



# Higher Diploma in Mathematical Science

## UCD School of Mathematical Sciences



### Why is this course for me?

More and more people now recognise the importance of mathematical sciences in technology.

If you have

- a flair for mathematics,
- done a primary degree with a high mathematical content,
- a keen interest in doing more,

then this course is for you. This course offers the opportunity for graduates with a degree in a subject other than mathematics to achieve a more advanced mathematical training. Taking the HDip in Mathematical Science will allow you complete in one year the core components of a BSc Honours Degree in Mathematics or Mathematical Science. This course would equip you with the necessary background to pursue an MSc degree in Mathematics or Mathematical Sciences.

### Why study at University College Dublin?

Some of the reasons to study at UCD:

- In the top 1% of the world's universities
- Ireland's largest provider of graduate education
- A diverse university, both in academic disciplines and culture
- Emphasis on research and innovation
- Purpose-built, modern parkland campus, close to Dublin city centre
- Extensive range of campus accommodation options.

#### UCD College of Science

The College is dedicated to the creation, delivery and communication of new knowledge and innovation across the spectrum of Science. With a staff of 750 and a student population of 5,500, including 1,800 postgraduate students, the College is a vibrant community dedicated to excellence in all our pursuits.

#### UCD School of Mathematical Sciences

The school is the largest of its kind in Ireland. It is a dynamic, multi-disciplinary department spanning the three disciplines of Mathematics, Applied and Computational Mathematics and Statistics and Actuarial Science. The school engages in research of international renown and teaches students in almost all of the colleges of the university. As well as having a strong commitment to basic research, several members in the school are involved in the UCD Complex Adaptive Systems Laboratory (CASL) and the Claude Shannon Institute for Coding, Cryptography and Discrete Mathematics.

### What will I study?

You will study up to twelve modules (a total of 60 credits) over two semesters. You will choose your courses under the guidance of the programme director, depending on your own mathematical background and interests. Students in the Mathematical stream choose modules from a selection of Mathematics courses. Students in the Mathematical Sciences stream select modules within both the disciplines of Mathematics and Applied and Computational Mathematics.

Below is a representative list of courses available to you, subject to scheduling constraints.

#### Mathematics Courses:

- Mathematical Analysis
- Calculus of Several Variables
- Graphs and Networks
- Game Theory
- Mathematics of Google
- Linear Algebra 2
- Functions of One Complex Variable
- Number Theory
- Groups, Rings and Fields
- Set Theory
- Group Theory
- Intro to Coding Theory
- Metric Spaces
- Galois Theory
- Measure Theory & Integration
- Intro to Topology

#### Applied and Computational Mathematics:

- Advanced Mathematical Methods
- Dynamical Systems
- Foundations of Fluid Mechanics
- Foundations of Quantum Mechanics
- Electrodynamics & Gauge Theory
- Potential Theory and Electrostatics
- Environmental Fluids
- Mathematical Biology
- Relativistic Quantum Mechanics
- Advanced Computational Science
- Differential Geometry
- Advanced Dynamical Systems

## Staff Profile and Testimonial

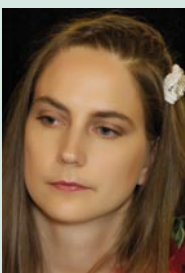
### Dr Miguel Bustamante

(Applied and Computational Mathematics)



"Our research in the fluids group combines expertise from mathematical analysis, high-resolution numerical simulations and mathematical modelling, with the aim of understanding fundamental flow properties such as turbulence, mixing, and instabilities that develop in real fluids. Our analytical/numerical calculations are compared with experiments from international groups and we apply our results to real-life systems or industry collaborations, in topics such as ocean rogue waves and tsunamis, ocean wave energy extraction, numerical weather prediction, wind energy extraction, fusion plasmas, solar magnetic storms, vortices in quantum fluids, shock waves, and carbon capture in fossil-fuel power plants."

### Dr Helena Smigoc (Mathematics)



"Positivity arises in a large variety of settings: time, money, goods, buffer sizes, queue lengths, network data, packet flow rates, human, animal and plant populations, concentration of substances, light intensity levels, probabilities—these are all positive. The wide range of applications of positivity gives rise to many problems that have substantial value in pure mathematics and enrich research in linear algebra and other branches of mathematics. My research addresses one of the most intriguing and challenging mathematical topics in the theory of positive operators; spectral properties of nonnegative matrices."

### Graduate

Alison Sneyd (HDip Mathematical Sciences, 2008):



"After completing a degree in Mathematical Studies at UCD, I decided to do the H. Dip. in Mathematical Science because it gave me the qualification I needed to do a PhD in mathematics. The H. Dip. really increased my understanding of a wide variety of topics in mathematics and was very beneficial to my future studies. It introduced me to both the topic of my future PhD research (coding theory) and to my future PhD supervisor. Overall, I think the H. Dip. in Mathematical Science is a very good choice for anyone wishing to do a conversion course in mathematics."

Alison completed her PhD with Dr Eimear Byrne in 2012 and is a member of the Claude Shannon Institute.

### Programme outcomes

On successful completion of the programme students will:

- have complemented their primary degree with a valuable mathematical qualification,
- have a level of mathematical knowledge equivalent to a BSc in Mathematics or Mathematical Science,
- be qualified to pursue an MSc in Mathematics or Mathematical Science, or indeed any postgraduate degree for which a degree in mathematics is recommended,
- have the confidence and experience needed to continue with a mathematically based career.

### What are the career opportunities?

Employers love mathematical sciences graduates. Why? Because mathematical sciences graduates are highly numerate, organized, logical and have excellent problem solving skills. If you feel like you don't necessarily have these skills just yet, don't worry! Studying for a degree within the mathematical sciences is the perfect way to develop and nurture these skills. Numeracy, organization and problem solving skills are required in many walks of life, from the trading floor of an investment bank, to the mathematics classroom, to predicting the weather, so you can see why mathematical sciences graduates are rarely out of work! Some of the careers chosen by our graduates include: research in mathematics (both in academia and industry), actuarial consultants, risk analysts, meteorologists, IT consultants, 2nd and 3rd level teaching.

### Prospective Employers

Aquamarine Power, Alcatel-Lucent, Bureau Veritas, Campbell Scientific, IBM, IFSC, Intel, Google, Lloyds, Marine Institute, Met Eireann, Microsoft, Nokia, Norkom, Numerica Corporation, OpenHydro, Paddy Power, Phillips, RIM, Simula Research, Tyndall Institute.

### How do I apply?

#### Entry Qualifications

Entry to the programme is automatically granted to:

- BA graduates with at least Second Class Honours Grade 1 in Mathematical Studies; (Mathematics Stream)
- Engineering graduates with at least Second Class Grade 1 Honours, who have scored highly in their Mathematics or Mathematical Physics courses;
- Actuarial and Financial Studies graduates with at least Second Class Grade 1 Honours; (Mathematics Stream)
- Economics and Finance graduates with at least Second Class Grade 1 Honours, who have taken a sufficient number of advanced Mathematics courses in their programme and have gained high scores in them. (Mathematics Stream)

Other graduates who believe that their mathematical training provides sufficient background to cope with the programme may apply for entry to the Programme Coordinator. Each application is considered on its merits.

#### Contact

Any queries about the courses should be directed to the Graduate Administrator (pgstudies@maths.ucd.ie; Tel: +353-1-716 7152).

#### Applying Online

To apply online, please go to: <http://www.ucd.ie/apply>

#### Fee Information

For information on fees, please visit: [www.ucd.ie/registry/adminservices/fees](http://www.ucd.ie/registry/adminservices/fees)

#### Useful Links

For more information please visit our website:  
<http://mathsci.ucd.ie/sms/postgraduate.html>