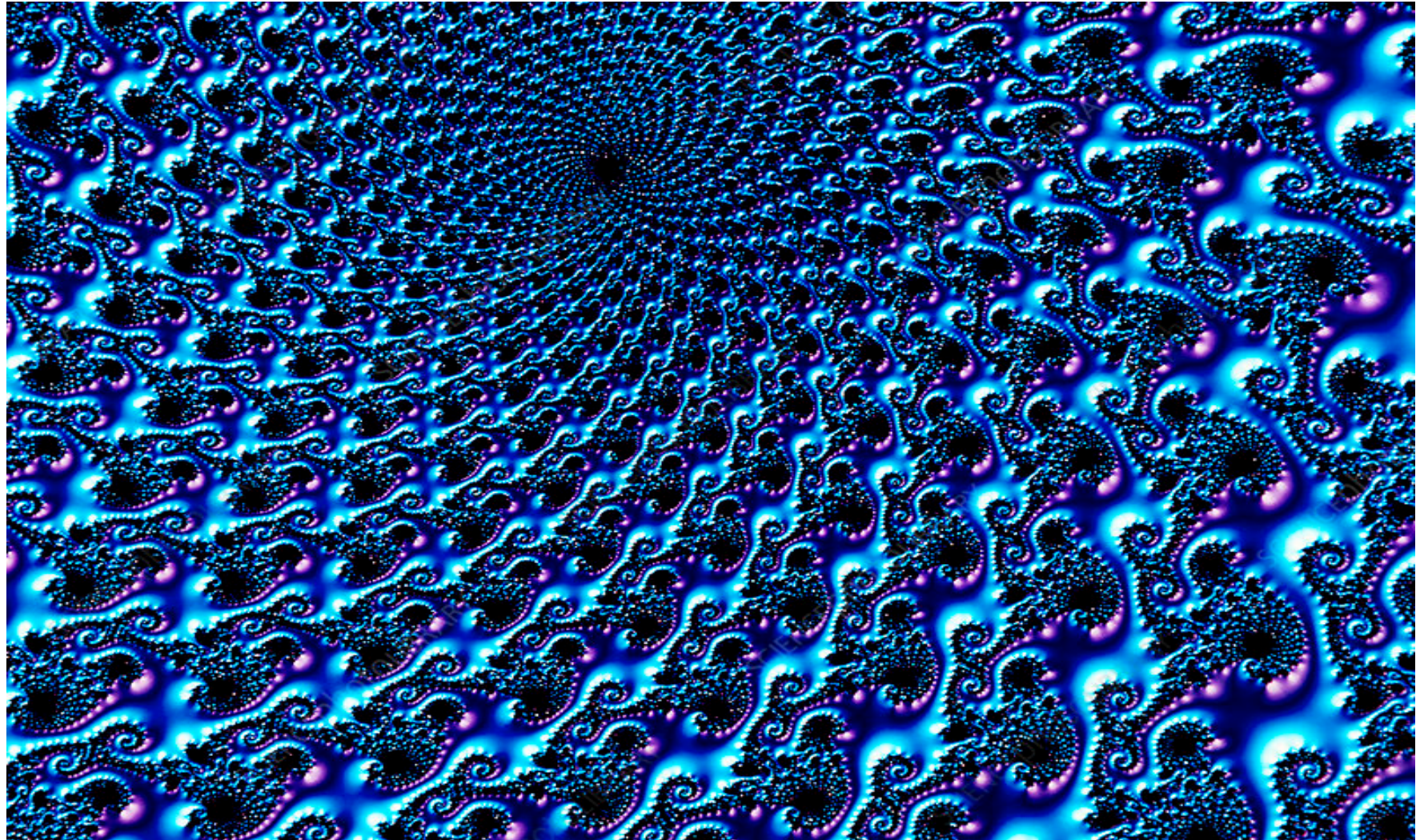


# APPLIED MATHEMATICS HONOURS 2027



# APPLIED MATHEMATICS HONOURS

**Coursework: 2 core units (12 cp) + 2 selective units (12 cp) = 24 cp**

The following **core units** are compulsory for all Applied Mathematics honours students:

- MATH4411 Applied Computational Mathematics (Semester 1)
- MATH4412 Advanced Methods in Applied Mathematics (Semester 2)

Two **selective units** should be chosen from units listed as 4000-level or higher from [AMH Table A](#).

In particular, the following 5000-level units are offered by Applied Mathematics research group:

- DATA5441 Networks and High-dimensional Inference
- MATH5410 Special Topics in Applied Mathematics

**Honours research project in Applied Mathematics: 24 cp**

Selected research areas of Applied Mathematics Research Group:

- Dynamical Systems
- Biomedical and Industrial Modelling
- Integrable Systems
- Geophysical and Astrophysical Fluid Dynamics
- Mathematical Biology
- Complex Systems
- Game Theory
- Stochastic Analysis
- ... and a lot of other research areas.

# APPLIED MATHEMATICS RESEARCH GROUP

- Anna Aksamit
- Eduardo Altmann
- Nathan Duignan
- Holger Dullin
- Ben Goldys
- Georg Gottwald
- Nalini Joshi
- Peter Kim
- Christopher Lustri
- Robert Marangell
- John Mitry
- Mary Myerscough
- Pantea Pooladvand
- Milena Radnović
- Marek Rutkowski
- Martin Wechselberger
- Caroline Wormell
- Yiming Ying
- Ding-Xuan Zhou
- Zhou Zhou

# RECENT HONOURS PROJECTS

The following projects were recently completed by Applied Mathematics honours students:

- Hamish Blair: Microlocal analysis and the geometry of distributions.
- Nicholas Cranch: Customising the stability of truncation schemes.
- Kai Nielson: The effects of partial slip on the stability of the rotating disc boundary layer.
- Jessica Slegers: Harnack-type inequalities for nonlinear evolution equations
- Samuel Lin: Symmetries and exact solutions of PDEs.
- Chamal Perera: Orbits of a small satellite co-orbiting around a Lagrange point 1 space station.
- Timothy Lapuz: A geometric approach to transonic accretion flows: Stars and black holes.
- Andre Nunez: Optimal sex allocation for dioecious species.
- Viney Kumar: How does the evolution of monogamy depend on human life history?
- Kenny Chen: Partial difference equations on face centred cubic lattices.
- Charles Lilley: Optimising a novel combination cancer treatment.
- Emily Cooper: Modelling refugee behaviour.
- Mia Bridle: Spectral analysis of coupled and decoupled eigenvalue problems.

# RECENT HONOURS PROJECTS

- Elizabeth Rose: The vortex filament equation.
- Yige Bian: Mathematical modelling of cancer immunotherapy.
- Ren Li: Optimal tensor network decoder for fault-tolerant quantum error correction of the XZZX surface code.
- Patrick Cahill: Who's going to win? Modelling elections with an adapted Hegselmann-Krause model and data assimilation.
- Harry Hiatt: A travellers guide to billiard knots.
- Yuan Xu: A lipid-structured model of atherosclerosis with smooth muscle cell-derived macrophages.
- Ivan Hu: Glycolytic oscillations in the integrated oscillator model.
- Georgia Wang: Mathematical modelling of immune cell dynamics in the tumour microenvironment and optimisation of immune checkpoint blockade therapy.
- Ewan Macfarlane: The Halo Drive: Can light help us to reach the stars?
- Matthew Qu: Exploratory stochastic control-stopping problems: optimal policies and convergence of policy iteration algorithm.
- Kate Fiumara: Modelling of  $T$  cell affinity maturation.
- Fei Han: Differentially private stochastic gradient descent.

# SELECTED TOPICS OF HONOURS PROJECTS

- Fractals in transient chaos (Eduardo Altmann)
- Finding regularity in chaos (Nathan Duignan)
- Chaotic dynamics of the pentagon (Holger Dullin)
- Magnetic nanowires (Ben Goldys)
- Networks of coupled oscillators (Georg Gottwald)
- Discrete soliton equations (Nalini Joshi)
- Modelling cancer immunotherapy (Peter Kim)
- Singularity formation in differential equations (Christopher Lustri)
- Geometric aspects of Turing bifurcations (Robert Marangell)
- PDE models for the distribution of lipids in macrophages in atherosclerotic plaques (Mary Myerscough)
- Elliptical billiards and their periodic trajectories (Milena Radnović)
- Geometric singular perturbation theory (Martin Wechselberger)
- Accurate numerical estimates for the Lorenz attractor (Caroline Wormell)
- Learning with a general loss by neural networks (Ding-Xuan Zhou)
- Exploration and exploitation in reinforcement learning (Zhou Zhou)
- ... and several other project topics; see the [handbook](#) for Applied Mathematics Honours.