

## APPLIED MATHEMATICS

### Maths solves problems

Applied mathematics is concerned with utilising mathematical techniques and models to obtain practical solutions to concrete problems. This may help explain observations, or predict what may happen in the future. Applications of mathematics span most branches of modern science, engineering, information technology and commerce. In particular, biology and medicine are important emerging areas where a mathematical approach can reveal new knowledge.

Applied mathematicians do not just rely on existing mathematical theories and techniques – often they need to modify or mould them to the specific application. They try to view problems in an abstract form, so they can identify links with other applications and build upon the existing approaches and knowledge. They use computational techniques to understand the solution better to reveal its properties. Sometimes they need to develop new theories.

Applied mathematicians develop and use mathematics to improve our lives.

## FINANCIAL MATHEMATICS

### Maths reduces risks

Financial Mathematics is the area of mathematics concerned with financial risk management. It has numerous applications in the world of business and finance, including quantitative investment, derivatives pricing and hedging, long-term life-insurance policies and more. One of its iconic results is the work of Black, Scholes and Merton on derivatives pricing, which was awarded a Nobel Prize in Economics in 1997. Financial Mathematics is a multidisciplinary area of mathematics, as it involves a range of mathematical tools including partial differential equations, stochastic analysis, computational mathematics, statistical learning and optimisation. A degree in financial mathematics opens up many exciting job opportunities in global financial markets, investment banking, insurance, hedge funds, in Australia and abroad, as well as successful careers in academia.

## PURE MATHEMATICS

### Maths is perfection

Pure mathematics is concerned with the abstract, the rigour and the beauty of perfection. Although pure mathematics constructions are motivated by reasons other than applications, such constructions often become the basis for applied mathematics.

Pure mathematicians imagine the unimaginable. This includes imaginary numbers and impossible figures such as Klein bottles. And, magically, such wonderful constructions become the basis of the most practical of mathematics applied to solve the most concrete of problems: the theory of prime numbers is fundamental to the security systems in electronic banking; notions of the curvature of space and time are applied in designing global positioning systems; imaginary numbers are used in everything from signal processing to the analysis of fluid flow. The examples are endless.

Pure mathematicians don't just dream the impossible – they make the impossible real.

## STATISTICS

### Maths makes decisions

There are two important parts of statistics – the mathematical theory and the applications of this theory in the real world. Mathematical statistics is the branch of mathematics that deals with models involving a random, unpredictable component. Real world applications are many and varied, and allow the making of informed decisions in the face of uncertainty.

Applications include testing of new drugs, drug testing in sports, risk evaluations in health, DNA testing, and designing and interpreting sample surveys such as TV and radio ratings. Other applications include actuarial mathematics and financial mathematics, where people deal with mathematical models in finance, insurance and economics.

A statistician's job is always interesting, with nearly every project involving a degree of innovation.

The School also offers a major/extended major in Mathematics, which covers a combination of the topics listed above.

# Mathematics is the basis of most of modern science and engineering



## WHY STUDY MATHEMATICS?

To complete your science studies and continue your career in science you must have suitable mathematical training. Mathematics and statistics will help you to:

- think logically and clearly, and apply a range of problem-solving strategies
- use data and other quantitative information effectively
- understand our world and universe
- model, analyse and improve systems
- appreciate the beauty and perfection of theory in nature and the sciences
- obtain employment at a good starting salary.



### Further information

[monash.edu/maths](http://monash.edu/maths)

1800 MONASH (1800 666 274)

The information in this brochure was correct at the time of publication (June 2017). Monash University reserves the right to alter this information should the need arise. You should always check with the relevant Faculty office when considering a course.

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## MONASH MATHEMATICS

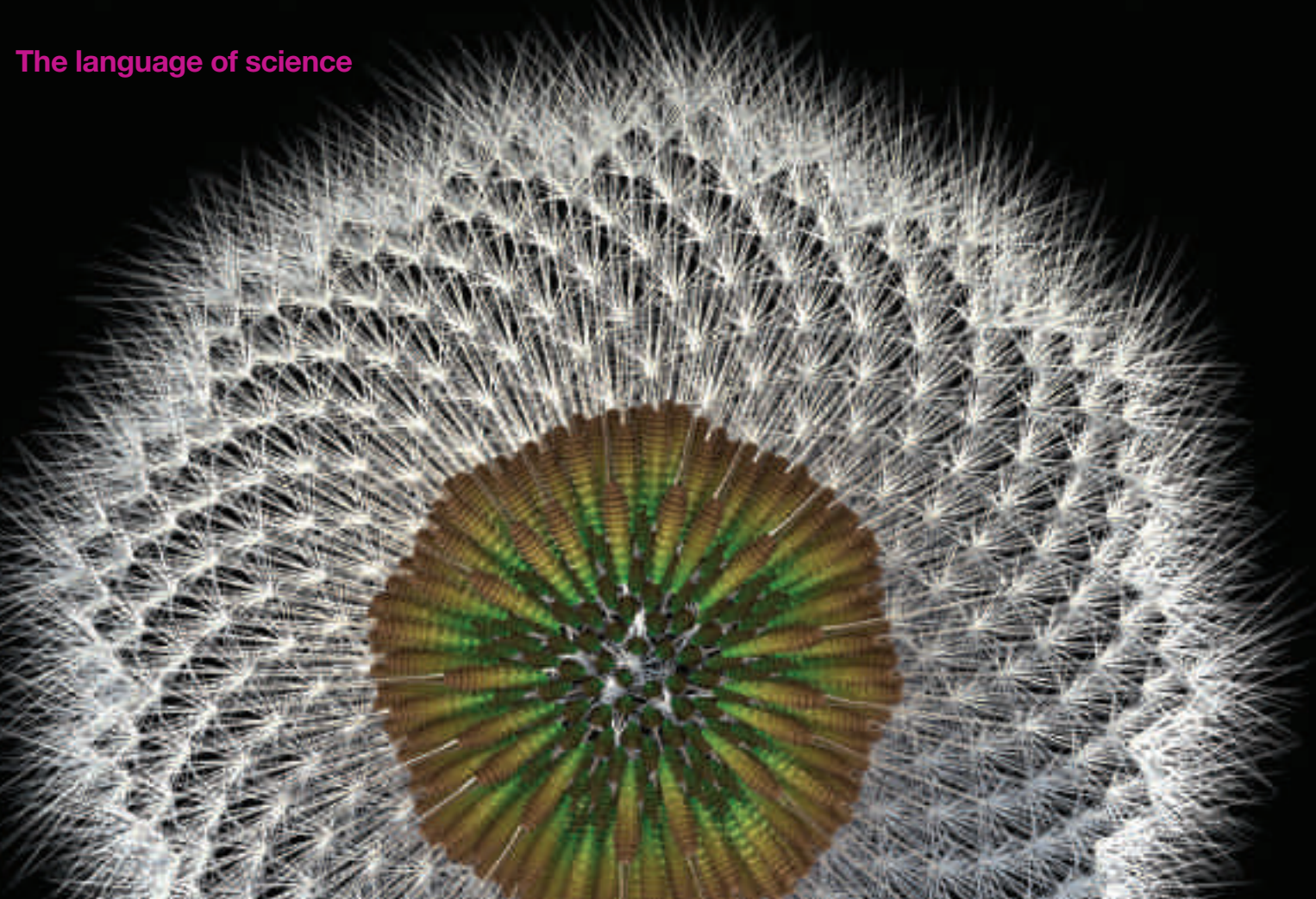
[monash.edu/maths](http://monash.edu/maths)



GROUP  
OF EIGHT  
AUSTRALIA

# MATHEMATICS

The language of science



**Mathematicians make it possible to harness and improve technology, explore space, shop online, bring animation to our screens, model climates, and solve complex logistic and traffic issues.**

In physics, mathematics describes our understanding of matter, from the smallest scales of atoms and subatomic particles, to the structure of the universe.

In engineering, the language of mathematics is used to understand fields as diverse as the aerodynamics of flight, the destructive power of waves and the design of telecommunication networks.

In the biological sciences, the growth of populations, be they rabbits or viruses, and the sequencing of the human genome are investigated using mathematics.

In finance, the trading on stock exchanges and economic modelling are reliant on mathematics.

Mathematics can also be studied for its own sake, with the bonus that many results in pure mathematics find important applications years after their initial discovery.

Studying mathematics develops a wide range of transferable skills from problem-solving to critical analysis and Monash students majoring in mathematics graduate into diverse and interesting careers.

The School of Mathematical Sciences offers a variety of units and majors designed to meet the diverse needs of students at Monash. We also offer an exceptional level of student support in maths, with a drop in help centre open every day and during exam periods.

Our enthusiastic mathematicians love finding the true magic and beauty in maths and pass this passion on to their students.

Visit [monash.edu/maths](http://monash.edu/maths) for more.



**JESSICA GIBSON**  
Bachelor of Science

"Lots of companies need people with a maths background and studying maths at Monash has provided me with lots of opportunities.

"I did an eight week summer vacation program at Ernst and Young, which was fantastic experience. I got a graduate position with the company at the end of it."

## STUDYING MATHEMATICS AT MONASH

**The School of Mathematical Sciences offers a variety of units and major sequences designed to meet the diverse needs of students at Monash.**

The School offers mathematics units at all undergraduate levels. These are offered across a wide range of areas of modern mathematics, from mathematical methods to statistics to pure mathematics, as well as demonstrating the utility of mathematics across a variety of applications.

Majors and/or extended majors are offered in each of the following areas:

- Applied mathematics
- Financial and insurance mathematics
- Mathematics
- Mathematical statistics
- Pure mathematics

Minors are also offered in mathematics and statistics.

Details of the individual mathematics units are provided in the Monash University Undergraduate Handbook at [monash.edu.au/pubs/handbooks](http://monash.edu.au/pubs/handbooks)

You can take a mathematics major at Monash in the following courses:

- Bachelor of Science
- Bachelor of Science Advanced – Research (Honours)
- Bachelor of Science Advanced – Global Challenges (Honours)

A major in mathematics can also be taken as part of a double degree.

### HONOURS STUDIES

Following their first degree, students can apply to do honours. The honours program involves the completion of a research project and coursework options that cover a broad range of topics selected by the student in conjunction with the coordinator.

### POSTGRADUATE STUDIES

After honours, students wishing to become research or academic mathematicians can undertake MSc and PhD studies. These degrees involve coursework options and a research project or thesis.

“Pure mathematics is, in its way, the poetry of logical ideas.”

ALBERT EINSTEIN

## OUR PEOPLE

**The School conducts research within the broad areas of applied mathematics, pure mathematics and statistics.**



**NORMAN DO**  
Pure mathematician

If you keep your eyes open, you see patterns everywhere. Once you start playing with mathematical patterns, you suddenly need to work out the formulas behind them.

I love problems. Some people see problems in life as a bad thing. Mathematicians love them. Many of my ideas intersect with physics and I work together with physicists to come up with the mathematical formulas behind what might appear to be random.

I have a very special home here at Monash. It is creative and vibrant and full of energy.



**ANDREW CHIU**  
Graduate, Bachelor of Science / Bachelor of Engineering, majoring in Mathematics – Analyst at Deloitte Australia

Studying mathematics at Monash definitely taught me how to think critically and how to be able to summarise information in a way that's understandable by other people.

Before I started working in this field, I would have thought an analyst just drew graphs and joined the dots. It's only when you get your hands into it that you realise the impact you're making – you're learning how people, society and the world work.

I work with a broad range of clients including health care providers, hospitals, insurers and government. I love the work because an analyst does such a wide variety of things – no two jobs are the same for me.



**KATE SMITH-MILES**  
Professor

I am an applied mathematician, which means that I love taking the mathematical tool kit that I've developed over many years and applying that to problems of real significance to society. Maths is everywhere, and a mathematician is able to see the beauty and potential of that.

Once you look at something with a mathematical lens you have the ability to describe how it is, you have the ability to describe how it could be, and how you can shift and how you can improve. One of the great things about mathematics is that it's an abstract language and with that language you can model all sorts of things.

For information on pathways from VCE maths to maths at Monash and more detailed course planning information, visit: [monash.edu/science/schools/mathematical-sciences/current](http://monash.edu/science/schools/mathematical-sciences/current)

For more information on the research happening in mathematics at Monash, visit: [monash.edu/maths](http://monash.edu/maths)  
For more stories about research and teaching staff, visit: [monash.edu/science-stories](http://monash.edu/science-stories)

## WHERE MATHEMATICS CAN TAKE YOU

GRADUATES IN MATHEMATICS HAVE VARIED AND DIVERSE CAREER OPTIONS

ACTUARY  
ASTRONOMER  
ASTROPHYSICIST  
BANKING AND FINANCE  
COMPUTER ANALYST  
CRYPTOLOGIST  
DATA ANALYST  
FINANCIAL ANALYST  
MATHEMATICAL MODELLER

MEDICAL RESEARCH/SCIENCE  
METEOROLOGIST/WEATHER FORECASTER  
OCEANOGRAPHER  
OPERATIONS RESEARCH ANALYST  
QUANTITATIVE ANALYST  
SCIENCE JOURNALISM  
STATISTICIAN  
TEACHER

MASTER OF FINANCIAL MATHS

Studying maths at Monash can lead you to further study in more specialised areas of maths.

Our Master of Financial Mathematics will complement your undergraduate study and prepare you to make an impact in the financial world where your skills in mathematics will be a highly sought after commodity in an increasingly globalised market.

See [monash.edu/science/schools/mathematical-sciences/future/careers](http://monash.edu/science/schools/mathematical-sciences/future/careers)  
There are also extensive resources on mathematics careers at [careers.amsi.org.au](http://careers.amsi.org.au)