Sciences. Interdisciplinary research opportunities are also available. Graduates who wish to broaden their general mathematical education before embarking on research can earn on MSc in Mathematical Science through further course work.

What our lecturers say…

Dr Emma Holian
Lecturer in Statistics

"If you are strong in mathematics and curious to explore mathematical applications in science then this degree programme is for you. The programme offers the foundation to each of the main mathematical disciplines in first and second year, while the vast choice of courses offered in the latter years of the degree allow you to specialise in topics of interest to you. This flexibility combined with the opportunity to see how mathematics impacts developments in numerous fields of scientific discovery makes the programme a very attractive choice with many interesting career opportunities."

What our students say…

Alan Brett, Business Strategy Consultant, Mars & Co, London (2016 Graduate)

"I chose this degree because it offered a broad introduction into the various areas of mathematics, with the ability to specialise further down the line … If you are interested in a career in strategy consulting, I would highly recommend studying mathematics, as the number one ability firms seek out is whether their candidates have analytical rigour."

Find out more:
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School of Mathematical & Statistical Sciences
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www.universityofgalway.ie/science-engineering/school-of-maths/

If you think you'd like to study towards a mathematical degree but want to keep your options open...

Arts degree in Mathematics and another subject

The Bachelor of Arts (BA) is a broad 3-year degree. Three subjects are taken in First Arts from the 21 subjects on offer. In Second Arts, two of the subjects chosen at First Arts are pursued and these two subjects are completed in Final Arts. An advantage of the wide choice available, and of having to take three subjects, is the opportunity to take new subjects and to make interesting combinations of familiar and new subjects. There are two mathematical BA degrees:

BA in Mathematics and another subject

Students take Mathematics as one of three subjects in their first year, and as one of two subjects in their second and third year. (CAO code GY109).

BA in Mathematical Studies and another Arts subject

Students take Mathematics as one of three subjects in their first year. They take Mathematical Studies as one of two subjects in their second and third years. (CAO code GY109).

Why study Applied Mathematics?

Applied Mathematics has appeal to anyone with good mathematical and problem-solving skills. Applied Mathematics is used to understand, model and predict the behaviour of the world around us with applications ranging from physics to engineering, biology to economics and beyond.
No previous experience of Applied Mathematics is required.

Why study Computing?

When you study Computing, you'll develop the fundamental skills in programming and computer science the lead to numerous career opportunities. But you'll also master the underlying ideas and methods of emerging technologies, from machine learning to network science, so that you are equipped to adapt in a rapidly changing challenges and trends.

BSc Mathematical Pathways

The majority of students in the College of Science and Engineering opt for the 4-year honours Bachelor of Science degree GY301. It allows them to take a variety of subjects before deciding to specialise in one scientific area. In their first year students choose four subjects from Mathematics, Applied Mathematics, Computer Science, Biology, Chemistry and Physics. Students typically retain two principal subjects in their second year. They pursue one main subject in their third and fourth years.

There are seven mathematical honours degrees:
- Applied Mathematics
- Computing
- Data Science
- Mathematics
- Mathematics and Applied Mathematics
- Mathematics and Computing
- Mathematical Studies and Computing

Why study Data Science?

Data Science is an interdisciplinary subject with courses in statistics, computer science and mathematics with specific domain knowledge relevant to your field of application. It involves the study of data, how they are collected, stored, accessed, visualised, modelled and ultimately used to inform decision making by turning data into intelligence.

Why study Mathematics?

There are many reasons why people study mathematics. For some, it provides a means of achieving greater understanding and insight into the physical world around them. For others, it is the social world of people and their concerns that is of greatest interest. For some, doing mathematics is about sharing in an age-old human activity. For others again, it is curiosity about the inner, individual worlds of imagination and possibility.