

Mech Connect Department of Mechanical Engineering **Annual Report 2025**





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Head of Department

Kia ora – Welcome to the 2025 Edition of our Mech Connect Annual Report

2025 has been a year defined by growth, momentum, and consolidation. Our Mechanical Engineering (BE-Hons) intake reached a historic high, with 185 students entering second year, reflecting sustained demand for our programmes. Mechanical Engineering once again recorded the highest number of first-preference applications across the Faculty of Engineering, while Mechatronics was equally oversubscribed, maintaining strong enrolments and continued popularity. Our Aerospace and Biomedical minors remain at full capacity, demonstrating ongoing student enthusiasm for specialised pathways.

The strong demand for our programmes is both humbling and motivating. It reflects the quality of our teaching and research, the relevance of our curriculum, and the diverse, future-focused career pathways our graduates pursue.

At the same time, we recognise that this increased demand for our programme must be addressed within the realities of constrained resources. We see these as catalysts for innovation.

One example of our response to growth is the development of a new taught Master of Mechanical Engineering, planned to commence in the first semester of 2027. This initiative will enable us to better meet both domestic and international demand while responding to industry needs and emerging trends in a financially sustainable and academically rigorous manner.

Research in 2025 has been equally impactful. We celebrated 46 successful grant applications, securing a total of \$4.46 million in external research funds and strengthening our research capability across a wide range of engineering disciplines. We're proud to contribute to UC's research strength of harnessing technology for real-world solutions.

A particularly significant milestone in 2025 was the addition to the department. We were successful in establishing a permanent home for the former Callaghan Innovation Cryogenics Lab, creating a dedicated base for Aotearoa New Zealand's leading cryogenics research programme. This achievement has already created, and will continue to create, exciting new opportunities for meaningful postgraduate study and long-term collaboration with industry partners.

Our postgraduate community continues to flourish, with 81 PhD and 11 Master's students enrolled in 2025. At the end of the year we held our first Postgraduate Student Recognition event, celebrating excellence in research, teaching, and service.

Other Mech Connect Edition 2025 Highlights include:

- UC Motorsport winning the Formula SAE Australasia Electric Vehicle Championship
- 48 final-year projects, including 23 industry-sponsored collaborations
- The launch of our inaugural Engineering Industry Connect event
- Record engagement at outreach events such as UC Open Day and SouthMACH
- 100% of participants rating WiE CAN as very good or excellent – our highest result ever

Our outreach and engagement activities continue to grow in scale and impact. Through Children's University partnerships, industry events, national and international competitions, and initiatives such as the Tonga Biomedical Outreach Programme, our students and staff are extending engineering expertise well beyond campus.

At the heart of all these achievements are our people. I would like to sincerely thank our academic, technical, and professional staff for their dedication and commitment to excellence. Their work underpins the quality of our teaching, research, and student experience. We are equally grateful to our alumni, industry partners, sponsors, and the members of our Industry Advisory Board for their continued guidance and support.

Mechanical Engineering at Te Whare Wānanga o Waitaha | University of Canterbury is ambitious, collaborative, and outward-looking. As we look toward 2026 and beyond - including hosting the Australasian Fluid Mechanics Conference in early December 2026 and celebrating the Faculty's 140th anniversary in 2027 - we do so with confidence in our direction and a deep appreciation for our community.

Thank you for your continued interest in our department. We hope you enjoy reading this edition and invite you to stay connected and share your stories with us in 2026.

Ngā mihi,

Professor Stefanie Gutschmidt
Head of Department
Mechanical Engineering



Who We Are

Staff Members

The Mechanical Engineering Department has 25 academic staff, four administrative staff, three senior tutors, 15 technical and IT staff and four post doctoral and research associates.

Academic staff



Stefanie Gutschmidt
Professor
Head of Department



Digby Symons
Associate Professor
Associate Head of
Department



Sid Becker
Associate Dean
Postgrad Research



Catherine Bishop
Professor
Director of studies 2nd
Year Engineering



Geoff Chase
Distinguished Professor
Advisor to Students with
Disabilities



Sanjay Choudhary
Lecturer



Don Clucas
Associate Professor



Stephen Daynes
Senior Lecturer Above
the Bar



David Denkenberger
Associate Professor
Director of Studies 4th
Year Engineering



Paul Docherty
Professor



Tim Giffney
Lecturer



Shayne Gooch
Associate Professor
Director of Studies 3rd
Year Engineering



James Hewett
Lecturer



Mark Jermy
Professor
Director of Postgraduate
Studies (ME)



Natalia Kabaliuk
Senior Lecturer Above the
Bar, International Director
of Studies



Deborah Munro
Associate Professor



John Pearse
Associate Professor
Undergraduate Director
of Studies



Dirk Pons
Professor



Chris Pretty
Professor
Co-Director of
Mechatronics



Geoff Rodgers
Professor
Associate Dean (Research)



Mark Staiger
Associate Professor
Chair of Departmental
Research Committee



Malcolm Taylor
Lecturer



Mathieu Sellier
Professor



Tania Shuker
Senior Tutor



George Stilwell
Lecturer
Chair of Outreach and
Marketing



Dan Zhao
Professor
Director of Master of
Engineering Studies



Yilei Zhang
Associate Professor
Director of Postgraduate
Studies (PhD)



Christine Walker
Senior Tutor

Senior Tutors

Technical and General Staff



Bruce Robertson
Technical Services
Manager
Design Engineer



Joseph Davidson
Workshop Technician



Anthony Doyle
Training Workshop Lead
Tutor



Tony Doyle
Staff Workshop Team
Leader



Rodney Elliott
Technical Officer
Scientific Officer



David Fanner
Workshop Technician



Phil Gadsby
Projects Engineer



Owen Kelly
Projects Engineer



Adam Latham
Systems Administrator
Technical Officer



Shaun Mucalo
Projects Engineer
– Microscopy and
Materials



Zac Perston
Projects Engineer



Julian Phillips
Technician



David Read
Technical Officer



Paul Southward
Programmer Analyst
Systems Analyst /
Programmer



Oscar Torres
Project Engineer



Eric Van de wiel
Workshop Technician

Administrators



Jess Lagoutte
Administrative Services
Manager



Jess Daly
Administrator



Greta Rapalaviciute
Administrator

Penny Crudgington
Administrator

Retirement/ resignation

- John Cater (Professor) – November 2025
- Jessica Fitzjohn (Post Doctoral Fellow) – June 2025
- Jake Campbell (Post Doctoral Fellow) – March 2025
- Steven Su (Post Doctoral Fellow) – November 2025

New Onboard

- Eric Van de wiel (Workshop Technician) – since January 2025
- Joseph Davidson (Workshop Technician) – since May 2025
- Ella Guy (Post Doctoral Fellow) – since March 2025
- Selin Duruk (Post Doctoral Fellow) – since April 2025

- Ryan Liu (Post Doctoral Fellow) – since January 2025
- Alan Caughley (Principal Researcher) – since October 2025
- Lan Le – Ngoc (Senior Research Engineer) – since October 2025
- Ryan McKinlay (Senior Research Engineer) – since October 2025
- Sanjay Choudhary (Lecturer) – since October 2025

Erskine visitors

- Dr Deepak Panghal (National Institute of Fashion Technology) – ENME492: Industry 4.0: Intelligent design and manufacturing
- Professor Ratnesh Shukla (Indian Institute of Science) – ENME488: Mechanics of Flight and Spaceflight
- Associate Professor Papatya Nur Dökmeci Yörükoğlu (Cankaya University) – ENGR401 Computational Fluid Dynamics

Post Doctoral and Research Associates



Alan Caughley
Principal Researcher



Selin Duruk
Post Doctoral Fellow



Ella Guy
Post Doctoral Fellow



Lan Le – Ngoc
Senior Research
Engineer



Ryan Liu
Post Doctoral Fellow



Liam Murphy
Post Doctoral Fellow



Ryan McKinlay
Senior Research
Engineer

Mechanical Engineering Industry Advisory Board (IAB)

The Industry Advisory Board (IAB) provides guidance to department on curriculum development, supports industry connections, and helps align research and teaching programmes with current and projected industry needs.

IAB members in 2025, representing a diverse range of industries and business types, are Aaron Goldsbury (Fonterra), Andrew Diehl (Holmes Solutions), Andrew Lamb (Fabrum), Craig Price (Beca), Jaclyn Pow (Beca), James Powell (Dawn Aerospace), Madeleine Martin (ChristchurchNZ), Michael Lee (Contact Energy), Oliver Hunt (Medsalv), Ry Collier (Methanex) and Tom Maslin (Aussie Lifts, Brisbane, Australia).

We farewelled Andrew Hilliard (Fisher & Paykel Healthcare), thanked him for his eight years' service to the board and welcomed his colleague, Alicia Evans. We are pleased to be adding a more recent graduate, another female engineer and continuing the long F&P representation on the board, particularly supporting the biomedical minor.

A strategic realignment of the board membership to align with the evolving needs of the department including growth programmes like aerospace, biomedical and mechatronics led to Adam Leatherland (HamiltonJet) joining as our new mechatronics industry representative.

The board had significant input into the new Master of Mechanical Engineering programme and the development of industry-academia partnerships, assisted with recruitment of academic staff, and provided leadership in shaping the terms of reference being

developed for all faculty advisory boards.

We greatly appreciate the opportunity to serve on the faculty IAB, working alongside Stefanie Gutschmidt as an engaged and passionate Head of Department. It is inspiring to see the department going from strength to strength. We encourage all alumni and supporters of the department to consider ways you can partner with and contribute to the success of the department, including sponsoring industry-driven final year projects.

Andrew Lamb
IAB Chair



Andrew Lamb (chair)
Service and
Commissioning Lead
Fabrum



Ry Collier
Global Manager –
Quality, Methanex



Andrew Diehl
Technical Director
Holmes Solutions



Alicia Evans
Product Development
Manager
Fisher & Paykel
Healthcare



Aaron Goldsbury
Chief Engineer
Fonterra



Andrew Hilliard
Product Development
Manager
F&P Healthcare



Oliver Hunt
Founder & CEO
Medsalv



Michael Lee
Engineering Manager
Contact Energy



Madeleine Martin
Health Technology
Centre Manager
The Arts Centre



Thomas Maslin
Engineering Manager
Aussie Lifts



Jaclyn Pow
Manager Southern
Building Services
Beca



James Powell
Co-Founder
Dawn Aerospace



Craig Price
Chief Operating Officer
Beca



IAB October meeting

Postgraduate students

Our department continues to support a strong and active postgraduate community. As of 31 December 2025, we welcome 11 Master's and 81 PhD students, whose research spans a wide range of areas, including intelligent design and manufacturing, biomedical engineering, robotics, renewable energy, materials science, thermofluids, and aerospace engineering. Together, they contribute to advancing knowledge, innovation, and real-world engineering impact.

In 2025, we placed a strong emphasis on recognising excellence and strengthening postgraduate culture. We organised the department's first Postgraduate Student Recognition Awards, celebrating outstanding contributions across three categories: research, teaching, and service. To further build community and staff-student engagement, we also held the annual postgraduate table tennis tournament, bringing together postgraduate students and academic staff in a relaxed and collegial setting.

Supporting academic development remained a key priority. The department delivered tailored workshops on academic writing and first publications, addressing both foundational skills and emerging challenges in research dissemination. These workshops covered topics such as responsible AI use in research, publication ethics, and navigating new opportunities and risks in modern academic publishing, helping students build confidence in their early research outputs.

We also strengthened postgraduate recruitment and support structures. Postgraduate recruitment was moved to the first half of the year, enabling earlier engagement with high-performing undergraduate students. A new Postgraduate FAQ was developed and postgraduate student representatives were invited to participate in new student briefings, allowing incoming students to engage early with the postgraduate community and its support networks.

To ensure steady progress and fairness, we enhanced progress monitoring and reporting, with timely reminders and support for students who were falling behind schedule. In parallel, we worked to standardise postgraduate student recommendations, improving transparency and ensuring that selection criteria are clear, consistent, and fair for both academic staff and prospective students.

Looking ahead, these initiatives strengthen our postgraduate environment by combining academic excellence, clear expectations, early engagement, and a supportive research culture. Together, they help prepare our postgraduate students to succeed in research, academia and industry.

PhD completions

Andres Guiguet: *Participative Simulation of Logistic Networks: Methodological frameworks and New Zealand case study.* Supervisor: Dirk Pons

Baxter Kamana-Williams: *Smart Homes, Sustainable Futures Novel Models for Realistic Residential Demand-Side Management in Aotearoa New Zealand.* Supervisor: Geoff Chase.

Dale Dai: *Design of highly skewed rotor blades for coaxial contra-rotating UAV rotor systems.* Supervisor: Digby Symons

Danyon Stitt: *From Lab to Lineout: A Study of Headgear and Brain Injury Biomechanics in Rugby* Supervisor: Natalia Kabaliuk

Ella Guy: *Rethinking Respiratory Diagnostics and Monitoring: From Hardware to Model-Based Therapeutics.* Supervisor: Geoff Chase

Finn McIntyre: *Multi-Axis Spin Coating on Curved Surfaces.* Supervisor: Mathieu Sellier

Francis Pooke: *Design and validation of a spring-driven insulin pump with an electromechanical clockwork-escapement dose-control mechanism.* Supervisor: Geoff Chase

Hui Rong: *Thermal and Emission Performance Studies on Premixed Meso-combustors for Thermophotovoltaic Applications.* Supervisor: Dan Zhao

Josie Dixon: *Non-Invasive Optical Methods for the Detection of Blood Analytes in the Near-Infrared Spectrum.* Supervisor: Geoff Chase

Lachie Crawford: *An Autonomous Monocopter for Fighting Fires.* Supervisor: Keith Alexander

Mariah McDonald: *Patient-specific Parameter Identification of Mechanically Ventilated Neonates.* Supervisor: Geoff Chase



April Graduation. Graduated PhD students (from the left): Nina Pernus, Finn McIntyre, David Muchiri, Ella Guy, Sagor Hosen

Matt Payne: *Development and Clinical Validation of an Ultra Low-Cost Insulin Pump For More Equitable Diabetes Care.* Supervisor: Geoff Chase

Nicholas Lam: *Advancing Numerical Evaluation of Model Identifiability in Noisy Data.* Supervisor: Paul Docherty

Nina Pernus: *Biomechanics of Sport Climbing: Development and Validation of Instrumented Mounting Screw for Holistic Evaluation of Climbers.* Supervisor: Debbie Munro

Pav Devanathan: *Post Mortem Interval Estimation using Soft Tissue Mechanical Properties.* Supervisor: Natalia Kabaliuk

Reza Kordani: *Structural Design of Rocking Systems including higher mode effects.* Supervisor: Geoff Rodgers

Richie Ellingham: *Integration of Biomimetic Pressure Mapping and Actuation in Soft Electroactive Elastomer Composites.* Supervisor: Tim Giffney

Ryan Liu: *Experimental, Numerical and Theoretical Studies of the Aerodynamic Performance of Small-size UAV Propellers for General Forward Flight Conditions.* Supervisor: Dan Zhao

Samaneh Dashti Ghalehjogh: *Risk-Informed Seismic Rehabilitation of Offshore Jacket Structures.* Supervisor: Geoff Chase

Seigan Hayashi: *Evaluating Control-Based Continuation for Investigating Micro-Electro Mechanical Systems.* Supervisor: Stefanie Gutschmidt

Simon Blue: *Novel Long-Term Packaging Material for Wireless Implantable Devices.* Supervisor: Debbie Munro

Master's completions

Finn Petersen: *Investigation into the Efficacy of an Adaptive Aerofoil System on Multirotor Drones.* Supervisor: Natalia Kabaliuk

Hammad Mohsin: *Synthesis and characterisation of poly glycerol sebacate bioelastomer.* Supervisor: Dirk Pons

Sam Dougherty: *Aerodynamic Performance Investigations of UAV Propellers at Low Reynolds Number.* Supervisor: Dan Zhao

Oliver Marchi: *The Application of Granular Materials in Lightweight Wall Partitions.* Supervisor: John Cater

Thomas Bell: *Research and Development of On-Orbit Servicing Capability for Dawn Aerospace Satellite Propulsion Systems.* Supervisor: Paul Docherty

Sebastian Yeoman: *Propagation of Sound Through Gaps.* Supervisor: John Pearse

Kailan Paul: *Design of a Wireless, Battery-Powered Snake-like Robot.* Supervisor: Chris Pretty

Zane Goggin: *Computational Fluid Dynamics of Upper Airway During Optiflow+ Duet Asymmetric Interface Nasal High Flow Therapy.* Supervisor: Natalia Kabaliuk

Morgan Stuthridge: *Benchmarks for Aerodynamic Modelling of Hypersonic Vehicles.* Supervisor: John Cater

Jessica MacFarquhar: *Design and development of Antarctic Ice coring equipment.* Supervisor: Geoff Rodgers

NEW PhD students enrolled in 2025

Aden Sadler: *Efficacy of Asymmetric Nasal High Flow.* Supervisor: Natalia Kabaliuk

Alice Cerdeira: *Optimizing cardiovascular models for improved predictions of ICU interventions.* Supervisor: Geoff Chase

Asma Nawaz: *Topic to be confirmed.* Supervisor: Yilei Zhang

Danny Su: *Developing Noninvasive Optical Methods for Blood Analyte Sensing.* Supervisor: Chris Pretty

Henry Hall: *Next-Generation EIT Devices and Biomedical Applications.* Supervisor: Geoff Chase

Jieyu Liu: *A Hybrid Stochastic and Machine Learning Framework for Ventilator Weaning.* Supervisor: Geoff Chase

Juan Han Ng: *Spray control in rotary atomizers.* Supervisor: Mathieu Sellier

Kesava Moorthy Muthu: *Long-term in vivo behaviour of biodegradable magnesium-alloy orthopaedic implants in critical-sized defects.* Supervisor: Mark Staiger

Kirsty Hawke: *Translating health monitoring technology for chronic respiratory conditions into home settings to improve patient self-management and reduce unnecessary hospital visits.* Supervisor: Geoff Chase

Lili Qi: *Investigations on the mechanism and characteristics of premixed ammonia combustion processes.* Supervisor: Dan Zhao

Merlin Steffi Manohar: *Biologically Inspired Mechanisms for Mitigating Catastrophic Forgetting in Multimodal Spiking Neural Networks.* Supervisor: Yilei Zhang

Mohammadreza Ebrahmnataj Tiji: *Resilience to Super Pandemics.* Supervisor: David Denckenberger

Parastoo Aghababaei Dehaghi: *Rheology makes a splash: Understanding the fragmentation process during the rise of a bubble at an interface.* Supervisor: Mathieu Sellier

Pinkeshkumar Attarwala: *Scaling of industrial equipment in a catastrophe.* Supervisor: David Denckenberger

Samantha Krieg: *Sustainable seismic resilience: Quantifying the relationship between performance, environmental impact, and cost.* Supervisor: Geoff Rodgers

Samuel Hastings: *Patient-Specific Respiratory Therapy Titration through Capnography.* Supervisor: Geoff Chase

Shimanto Sarker: *A Large Language Model Architecture for Iterative Robotic Self-Improvement via Trajectory Analysis, Failure Detection, and Reinforcement Learning.* Supervisor: Yilei Zhang

Swarupa Kundu: *Topology Controlled Bio-printed Neural Micro-Networks for Studying Physical Information Flow and Stroke-Like Injury.* Supervisor: Yilei Zhang

Willow Pileggi: *Metal Dusting of High Temperature Alloys.* Supervisor: Catherine Bishop

PhD students enrolled in 2025

Adam Cox: *Optimal control of flow over a hydrofoil using suction/blowing to mitigate cavitation.* Supervisor: Mathieu Sellier

Alexandra Mckendry: *Resonant MEMS for In-sensor Reservoir Computing.* Supervisor: Stefanie Gutschmidt

Ali Akbari: *Low-cycle fatigue, strain-ageing, and residual-capacity of G300E and G500E reinforcing steels.* Supervisor: Geoff Rodgers

Ali Kazemian: *Research in progress.*
Supervisor: Geoff Chase

Ana Luisa Monteiro: *Production of plant-based resilient foods in case of catastrophe.* Supervisor: David Denkenberger

Andrew Lange: *Modelling collisions of milk droplets.* Supervisor: Mathieu Sellier

Annette Swale: *Investigating the Efficacy of Innovative Design Approaches for Softshell Headgear to Minimise Linear Acceleration and Mitigate Brain Strain.* Supervisor: Natalia Kabaliuk

Ashok Kandel: *Effects of welding process on health & environment*
Supervisor: Dirk Pons

Ben Robertson: *Therapeutic Optimization and Targeted Applications for Levelling Blood Sugar (in the ICU).*
Supervisor: Geoff Chase

Briana McKellar: *Steven In Vitro Particle Image Velocimetry Analysis of Aneurysms and their Surgical Remedies.*
Supervisor: Paul Docherty

Caleb Barr: *How can the RoC*RoI model be adapted to advance predictive power and fairness?* Supervisor: Paul Docherty

Christopher Cameron: *A low-cost proprioceptive feedback and neural stimulation system to facilitate somatosensory retraining in individuals affected by stroke.* Supervisor: Chris Pretty

Chuan Tian: *Enhancing Autonomous Engineering Solutions through Collaborative Large Language Model Techniques.* Supervisor: Yilei Zhang

Congyu Xu: *Development of isotropic TPMS-based structures suitable for rugby headgear.* Supervisor: Natalia Kabaliuk

Connor Melton: *Optimising Plantar Heel Pain Comfort with User Adjustable Home Footwear.* Supervisor: Don Clucas

Conor Papple: *A model-based investigation of the distinction between phenotypes of polycystic ovary syndrome (PCOS).* Supervisor: Paul Docherty

Dael Summerhays-Sunnex: *AI-driven Two-Way, Feedback Controlled Emotional Recognition Training for Individuals with Autism Spectrum Disorder.* Supervisor: Geoff Chase

Dale Cusack: *An experimental investigation of lava rheology using analogue fluids and numerical methods.*
Supervisor: Ben Kennedy

Di Guan: *Attenuating Self-Excited Thermoacoustic Instability in Rijke-Type Combustors by Implementing Bias Flow Perforated Liners.* Supervisor: Dan Zhao

Emily Young: *Point-of-Care Biomolecule Sensor Technology Platform for Measuring Insulin.* Supervisor: Stefanie Gutschmidt

Finn Birchall: *Accelerating Alloy Discovery through Gradient Microstructures.* Supervisor: Catherine Bishop

Han Qiao: *Empowering Enterprise Product Emotional Design with AI: Integrating Kansei Engineering and Large Language Models for Human Emotion Recognition.* Supervisor: Yilei Zhang

Haoyu Cheng: *Numerical and Experimental Studies on Fixed-wing UAV Aerodynamics at Different Icing Conditions.* Supervisor: Dan Zhao

Harvey Morison: *Monitoring and Management of Fatigue for use in Exoskeleton Stroke Rehabilitation.*
Supervisor: Chris Pretty

Isaac Flett: *Quantifying Agitation in Intensive Care Patients Using Wearable Devices.* Supervisor: Geoff Chase

Jaimey Clifton: *Classification and predictive monitoring of respiratory disease.* Supervisor: Geoff Chase

James Cushway: *Model-Based Fluid Resuscitation in the Intensive Care Unit.*
Supervisor: Geoff Chase

Jessica Sewell: *Development of a modeled approach to monitoring and preventing ACL tears in women's football.* Supervisor: Geoff Chase

Jessica Rocio Montoya Meja: *3D Printing of Piezoelectric Transducers.*
Supervisor: Tim Giffney

Jiaming Gao: *Numerical and Experimental Investigation on Drones' Unsteady Aerodynamics Performance.*
Supervisor: Dan Zhao

Jinshen Tong: *Investigating the chemical, combustion and emission characteristics of premixed combustion chamber fuelled with renewable-sourced ammonia.* Supervisor: Dan Zhao

Jordan Hill: *Non-invasive Optical Oxygen Extraction Estimation.*
Supervisor: Chris Pretty

Junfeng (Jeff) Wu: *Novel Wool Protein-polysaccharide Hybrid Materials for Encapsulation and Delivery of Probiotics.* Supervisor: Mark Staiger

Kaleb McGillivray-Seaton: *Wireless Power and Communication for Implantable Sensor.* Supervisor: Debbie Munro

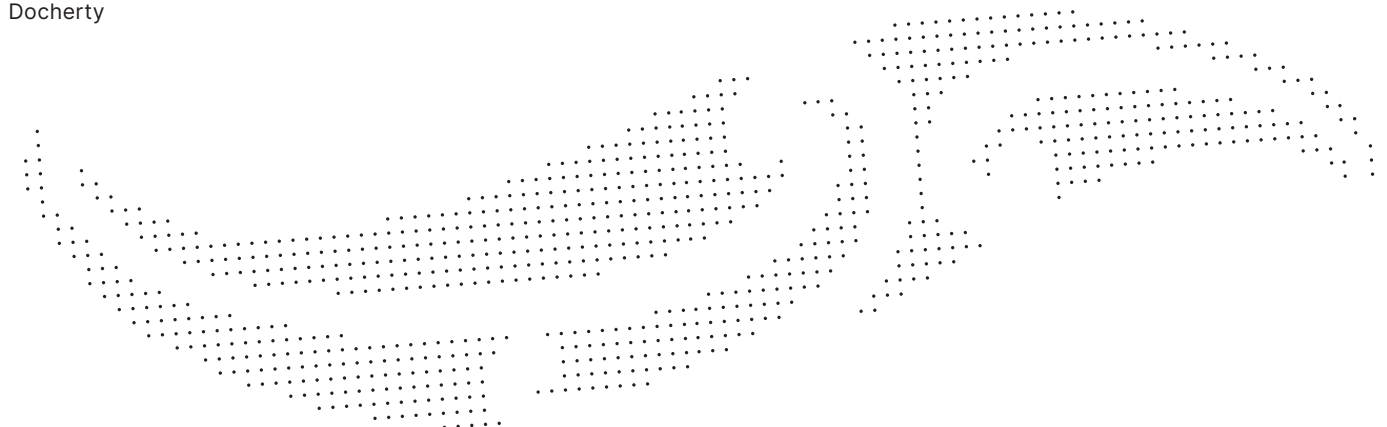
Kamran Ali: *Ahmed Novel Latticing Methods and Topology Optimisation of Triply Periodic Minimal Surfaces (TPMS) based Structures with Integrated Manufacturing Constraints for Additive Manufacturing.* Supervisor: Stephen Daynes

Kaspar Soltero: *Acoustic resolution of Animal Dynamics for Biosecurity in Primary and Regenerating Native Forests.* Supervisor: Stefanie Gutschmidt

Kaveh Rahmani Molten: *Molten oxide electrolysis processing for technology-critical, strategic metals.* Supervisor: Catherine Bishop

Kongting Lee: *A Bio-Inspired Hierarchical Attention Model based on the Cocktail Party Effect.* Supervisor: Dirk Pons

Kritika Khanal: *Interface Phase Transitions and Degradation in Pb-free Ferroelectric Ceramics.* Supervisor: Catherine Bishop



Kshitij Thapa: *Decoding the nanomechanics of insect eggs: Linking Structure to function at the nanoscale.* Supervisor: Mark Staiger

Lev Chernyshev: *Improving real-time hydrodynamic models of foiling yachts in dynamic simulation.* Supervisor: Natalia Kabaliuk

Linghui (Jeff) Meng: *EMG-EEG Hybrid Control System for Upper-Limb Prosthetics Based on Deep Learning.* Supervisor: Debbie Munro

Marvin Miklosa: *On the design of Len Lye's kinetic art work Trilogy.* Supervisor: Shayne Gooch

Molly Evans: *Numerical and Experimental Investigations on Thermoacoustic Instability in Ammonia-Fired Gas Turbine Combustors.* Supervisor: Dan Zhao

Nicolas Davey: *Predictive Cardiovascular Modelling using Support Vector Machines.* Supervisor: Geoff Chase

Paul (Pavlo) Kyselvo: *Non-destructive testing of products made of polymer composite materials: Research and development of control technology.* Supervisor: Natalia Kabaliuk

Phillippe Bruneau: *Development Of A Method For Evaluating The Sustainability Of Energy Systems.* Supervisor: Dirk Pons

Prospero Uybarreta: *A Limited Study to Develop a Piloted Aircraft Comprehensive Operability Rating System (PACORS).* Supervisor: Natalia Kabaliuk

Ryan O'Sullivan: *Model Based Control of Agitation Management in Critical Care Patients.* Supervisor: Chris Pretty

Samantha Couper: *Development and validation of new cameras, technology and diagnostic algorithms for a Digital Imaging Elasto Tomogra-phy breast cancer screening device.* Supervisor: Geoff Chase

Tambwe Gregoire Mbang: *Enabling Smart Safe Manufacturing* Supervisor: Dirk Pons

Theo Nankivell: *Cavitation Mitigation on Hydrofoils by Surface Distributed Mass Flux.* Supervisor: Dan Zhao

Thomas Maslin: *Active, coupled micro-oscillators for totally implantable* Supervisor: Stefanie Gutschmidt

Tianyuan (Daniel) Wu: *Symmetry Engineering Novel Domain Structures in Barium Titanate Thin Films.* Supervisor: Catherine Bishop

Trudy Calje-van der Klei: *Personalising Respiratory Care: Patient-Specific Model-Based Methods to Optimise Ventilatory Support in the ICU.* Supervisor: Geoff Chase

Widhanalage Ramesha Indeewarie (Ramesha) Soysa: *Sensor System to Measure and Monitor Stress Fractures in Racehorses.* Supervisor: Debbie Munro

Xinyu Zhao: *Theoretical and Numerical Studies on Combustion Instability and its Control.* Supervisor: Dan Zhao

Yadian Zhao: *Physiological control and healthcare management systems.* Supervisor: Geoff Chase

Yiheng (Gwen) Guan: *Investigation on Self-sustained nonlinear thermoacoustic instabilities and its control.* Supervisor: Dan Zhao

Yiwen Lyu: *Development of automated AI-based emotion recognition therapy for individuals with ASD.* Supervisor: Lui Holder-Pearson

Yufeng Lin: *3D Screen Printing of Advanced Topical Wound Dressings.* Supervisor: Yilei Zhang

Yuwei Sun: *Research in progress.* Supervisor: Geoff Chase

NEW Master's students enrolled in 2025

Benjamin Wilson: *Industrial Development of a Spinodal Copper Nickel Alloy* Supervisor: Catherine Bishop

Chris Huynh: *Large-scale 3D Printing Robot.* Supervisor: Chris Pretty

Finlay Gilmour: *Measurement of Heavy Vehicle Towing Forces.* Supervisor: Shayne Gooch

Jared Ng: *Effect of cooling rate on tensile performance and microcracking of fibre-reinforced polymer composites in cryogenic environments.* Supervisor: John Cater

Jessica Logopati: *What Goes Up Must Come Down: A Proof-of-Concept Vessel-based Autonomous UAV Control System for Marine SAR Missions.* Supervisor: Chris Pretty

Junhao Fan: *A Hybrid Memory-Augmented Lifelong Learning Framework for Large Language Models.* Supervisor: Yilei Zhang

Mia Dicey: *The design of a perceptive and adaptive snake robot.* Supervisor: Chris Pretty

Sam Pearce: *Design of an instrumented mounting screw for sport climbing analysis.* Supervisor: Debbie Munro

Master's students enrolled in 2025

Andrew James Garner: *Manager worker relationship in industrial operation. Personal productivity and its contributions to national productivity: A New Zealand – Denmark contrast.* Supervisor: Dirk Pons

Junkeng (Oscar) Su: *Development and Implementation of a Gaze-Directed Flight Control System for Fixed-Wing UAVs.* Supervisor: Natalia Kabaliuk

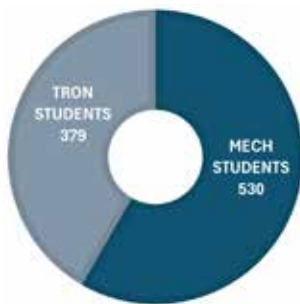
Liam Holliday: *Quantifying potential benefits surrounding the use of Distributed power in New Zealand's Rail Network.* Supervisor: Dirk Pons

Undergraduate students

Mechanical Engineering was once again the most popular discipline across the Faculty of Engineering. Mechanical had 330 total applications as 1st preference and 182 offers were sent to students. The cut off GPA was 6. Mechatronics Engineering kept the same maximum number of students as in 2024; the program had 132 total applications as 1st preference and 135 offers were sent to students. Cut off GPA for Mechatronics was 4. Both programs continue to attract interest from first-year undergraduate students, making entry more competitive every year.

Student Demographics, Distribution of Major and Performance Overview

In 2025, the Department had 530 students enrolled in Mechanical Engineering and 379 students in Mechatronics Engineering across the second to fourth years. Mechanical Engineering continues to account for the larger proportion of enrolments. Overall enrolment numbers remain consistent across both disciplines.



Student enrolment 2nd – 4th year 2025

The distribution of honours among Mechanical and Mechatronics graduates in 2025 is depicted in the figure below. The majority of graduates were awarded Second Class Division I or Division II honours. This is a consistent pattern throughout the years.

Overall enrolment numbers remain consistent across both disciplines.



Honour Split in Graduate Students 2025
(Mechanical and Mechatronics programs)

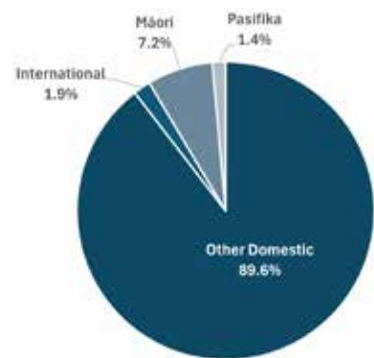
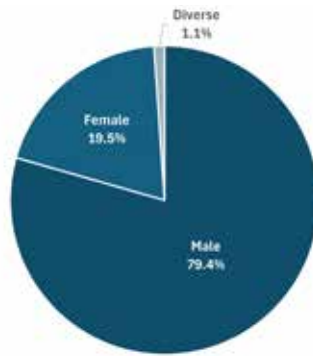
The gender composition of the Mechanical and Mechatronics second to fourth year students comprises of 79.4% male students, 19.5% female students and 1.1% identifying as gender diverse. This is yet another increase in female and gender diverse student numbers in the Mechanical Engineering Department. Initiatives like WiE CAN (an annual five day/four night Women in Engineering residential programme that features interactive workshops, inspiring presentations, and fun social activities), Women and Gender-Diverse Students in Mech Morning Tea and various all-girl school outreach campaigns boost female enrolments in engineering and help move towards closing the profession's gender gap.

At the Department of Mechanical Engineering, in alignment with UC's Tangata Tū, Tangata Ora Strategic





Vision 2020–2030, we are working towards a bicultural campus that fosters ethnic diversity and a sense of belonging for all staff and students. In 2025, 7.2% of Mech and Tron students were Māori, 1.4% Pasifika, and 1.9% were International students. Various scholarships, such as Tū Ātea Scholarship for Māori Engineering Students, Cotter Tait Scholarship for Māori and Pacific Engineering Students, UC Engineering Pacific Scholarship, play a vital role towards increasing these numbers. The department is also working towards the development of online courses, bridging programs and mentoring support for international students.




Gender & Ethnicity Diversity in Mechanical and Mechatronics Engineering (2nd – 4th Year, 2025)



Top: Class of 2025 Mechanical Engineering

Left: Class of 2025 Mechatronics Engineering

A decorative graphic on the left side of the page, consisting of several overlapping, flowing white lines that form a stylized, organic shape, possibly resembling a leaf or a scroll. The lines are thin and elegant, set against a dark grey background.

Teaching and Learning

Teaching and Learning Developments in 2025

Mechanical Engineering

In 2025, 185 students entered the BE(Hons) degree in Mechanical Engineering in their second year, based on first year academic performance. This was the highest ever number of students entering the programme and required changes to our processes and methods in a number of areas. The Department also welcomed one international student in 2025 and had two students take one semester at an exchange university (University of Colorado Boulder) overseas.

The Department offered 15 elective courses for students in their final year of study. Regarding elective courses, the trend over the last few years has been an increase in the numbers in aerospace related electives (ENME404, ENME460 and ENME486) at the expense of thermodynamic related subjects (ENM405, ENME465 and ENGR401). There has been a relatively small decline in the number of students doing materials related electives; no materials electives were offered in 2025.

A start was made to future proof the department in terms of student numbers and intake, as well as curriculum and material taught. A new Masters in Mechanical Engineering Programme is being developed and will be structured to appeal to domestic undergraduate students and post graduate study international students. This programme is expected to be offered from 2027, at which time the current MEngSt (Master of Engineering Studies) will be disestablished.

Following the development of a conjoint degree structure, two conjoint students entered the Department in 2025. The conjoint degree is offered with several other qualifications including Bachelor of Commerce, Bachelor of Health Science, Bachelor of Data Science and Bachelor of Product Design. The uptake in 2026 is expected to be significantly higher than in 2025.

Mechatronics Engineering

The Mechatronics Engineering programme was introduced in 2004 and is shared between the Departments of Mechanical Engineering and Electrical and Computer Engineering. Students studying Mechatronics Engineering take a mix of courses from Mechanical, Electrical and Computer Engineering as well as having dedicated Mechatronics design courses in the second and third years.

The Mechatronics program has continued to remain popular with students and in 2025, 136 students were admitted to the program. Over the past 10 years, the intake has grown steadily from 49 in 2016 to the current levels.

Throughout their undergraduate degree, Mechatronics students participate in a series of hands-on design projects and competitions that strengthen their practical engineering skills. In the second year, students complete the Elevator Cup, developing a control system for a five-floor model elevator using a programmable logic controller, and a line-following robot project that integrates circuit simulation, printed circuit-board design, and fabrication of mechanical parts. In third year, the Robocup competition challenges teams to design and build autonomous robots that navigate an arena and collect weights in head-to-head rounds, applying engineering science to a practical, open-ended problem in a competitive and engaging format. Students also take part in the annual ENCE461 Embedded Systems II Wacky Racers assignment, where teams design, build and program microcontroller-based radio-controlled vehicles operated by head movements, encouraging creativity, technical integration and teamwork.

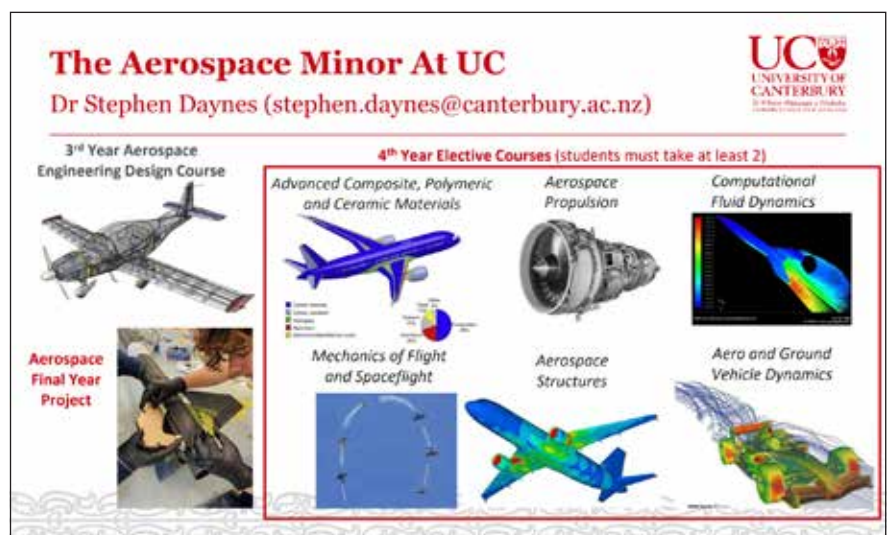
Mentorship & Student Support

The Department and students contributed throughout the year to the strong community. With the student disengagement of the covid years diminishing, and more students present on campus, it was important to create opportunities for students to feel they belong and could contribute to a unique community. The traditional induction that is run at the start of the year for incoming second-year students was expanded to third- and fourth-year students, to provide them with an opportunity to reconnect with their peers and teaching staff. The Mech Mentors program – weekly sessions for second-year students taken by third- and fourth-year students run throughout Semester 1 – provided community and support opportunities. The Study Management group – a weekly meeting for academically at-risk students, run by post graduate students – supported students to improve their study skills and management, resulting in success for all who attended.

Minor in Aerospace Engineering

Aerospace Engineering involves the design, development, testing, and production of aircraft, spacecraft, and related systems and equipment. The Minor in Aerospace Engineering as part of the BE(Hons) Mechanical Engineering degree provides aspiring students an enhanced pathway into the industry by specialisation. UC offers the only undergraduate aerospace degree in Aotearoa.

The Minor aims to educate students on the design, development, and maintenance of flight vehicles, which involves knowledge and



The Aerospace Minor At UC
Dr Stephen Daynes (stephen.daynes@canterbury.ac.nz)

3rd Year Aerospace Engineering Design Course

Aerospace Final Year Project

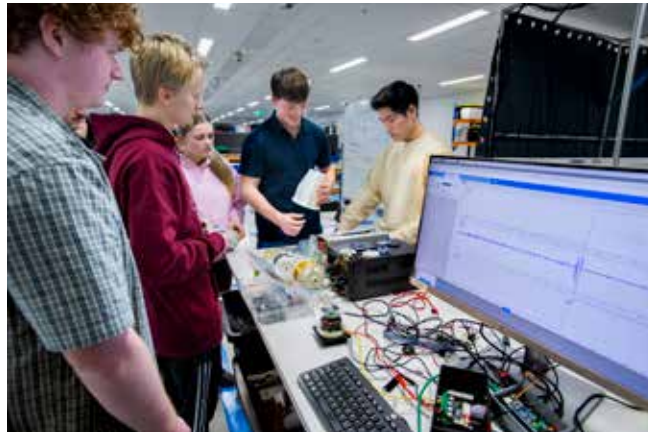
4th Year Elective Courses (students must take at least 2)

- Advanced Composite, Polymeric and Ceramic Materials
- Aerospace Propulsion
- Computational Fluid Dynamics
- Mechanics of Flight and Spaceflight
- Aerospace Structures
- Aero and Ground Vehicle Dynamics

The brochure features several images: a 3D model of an aircraft, a jet engine, a colorful computational fluid dynamics simulation, a student working on a project, a diagram of flight mechanics, a 3D model of an aircraft structure, and a 3D model of a vehicle dynamics simulation.



Winners of the Med Device Cup for 2025



Biomedical Engineering Minor students conducting an experiment

skills in Aerodynamics, Material Science, Computational Simulation, Aerostructure Design, Propulsion, and Flight Control. Students are educated in both established and emerging aerospace technologies and processes in the fields of aerospace design, vehicle structural integrity analysis, subsonic and hypersonic flight dynamics, vehicle guidance and stability techniques, aerospace airframes, and propulsion systems. Students are introduced to the impact of the aerospace industry in New Zealand and worldwide, including contemporary practice.

In 2025, the Aerospace Minor continued to be very popular amongst the students, again reaching the enrolment cap of 40 students, met each year since the Minor's inception four years ago. Highlights this year included guest lectures from Prospero 'Paco' Uybarreta (principal experimental test pilot) and Dr Jonas Aust (Pratt & Whitney propulsion principal engineer). We have again taken the top five students from the ENME362 Aerospace Design course for a flight experience at the Canterbury Recreational Aircraft Club. During the flight experience, students get practical experience of stability and control.

The aerospace electives now on offer are Computational Fluid Dynamics (ENGR 401), Aerodynamics (ENME404), Advanced Composites (ENME417), Aerospace Propulsion (ENME460), Aerospace Structures (ENME486), and Mechanics of Flight and Spaceflight (ENME488).

Minor in Biomedical Engineering

The Minor in Biomedical Engineering continues to attract steady enrolment. The third-year biomedical design course, the first compulsory course in the Minor, consistently enrolls between 35 and 42 students. Across the three years of Mechanical Engineering, this represents more than 100 students engaged in biomedical engineering study.

The compulsory biomedical design course features the Med Device Cup, in which students work in teams of four with a shared external client to develop solutions to a real-world clinical problem. Last year's project was sponsored by Mr Alex Malone, an orthopaedic surgeon seeking an improved method for tightening flex-tape sutures in shoulder resuspension procedures. He was highly impressed by the quality, innovation, and usability of the students' designed, built, and tested tensioning devices.

Another highlight of the design course is a field trip to Enztec, a Christchurch-based orthopaedic instrument design and manufacturing company. Enztec engineers provide students with an overview of the company, followed by a hands-on design challenge drawn directly from their real-world projects, and conclude with a tour of the manufacturing facilities.

Female and gender diverse student participation remains strong, with approximately 40% representation each year. This is reflected not only in course enrolments, but also in the membership of the UC BIOMED student club and in postgraduate study. At the postgraduate level, at least six students from the

programme, the majority of whom are women, are continuing into advanced bioengineering study. Since the introduction of the Minor, female and gender diverse student participation has doubled.

In the past year, the Biomedical Engineering Steering Committee was established, with strong representation and support from industry partners and colleagues across multiple disciplines. The committee has developed plans for new Master of Biomedical Engineering programmes, featuring compulsory coursework in biomechanics, biomaterials, medical device regulatory affairs, and commercialisation and intellectual property, with both taught and thesis-based pathways. It was decided that the taught master's option (without a thesis) will initially be offered as an endorsement within the proposed Master of Mechanical Engineering from 2027. Once enrolments reach sufficient scale, this pathway will transition to a standalone Master of Biomedical Engineering degree. Development of the thesis-based option is ongoing, with a targeted launch in 2028.

A new international initiative is also underway to establish an educational pathway in collaboration with Tonga National University (TNU) and support from the Tonga Ministry of Health. This initiative aims to increase the number of biomedical engineering graduates in Tonga to better support medical equipment in local hospitals. The programme takes a two-pronged approach: first, expanding biomedical-specific certificate programmes at TNU to grow the biomedical technician workforce, and second, creating pathways for Tongan students to study biomedical engineering at UC before returning to TNU to teach and support future generations of students.

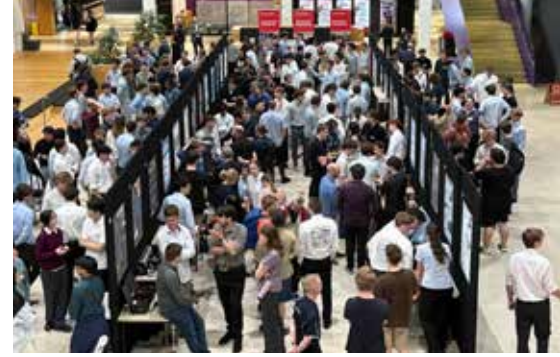
Final-Year Industry & Research Projects

In 2025, students in the Department of Mechanical Engineering completed a total of 48 Final-Year Industry and Research projects. 23 of these projects were sponsored by external organisations and the department is most grateful for the support of these clients across a range of industries including agritech, biomedical, power and marine engineering.

Many projects involved design and build of a prototype device, an automated tree pruner is one example, whilst some focused more on research, such as materials testing and evaluation techniques for manufacturing processes.

15 projects were research projects aligned with interests of department academics, some supported by external grants and many involving collaborations with other departments of the Universities of Canterbury, Otago and Auckland. Several of these projects focused on aerospace with the performance, design and applications of autonomous air vehicles (drones) being a particular theme.

Finally, 10 of our 2025 final year projects were initiated by student-led organisations: the University of Canterbury Aerospace, Motorsport, Human Power, Biomed, Robotics and Sustainable Design Clubs.



Highlights included the UC Motorsport team winning the 2025 Australasian FSAE event in Melbourne and the Human Power club setting an unofficial New Zealand land speed record of 83 km/h.

Many of these clubs received external financial sponsorship and mentoring and we also extend our thanks for this generous support of our students.

M14: Determining Residual Stress in Copper Alloys

OBJECTIVE
Residual stresses are internal forces that remain in a material after being made or shaped. If these stresses are not properly managed, they can cause problems. For example, when a part is machined, the removal of some internal stresses can reduce the dimensions of the part to change. This might push it out of its required tolerances and the part may have to be discarded. Techniques as simple as CO2 lasers may be required, understanding and controlling residual stress is key to keeping the manufacturing process stable and reducing waste. The objective is to determine the best method to measure residual stress in copper alloys. The method will be validated against a known standard.

BLITTING
Creating a slit in a sample allows residual stress to be released. ASTM E1826 measures the change in diameter before and after making the slit. The change in diameter is converted to the released stress. Strain gauges were also used to verify the stress release.

CONTOUR METHOD
The samples were cut along a flat plane to release residual stresses, causing the cut surface to deform. The deformed surface is then measured using a CMM. The results are applied to a model which can predict the residual stress distribution within the sample.

HOLE DRILLING
A small hole is drilled at the centre of a strain gauge. The strain gauge is used to measure the stress release. The hole is drilled using the ASTM E837 method.

X-RAY DIFFRACTION (XRD)
X-rays are directed at the sample at a single angle. The reflected X-rays are calculated and plotted against the angle. The peak position is used to determine the stress in the sample.

CONCLUSION
Using the most precise, straightforward method also cut out any special equipment. Therefore this method could be easily implemented by any future. Results have been validated with stress released control samples.

CLOSED LOOP MECHANICAL VENTILATION PATIENT SPECIFIC ADAPTIVE CARE

OBJECTIVE
The aim is to develop a low-cost, closed-loop ventilator system that can adapt to patient lung mechanics in real time.

BREATH SIMULATION
Using a patient-specific model to simulate the dynamics of the respiratory system and lung mechanics, which can be used to predict the required ventilator settings for a given patient.

CLOSED LOOP
The system uses a closed-loop control strategy to adjust the ventilator settings in real time based on the patient's lung mechanics.

OUTCOMES
The system was able to maintain the target tidal volume and PEEP across a range of patient lung mechanics. The system was able to adapt to changes in lung mechanics in real time.

POWERTRAIN M21 UCM25

OBJECTIVES
M21 has designed, analysed and built the powertrain components for the University of Canterbury Motorsport team's M21 car. The focus is on the following:

- Efficiency
- Reducing performance with light weight penalties
- Creating a robust package

PEDAL AND BRAKES
Fully optimised aluminium pedal assembly

SUSPENSION AND STEERING
Multi-link front and rear suspension system and steering package. Side links optimised to balance ride height and suspension geometry. Heavy-duty rear suspension. High ground clearance of shock and coil-over per wheel. Top view of 1/10 scale.

WHEELS
M21 has three gear wheels with carbon fibre barrels. Split rim for better and easier tyre mounting.

Optimisation of Low-Noise Coaxial Swept UAV Blades

Project Objective
Sweeping coaxial blades was found to reduce noise. However, swept blades have not yet been optimised for performance. The goal of this project was to design swept blades that had a thrust to power ratio similar to that of conventional straight blades.

Design Method
Iteration of chord and pitch added. Optimised with Blade Element Momentum Theory (BEMT). Validated with CFD and experiments.

Aerodynamic Performance
Blades were manufactured out of carbon fibre. Optimised blades had a 22.3% increase in performance compared to the original. Commercial blades had 12.8% more performance than the Optimised Blade.

Acoustic Performance
Commercial Blade: 82.1 dB LAeq. Optimised Swept Blade: 77.7 dB LAeq.

TOTAL ARTIFICIAL HEART

DESIGN
Back-to-back centrifugal blood pumps. Requires a robust DC-link flow meter. Designed for hemodynamic and magnetic signal responses.

CFD SIMULATION
A mesh independency test was used to test the finite element model under physiological conditions. In parallel, CFD simulation was conducted to further analyse and verify performance.

IMPELLER COATING FOR JET CORROSION PERFORMANCE

OBJECTIVE
The objective of this project was to improve the corrosion performance of the impeller coating used in jet engines.

DESIGN METHOD
The impeller coating was designed using a combination of materials and manufacturing techniques.

RESULTS
The impeller coating showed improved corrosion performance compared to the standard coating.



Scan the QR code for more details about the Department of Mechanical Engineering's Final-Year Projects.

Engineering Work Experience at UC 2025 – Mechanical Engineering

Over the 2024/2025 summer approximately 235 Mechanical Engineering students completed part of their required engineering work experience, typically over a 10-week period. This represents the involvement of over 200 different companies and business across the country willingly offering internships in either Practical (Workshop) or Professional work experience. The type of engineering business offering short-term employment includes small rural workshops like Bailey Engineering in Ashburton through to much larger companies, like Buckley System Ltd and F&P Healthcare in Auckland. The nature of these engineering activities canvasses repair and maintenance, casting, sheet metal fabrication, HVAC

design and install and medical devices manufacture, to name but a few. The department is most grateful and acknowledges that without the help of these organisations our students would be less prepared, less competent and confident to contribute to society in their chosen field.

Overwhelmingly, the students report a positive experience and the following testimonies that highlight the learning outcomes that arise:

'By working at ENZTEC I learnt new skills and also built on those I knew already.... I began to understand the content I had learnt during the year in my courses more as I saw the theory that was taught being put into practice in practical setting.'

'I learned valuable machining skills and how to take apart and put back together a tool safely and carefully. However, the most important lesson I learned was to consider the ease of maintenance, repair, and cause of failure and deterioration during the designing process. This mental switch was something I could not have truly grasped without working hands-on in the workshop.'

'Overall, I learned lots and I think that my learnings from my summer at Howick will stay with me throughout my engineering career. I really appreciate being required to complete practical hours as a student studying mechanical engineering. If I become a design engineer I think that my newfound knowledge about how fabrication works and the work which goes into it will

Internal Competitions for Hands-On Learning

Warman competition

Since its establishment in 1988, the Warman Design and Build competition has brought engineering beyond the classroom and into real-world application, enabling students to develop innovative engineering solutions.

This year's challenge (known as Project Seesaw) required teams to design and construct a reduced-scale demonstration system capable of retrieving three model meteorites and safely delivering them to a storage bunker.

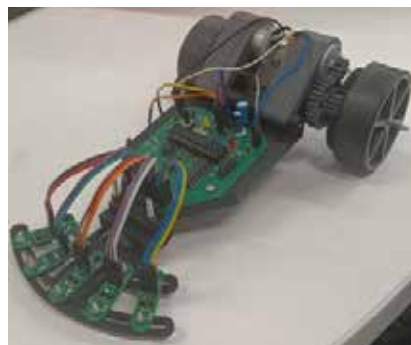
1st Place winners Alexandria Sidwell, Dihan Putter, Daniel Olsen and Eleashah Jackson (Team 1C6) represented UC at the Australasian finals. The team made a perfect second run, but it wasn't enough to earn a place on the podium. The committee praised their simple and elegant design and the team did win the Engineers Australia Best Design award.



Team 1C6 celebrating their successful performance during the Warman finals

Elevator Cup

As part of the ENMT221 course, Mechatronics Engineering students take part in the Elevator Cup and line-following robot projects. The elevator project involves pairs of students developing a control system for a 5-floor model of an elevator implemented on a programmable logic controller. The line following robot is a design and build project developing students' abilities to create a simple, integrated mechatronic system and involves circuit simulation, printed circuit-board design, and the design and fabrication of mechanical parts.



Elevator Cup: One of the line following robots, designed and fabricated by students in ENMT221

Robocup

A major feature of the third-year design course for Mechatronics Engineering students is the Robocup competition. Robocup involves students, in teams of 3, designing and building an autonomous mobile robot that must navigate an arena and collect steel weights. The competition is a dual-elimination format with two robots competing head-to-head in an arena for two-minute rounds, with the winner of each round being the robot that collects the most weight. The project gives students hands-on experience using the engineering science they have learned in other courses to solve a practical, open-ended problem and the competition aspect makes it fun. For the 2025 version, a big congratulations to Cole Stagg, George Johnson, Josh Bergerson for taking out the win. But also, to Caleb Everitt, Jack Chapman and Grant Caughley for making the final rounds and coming a close second. Overall, the class did extremely well in the competition rounds and there were excellent robots developed.



2025 Robocup winning team, from the left: Cole Stagg, George Johnson, Josh Bergerson

help me create things which solve problems in hopefully practical and efficient ways.'

'No two days were the same, and I got to improve on my hand skills every day and learn new processes, as well as using the skills I have learnt so far at university to help the engineers at the sawmill to solve problems and make improvements as required. Every day I used the knowledge that I had learnt in 2024 as a second-year mechanical engineering student in basic mechanical engineering practices. One of the key skills I learnt was how to work efficiently as a team to achieve a task under time pressure to ensure that the mill could start operation on time in the morning.'

'A way it will forever change my perspective on how I conduct my engineering is by focusing on how something is going to be manufactured after it has been designed. Going through the whole design process in my project at Agripower I got to see the raw process of how things are manufactured in a workshop. There are problems that you would never have thought of when you design something that comes through very clearly when you start physically making and putting it together. This helped develop the skills learnt in the design papers in the second year where we had to account for different manufacturing issues in our technical drawings.'

'I also had to engage in many spontaneous workshop tasks for R&D activities. This experience helped me



build confidence in the workshop, which is an area that I personally struggled with due to gender stereotypes of women in a workshop. My coworkers were open-minded and created a supportive atmosphere that allowed me to improve significantly in this area. I learnt that I thoroughly enjoyed using hand tools and machinery, and my initial avoidance to it was only due to my own prejudice.'

Wacky Racers

The annual ENCE461 Embedded Systems II Wacky Racers assignment was held in Rata with forty-five groups of four students competing. For this assignment, students had to race microcontroller-based radio-controlled vehicles that they designed, built, and programmed. To keep things interesting, the students had to control their vehicles by moving their heads and could utilise dastardly features to hinder other vehicles. This year's winners were Shuska: Jed Jager, Zak Lockett, Isaac Siu, Pakin Sothisaovapark.



Dressing up is a big part of the Wacky Racers competition

Mech Tech Challenge 2025

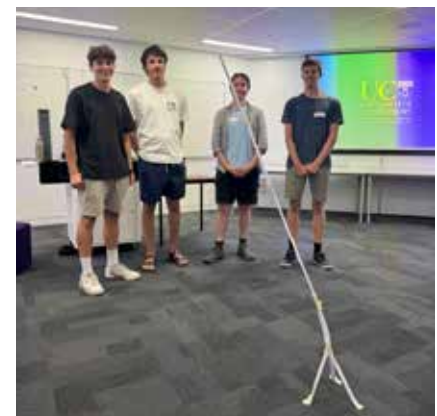
To kick off Term 2 for Mechanical second-year students, Mech Mentors, run by Jordan Hill, Danny Su, and our dedicated team of third- and fourth-year Mech Mentors, hosted the 3rd annual Mech Tech Challenge where second-year Mentor groups challenge each other to build a serviceable chair, built entirely of newspaper and masking tape. The winning teams were proud to display their prototypes and all were rewarded for their efforts with a pizza party, hosted by the department.



Mech Tech Challenge 2025 winning team and their serviceable chair

Third-year design challenge

This year, the Mechanical Engineering Department ran a simple design challenge during the third-year student induction. The purpose of the challenge was to enable students to build whanaungatanga (close connection) within the cohort and hopefully meet someone new. The third-year students were challenged to build the tallest freestanding tower in 12 minutes, given only two pieces of A4 paper and 70cm of masking tape. The winning team managed to make a tower that was 1.52m tall! This is a 20 cm improvement on previous years!



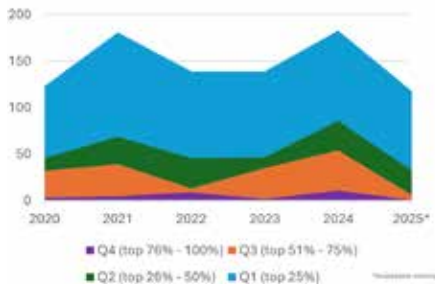
Third-year design challenge winning team with their freestanding tower



Research

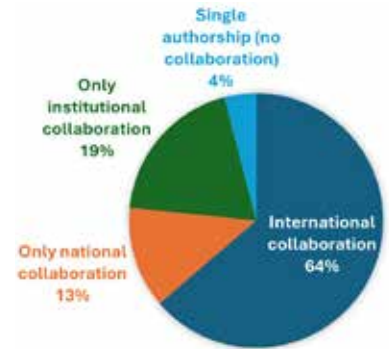
Research Funding and Publications Overview

In 2025, the Department of Mechanical Engineering maintained its long history of research excellence. There were 46 successful grant applications leading to a total research investment of \$4.46 M NZD. Half of this was brought in by the CryoLab, a new research entity operating under the department (see p22).



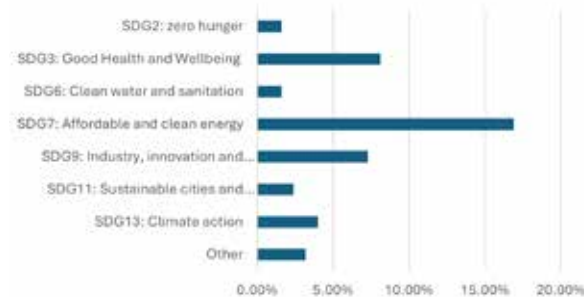
Journal Publications Quartiles

Publications outputs remained solid with a greater proportion in the top quartile of journals. The department has achieved a strong international research impact, as evidenced by the high level of collaboration with global partners. Nearly two-thirds of our research has been conducted in partnership with international researchers. These international linkages ensure that our work has maximum reach and remains informed by emerging research, methodologies, and innovative approaches worldwide.



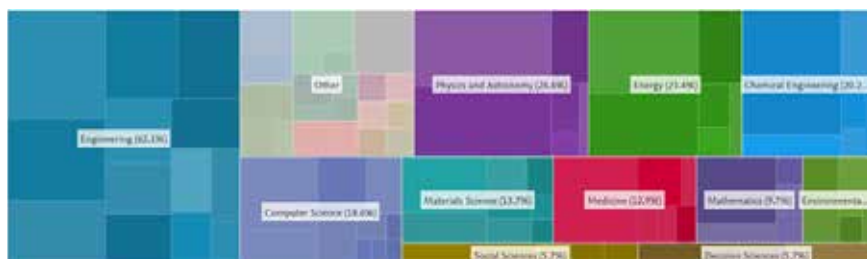
Collaboration Record

The United Nations adopted a series of sustainable development goals (SDGs) to achieve 'Peace and prosperity for all people and the planet'. When mapped against these SDGs, the potential impact of the department's research is distributed as depicted in the graph.



UN Sustainable Development Goals

The breadth of expertise and research interests within the department is reflected in the publication subject tags. A SciVal (Elsevier) infographic of the department's 2025 research tags demonstrates the wide range of areas in which our staff are active.



Diversity of Research Strengths within the Department

The following graphic further breaks down the engineering segment into its contributing subject areas.



Breakdown of Engineering Segment

Patents and Start-ups in 2025

Ongoing successful research streams from Distinguished Professor Chase's group have led to potentially marketable products. Three patents have been granted in 2025 for

- an **actuator for a fluid dispensing apparatus** (Jake Campbell, Geoff Chase, Lui Holder-Pearson, Francis Pooke, Richard Strahan);
- a system and method for **non-invasive determination of arterial and venous oxygen saturations and oxygen extraction** (Jordan Hill, Geoff Chase, Chris Pretty); and
- a device and method for **non-invasive pulmonary function assessment and racking from resting tidal breath data** (Ella Guy, Geoff Chase, Lui Holder-Pearson).

Zuuka was spun out of Distinguished Professor Chase's group in 2025. Zuuka raised a successful pre-seed round in late 2025 and currently employs five people. The technology is built off IP developed within the University of Canterbury that was funded and supported by the National Science Challenge SFTI, KiwiNet and Te Titoki Mataora the Medtech Translator. Zuuka is developing a next-generation drug infusion pump, initially focusing on insulin delivery. The company aims to redefine usability in patch pumps through a novel design featuring exceptionally simple operation, a significantly reduced environmental footprint, and an intuitive app powered by AI and machine learning.

Research Stories of 2025

The New Cryogenics Research Lab

In 2025, the University of Canterbury's Department of Mechanical Engineering, became the new home for the CryoLab research team. CryoLab was previously at Callaghan Innovation and was Aotearoa New Zealand's only research group combining cutting-edge cryogenic refrigeration research and development as well as consulting to industry in cryogenics, fluids and thermodynamics.

The facility will continue to support consulting for industry requirements and now adds research opportunities for master's and PhD students.

"CryoLab represents a powerful opportunity for collaboration between academia and industry," Professor Stefanie Gutschmidt, Head of UC's Mechanical Engineering Department, says. "The expertise of our researchers, combined with strong partnerships across the engineering and aerospace sectors, means we can accelerate innovation in areas that matter for Aotearoa and the world. We're proud to provide a permanent home for this highly specialised capability. Cryogenics is a key enabler for technologies that rely on extremely low

temperatures, including MRI scanners, superconductors, night-vision systems, low-noise sensors, satellites, space telescopes, biological storage, quantum computing and cryogenic fuels such as liquefied natural gas and liquid hydrogen — an emerging sustainable aviation fuel that must also be cooled to temperatures below -250°C ."

Much of this work is made possible by cryocoolers: small-scale mechanical refrigerators that are enabling breakthroughs in aerospace, medical and sensing technologies. CryoLab's flagship research programme focuses on providing cooling for a superconducting motor intended to power electric aircraft. The motor aims to replace conventional jet engines, enabling major efficiency gains while working with liquid hydrogen as a clean fuel. This technology is significant for New Zealand's growing aerospace sector and contributes to global efforts to electrify aviation.

Dr Alan Caughley, a Principal Researcher at CryoLab, says cryogenics underpins the development of other cutting-edge technologies. In the early 2000s, Alan led Christchurch



HoD Prof Dr Stefanie Gutschmidt and UC Principal Researcher Dr Alan Caughley run the cryocooler technology in the new CryoLab.

cryogenics programme developed a mid-sized, mid-temperature cryogenic refrigerator robust enough to operate 24/7 in electrical power environments — technology that is now central to Christchurch-based company Fabrum's cryogenics business. His team later contributed to superconducting motor development for electric aviation.

The new CryoLab at UC allows us to continue this trajectory, advancing the superconducting aircraft motor project and supporting a wide range of consulting work powered by our expertise in fluids, thermodynamics, and modelling.

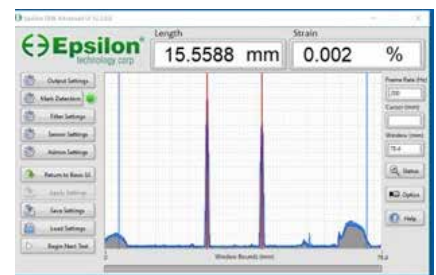
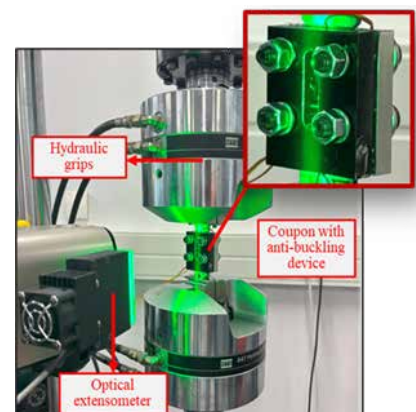
Strain-controlled cyclic testing with variable strain amplitude (BinXu Li)

Stainless steels offer excellent corrosion resistance, superior ductility, and strong energy dissipation capacity, making them highly suitable for seismic applications. Under earthquake loading, structural members undergo cyclic deformation with significant plasticity, and their performance depends critically on the material's cyclic stress-strain behaviour, which differs substantially from the monotonic response. Understanding cyclic hardening and large-strain characteristics is therefore essential for predicting nonlinear behaviour, developing reliable numerical models, and formulating sound seismic design rules for stainless steel structures.

To investigate these hardening characteristics, a series of cyclic-coupon tests were carried out in the Materials Lab of the Mechanical Engineering Department, as part of the project "Structural performance of stainless-steel beams and columns under cyclic loading". Axial coupons from austenitic and duplex stainless

steels, together with S355 carbon steel, were tested under strain-controlled cyclic loading in accordance with ASTM E606 and FEMA-461 using the MTS 810 universal testing system. Specimens were hydraulically gripped and laterally restrained with an anti-buckling device, while strain and elongation were measured using strain gauges and an Epsilon ONE-78PT-200 optical extensometer. Comparisons between monotonic tensile curves and skeleton curves derived from hysteresis loops confirmed significant cyclic hardening of stainless steel.

The resulting experimental data form the basis for developing a reliable cyclic hardening model that can be implemented in finite element analyses of stainless-steel structural components. These analyses, together with structural test results, are expected to support improved design approaches for stainless steel structures under seismic actions, inform future design standards, and provide a robust reference for engineering practice.

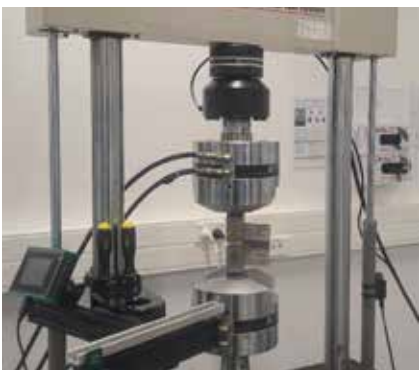


Cyclic coupon test setup

High-cycle fatigue (HCF) of Compact Tension (CT) specimens (Codrut David)

Fatigue cracks in critical infrastructure pose serious safety risks and lead to costly downtime. Conventional manual repairs are often slow and inconsistent, highlighting the need for automated repair solutions of fatigue cracks in structural components. This research focuses on developing and validating laser welding procedures for fatigue crack repair in stainless steel 304/304L components, as part of the PhD project "Automated Repair and Stabilization".

Work was conducted in the Materials Lab of the Mechanical Engineering Department to generate reproducible pre-cracks with minimal plastic zones for subsequent laser-repair trials. The MTS 810 universal testing system enabled high-cycle fatigue (HCF) testing on 4 mm stainless steel 304/304L Compact Tension (CT) specimens in accordance with ASTM E647. Specimens were tested under different controlled load ratios at frequencies up to 90 Hz during approximately 1.5 million cycles, producing reproducible pre-cracks (16–19 mm) and a bank of damage states. The work confirms stable crack growth control at high frequency without overheating or grip slippage and provides consistent inputs for the repair/stabilisation experiments and subsequent S–N and da/dN characterisation.



Test setup and 304/304L Compact Tension (CT) specimen

Performance of composite materials in cryogenic environments (Jared Ng)

Green hydrogen has emerged as a promising pathway for decarbonising hard-to-electrify industries such as heavy transport and aviation. However, its low volumetric energy density presents a major challenge for onboard storage. Liquid hydrogen (LH2) appears the most technologically viable storage solution, with lightweight tanks made possible by advanced materials such as fibre reinforced polymer (FRP) composites. A key limitation is that many existing fibre-resin systems are prone to microcracking at cryogenic temperatures, allowing hydrogen to permeate through the tank wall. Due to the complex behaviour of FRPs at cryogenic temperatures, dedicated low-temperature material testing is essential to understand their performance under service conditions.

Master of Engineering student Jared Ng, supervised by Prof. John Cater and Assoc. Prof. Mark Staiger, and supported by the cryogenic expertise of Dr Alan Caughley, has designed and manufactured a cryogenic mechanical testing system capable of performing tensile and flexural tests at -196°C through immersion in liquid nitrogen (LN2). The LN2 cryostat is compatible with the existing MTS 810 and MTS Criterion universal testing systems in the Department's Materials Lab.

A substantial test campaign, conducted in collaboration with Fabrum, evaluated the cryogenic performance of glass fibre reinforced polymer composites using a new cryogenic extensometer (Epsilon), which enabled precise tensile strain measurements in LN2 conditions. The design and implementation of this system add low-temperature testing capabilities to the Mechanical Engineering Department's Materials Group and will support the development of future lightweight composite LH2 tanks.



Jared Ng and Oscar Torres during the testing

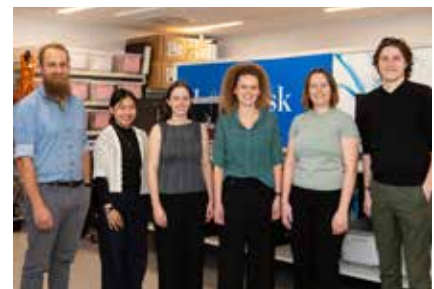
Lung Function Monitoring and Respiratory Mechanics (Dr Ella FS Guy, CMRF Research Fellow)

20% of people in Aotearoa have a respiratory disease and exacerbations of these diseases account for 1 in 11 of our hospital admissions. Yet, lung function monitoring at home is limited and, inequitable, and tools are difficult to use. Dr Guy's research aims to address this by developing solutions for at-home monitoring to enable better management of respiratory diseases, much like how CGM's have improved management of diabetes.

A key problem with current lung function testing is that accurate results require patients to perform maximal breaths. Dr Guy's PhD (2025) developed a method of assessing lung function which is not breath pattern dependent. These methods are currently in feasibility testing at Christchurch Hospital (in collaboration with the Respiratory Testing Lab).

Increased accessible and equitable lung function monitoring provides the data required to develop patient-specific treatment protocols. Thus, the results from pilot testing have enabled further research: assessing the progression of lung scarring and fibrosis, monitoring asthma control and predicting exacerbations, pregnancy-induced respiratory dysfunction, and assessing breathing pattern dysfunction.

The team is now working in our new low-risk Clinical Unit and Biomechanical Engineering lab (CUBE – E116). This lab will be used to pilot and run trials, develop prototypes, conduct bench testing.



Respiratory Research Team at UC: pictured (from left) Dr Lui Holder-Pearson, Chris Huynh, Jaimey Clifton, Dr Ella Guy, Kirsty Hawke, Samuel Hastings

Mitigating Head Impact Accelerations in Youth Rugby (Annette Swale)

Youth rugby continues to face challenges around head impacts and the long-term consequences of repeated head acceleration events. Annette's PhD research investigates how softshell headgear can reduce the severity of these impacts, drawing on a comprehensive review of brain injury mechanisms, existing prevention strategies, and the standards governing protective equipment in rugby. This review informed the development of a new test methodology tailored to the department's droptower rig.

Her experimental research evaluates both linear and rotational

acceleration mitigation using a sensor-instrumented headform, advanced softshell materials, and controlled impact protocols. A key component of the research examines how World Rugby regulations shape current headgear design and identifies small, compliant deviations that could yield meaningful improvements.

Annette has also developed and tested her own softshell headgear prototypes, benchmarking them against leading commercial models such as NPro (Ireland) and Gamebreaker (USA). Her findings contribute to improved understanding of impact dynamics in youth sport and support the development of safer, evidence-based headgear for young athletes.



Annette Swale with softshell headgear that she is testing

High-throughput Alloy Structure-Processing-Properties Characterisation (Finn Birchall)

Many mechanical components are made from wrought alloys, which are plastically deformed to obtain the desired shape. After shaping, a post-deformation heat treatment is typically applied to give the component the required mechanical properties. This occurs through a process known as recrystallisation, where new, strain-free grains nucleate and grow to consume the original work-hardened microstructure. The amount of plastic deformation and time and temperature of annealing all control the resultant microstructure, which in turn affects properties like strength and ductility. These processing-structure-properties relationships are at the heart of materials science and engineering.

PhD student Finn Birchall, working with Professor Catherine Bishop, has developed a novel processing-structure-properties characterisation technique for recrystallisation in wrought alloys. His method improves identification of critical parameters for recrystallisation and accelerates the acquisition of data. He uses a combination of tensile deformation with digital image correlation, scanning electron microscopy techniques for microstructural analysis and hardness measurements. His first paper used the model alloy alpha brass to validate the technique and rapidly identify strain-time-temperature relations for initiation and completion of recrystallisation.

While important, recrystallisation behaviour is not well documented for many workhorse alloys. Incoloy 800H, a high temperature, Fe-Ni-Cr superalloy, is one such material. Recently, Finn has identified critical parameters and changes in recrystallisation mechanism in 800H using his novel high-throughput method. The platform could be used to design protocols for grain boundary engineering, a processing method to obtain beneficial alloy properties through iterative cold work and annealing. The 800H results have implications for applications such as reaction vessels for petrochemical processing, heat exchangers for nuclear energy and high temperature furnace components.

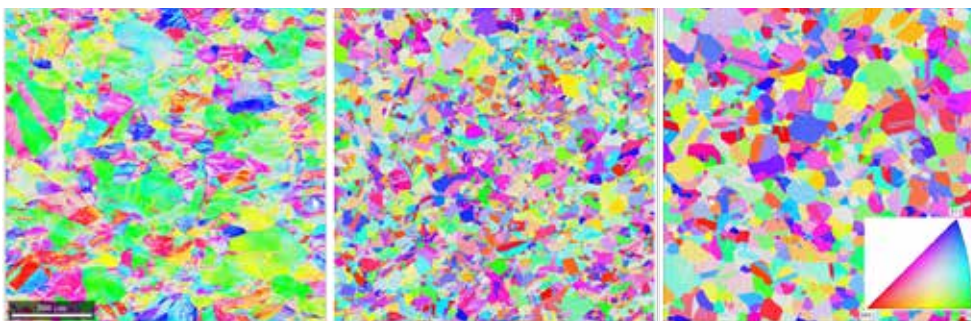


Figure 1 - Inverse pole figure (IPF) maps obtained using electron backscatter diffraction showing 800H microstructure after deformation (left), after annealing at low temperature (middle), and after annealing at high temperature (right). Note the difference in grain size and morphology between the two post-heat treatment microstructures. IPF colour legend for crystallographic orientations is shown in right image.

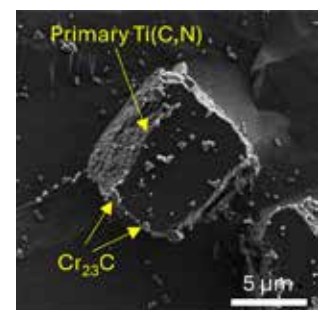


Figure 2 - High-resolution secondary electron image showing extensive chromium carbide precipitation (small, light grey) on a primary titanium carbonitride precipitate (large, dark grey) after heat treatment of 800H.

Understanding the mechanochemical properties of insect eggs using atomic force microscopy (AFM) based techniques (Kshitij Thapa)

The research aims to measure and map the mechanical and chemical properties of the insect eggshell (chorion) at the nanoscale. The AFM-based techniques will examine distinct regions of the chorion across the surface (lateral, anterior and posterior sides) and via cross-sectioning. Attempts will be made to correlate the mechanical properties to local chemical signatures (such as protein cross-linking and lipid interaction) to create mechanistic connections between egg structure and environmental durability. Quantitative nanomechanical mapping modes will be used to measure the stiffness variations across the chorionic layers, while complementary chemical analyses will assess the chemical composition. The project aims to understand how hierarchical layering, chemical heterogeneity, and structural organisation contribute to the mechanical integrity of the egg. The outcomes are expected to provide a conceptual framework for comprehending evolutionary adaptations in egg properties, as well as having potential applications in the biomimetic engineering of new materials.



Bruker Dimension IconIR - Atomic Force Microscope (AFM) used for the research

Novel Wool Protein-polysaccharide Hybrid Materials for Encapsulation and Delivery of Probiotics (Junfeng Wu)

Hydrogels are three-dimensional polymer networks capable of absorbing large amounts of water while maintaining structural integrity. Their excellent biocompatibility and tuneable properties have attracted significant interest in the biomedical field.

Under the supervision of Associate Professor Mark Staiger, PhD student Junfeng Wu has successfully developed a keratin-polysaccharide dual-network hydrogel based on natural biomaterials with excellent mechanical strength. Keratin was efficiently extracted from New Zealand wool fibres, followed by an environmentally friendly green crosslinking strategy and the construction of a cooperative dual-network structure with polysaccharides. This architecture markedly improves the stability and load-bearing capacity of the hydrogel, enabling the material to maintain a continuous and uniform mechanical response even under deformations. Experimental results demonstrate that the composite hydrogel exhibits both elasticity and toughness. It outperforms single-network keratin gels in compression, fracture resistance, and cyclic loading tests, thus overcoming the inherent brittleness and insufficient strength of traditional keratin hydrogels.

With its outstanding biocompatibility, structural tunability, and enhanced robustness, this novel keratin-based hydrogel shows strong potential for a wide range of biomedical applications, including probiotic protection carriers, oral drug delivery, tissue engineering scaffolds, and wound dressing materials. This research not only provides a new strategy for the high-value utilisation of natural protein materials but also highlights the potential of transforming New Zealand wool into advanced biomaterials.

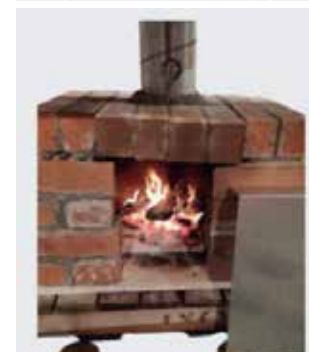


Gel morphology and Texture profile analysis

Seaweed cultivation: a cost-effective strategy for food production in a global catastrophe

A research team including UC Mechanical Engineering Associate Professor David Denkenberger has found that seaweed could provide an affordable and resilient food source following a severe global catastrophe such as nuclear conflict or a major volcanic eruption. Using climate modelling to simulate large amounts of atmospheric particles blocking sunlight, researchers from UC, the Alliance to Feed the Earth in Disasters (ALLFED), and the University of the Philippines Diliman examined conditions similar to a "nuclear winter," where temperatures drop by more than 10°C and conventional agriculture fails.

The study found that seaweed production could be rapidly and cost-effectively scaled to supply up to 25 percent of global food needs at under US\$1 per dry kilogram. Beyond disaster scenarios, increased seaweed farming offers environmental benefits, as it requires no land, freshwater or agricultural chemicals, can reduce methane emissions when fed to cattle, and helps store carbon. The research has been published in *Aquaculture International*.



Seaweed dryer engineered and constructed by ICoS student Simon Charman

A decorative graphic on the left side of the page, consisting of several overlapping, flowing white lines that form a stylized, organic shape, possibly resembling a leaf or a scroll. The lines are thin and elegant, set against a solid grey background.

Community Engagement

Publicity & Outreach

In 2025 the Publicity & Outreach team was chaired and led by Dr George Stilwell, with Owen Kelly leading all technical aspects and Greta Rapalaviciute managing and overseeing all administrative tasks. Furthermore, 4th-year student Petra Edgar and 3rd-year student Vidha Saeed were key team leaders and primary communicators, helping to organise and guide volunteers for our on-campus outreach events in 2025. Members from UCM, UC Aerospace and UC Biomed were key in enabling off campus school visits in collaboration with Children's University. The entire outreach team included 26 dedicated members representing a broad diversity of skills, programmes, genders and levels of experience. The team supported the department, faculty and university in many regular events as well as new initiatives and one-off flagship activities. Throughout the year, whether at UC-Central-led events such as UC Welcome Day, UC Discovery Day, International Famil, and UC Open Day, or when hosting Children's University and school groups, we consistently delivered fully booked information sessions and lab tours and attracted enthusiastic visitors. We thank all of those who were involved with helping with the department outreach activities.



Lab tour during UC Open Day

UC Open Day

UC Open Day was a major highlight for everyone involved, with a record number of registrations and an impressive attendance of approximately 4,500 people on campus during the day. Two parallel sessions were completed to give over 650 prospective students all of the key information they need to pursue engineering in future years. A one-off session was also held to give prospective students more information about the Aerospace and Biomedical minors offered in the department. Our student-led professional clubs UC MECHSoc, UC TronSoc, UC Motorsport, UC Aerospace, UC Human Powered, UC Bio Medical and UC Flight were amazing on Open Day letting students know all about what their clubs do!

Children's University – Club-led School Visits

This year, the Te Mātāpuna Mātātahi | Children's University Team have been working alongside the student-led professional clubs to deliver awesome outreach experiences to five schools in the Canterbury region (Waltham School, Te Kāpehu Riccarton School, Te Manu Tukutuku South Hornby School, Te Kura o Matarangi - Northcote School and Ngutuawa School).

The University of Canterbury Aerospace Team gave tamariki a hands-on look into the world of rocketry and aerospace.



UC Aerospace, BioMed and Motorsport club members helping kids with their tasks

After learning about real-world achievements in the field, they built and launched their own rockets—some soaring over 30 metres into the air before returning to earth, parachutes and all. An unforgettable experience that brought science and engineering to life.

The University of Canterbury Motorsport Team ran an engaging session where tamariki raced remote-controlled cars around a custom-built track. They also had the chance to build their own race cars, learning what goes into designing and refining a working vehicle. It was a hands-on experience that highlighted the value of problem-solving, persistence, and learning through trial and error.

The University of Canterbury BioMed Team introduced tamariki to real-world biomedical engineering with 3D-printed mechanical hand parts. The kids took on the challenge of assembling the hands themselves, using rubber bands and precise instructions. It was a practical, hands-on session that got them thinking, problem-solving, and building like real engineers.

Feedback was that the kids absolutely loved all of the sessions the clubs delivered! We hope to be able to run these sessions again next year.





George testing the strength of the earthquake tower

Children's University – Campus Visit

The Children's University Campus Experience occurred on the 26th and 27th of June. In total, four sessions with ~56 children aged 7-12 were completed. Pupils completed engineering activities including building earthquake towers, and catapults and learning about the wind tunnel.

Included below are some quotes from students who were part of the sessions:

"I loved building the towers in the engineering activity"

"My favourite activity was building Towers and then using an earthquake simulator"

"I loved the engineering activity"

EPro8

The department supported the EPro8 Grand Finals hosted by Holmes Solutions. We're proud to support STEM in schools. The future looks bright! Each year the secondary school students up their game, and it's amazing to watch them complete the challenges. Kelvin - the brains behind EPro8 - comes up with incredible challenges. This year, the challenges included replicating a scene from Indiana Jones, launching Thunderbird 2, building a Delorian, and making a JAWS shark!

If you want more info about EPro8 and how your school can get involved, check out their website: <https://epro8challenge.co.nz/> Many of the students were already looking forward to heading to UC to do a degree in engineering in the future.



EPro8 Grand Finals



Mechanical Engineering Industry Advisory Board chair Andrew Lamb giving an opening speech

Industry Connect

In 2025, the inaugural "Engineering Industry Connect" was held on the 1st of October in the Rātā Building. The event brought together practicing engineers, students, and UC staff to build connection and explore possible opportunities for collaboration in the future. For students, the event was an opportunity to network with engineers working in the mechanical, mechatronics, aerospace, and biomedical spaces. It is also an opportunity to talk to academics about possible research projects as well as fellow students who are at different stages of their degree. For the practicing engineers in industry, the event was an opportunity to meet students and share perspectives of working as an engineer, and to give advice to the next generation of engineers.

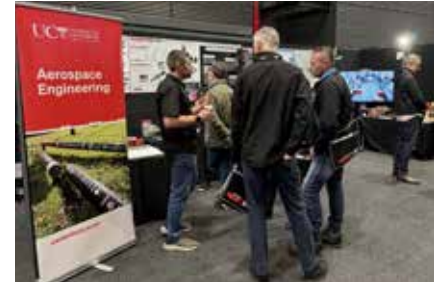
Thanks to all who attended. We are looking forward to running the event again next year!

Math199 Experience Workshop

Similar to previous years, Math199 students completed a workshop which involved programming artificial "fingers" to play a song on the keyboard. The workshop went great; all of the outreach team were absolutely exceptional on the day! Although a few microcontrollers didn't make it through the workshop, the participating students learned a lot from the experience!

SouthMACH

The department hosted a stall at the SouthMACH. SouthMACH is the South Island's leading industry trade event, spotlighting the latest developments in manufacturing, engineering and technology. Over the two days many useful conversations with engineering companies and prospective students were had.



Mechanical Engineering stand at SouthMACH

The department stall showcased a range of student-led club and research projects. Dr George Stilwell was part of the SouthMACH Seminar Series and completed a presentation which showcased current research projects that are using additive manufacturing to create innovative engineering design solutions. Overall, the event was a success, with 2025 being the biggest SouthMACH yet (visitor attendance increase of 22%)! We look forward to having an exhibition at the next event.

UC Engineering Challenge

On Saturday 23 August, the inaugural nationwide "UC Engineering Challenge" was hosted by UC's student-led club TronSoc with a cash prize of \$3000! The challenge required teams of high school students to come up with a solution for an open-ended engineering problem that required interdisciplinary thinking. From Auckland to Invercargill, a total of 320 students participated across all teams competing in the challenge. Throughout the competition, numerous students learned to use university-level tools such as LaTeX, Fusion360, Blender, and Figma. Students found the challenge both engaging and educational, describing it as "a really fun day" with an "interesting problem to solve". The club hopes to run the challenge again next year.

Teams from the following schools took out each of the prizes for the challenge.

UC Engineering Prize for 1st Place:
St Dominic's Catholic College

Holmes Solutions Prize for 2nd Place:
King's High School

Technology Education New Zealand Prize for Judges' Choice: Rangī Ruru Girls' High School



Example of brainstorming completed by students



UC Students and Tonga technicians carrying out repairs on donated equipment



Tonga Biomedical Outreach Programme 2025-26

The Tonga Biomedical Outreach Programme has now completed its third year and continues to go from strength to strength. This year, eight students were selected from a competitive pool of 40 applicants to participate in the ten-week programme.

Tonga, like many Pacific Island nations, relies heavily on donated medical equipment. These donations arrive from around the world, often in shipping containers, and frequently include equipment that is outdated, expired, or in need of repair. In many cases, user manuals are unavailable and there is no access to technical support. As a result, the Tonga Ministry of Health biomedical technician team faces an overwhelming task: unloading the containers, assessing each item, carrying out repairs where possible, and registering usable equipment into the national asset management system.

During the first six weeks of the programme, students undertook training at UC through a combination of lectures and hands-on laboratory workshops, supported by numerous guest lecturers as well as staff at the CDHB. This was followed by four weeks in Tonga after the mid-year holidays.

The UC Mechanical and Mechatronics team travels to Tonga to assist with these challenges, providing not only additional capacity for large-scale tasks but also delivering applied research projects aimed at improving the quality of healthcare in Tonga. This year's projects included refurbishing electric hospital beds and autoclaves for sterilisation, supplying low-cost 3D-printed otoscopes to improve hearing diagnostics, and assessing and repairing more than a dozen ventilators that had been donated new but had never functioned.

While in Tonga, participating staff (Associate Professor Debbie Munro, electronics technician Julian Phillips,

and Dr Isabel Andrade) also delivered educational content to upskill local technicians in the design, maintenance, and repair of complex medical equipment.

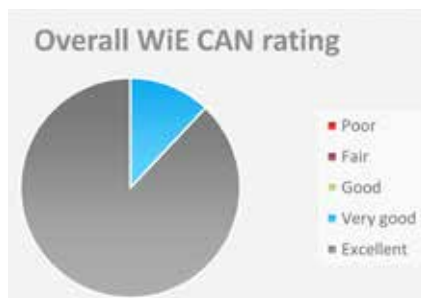
This programme would not be possible without the generous support of numerous donors, including the Tait Contel Charitable Trust, which covered all operational expenses, as well as the PAGE Fund and the Hales Mechanical Engineering Fund.

WiE CAN

This year, UC welcomed 60 Year 13 students from across Aotearoa to the University of Canterbury for five days of immersive, hands-on engineering experiences. The students stayed in the UC halls and participated in nine engaging workshops, alongside social events, presentations and team challenges designed to give them a real taste of what it's like to study engineering. The programme was



One of the WiE CAN workshops



Goal: 90% attendees rate WiE CAN as very good/excellent Result: 100% attendees rate WiE CAN as very good/excellent. Highest result we have had. Nobody rated it poor, fair or good

supported by 10 incredible Residential Assistants who are current women engineering students whose passion, leadership, and positivity made a lasting impact on the group. Seeing current students thrive in engineering is one of the most powerful influences for these young women. We thank Tait Communications and the Tait Foundation, who fully fund this initiative and make the opportunity possible for the students who attend.

One participant commented "WiE CAN was a really positive experience that helped build my confidence and interest in engineering. Thank you to everyone involved for creating such a supportive and enjoyable environment. I usually feel a bit intimidated by maths and engineering, but WiE CAN made it fun and approachable. It gave me confidence to think about doing engineering at the University of Canterbury in the future."

Mech Seminars

We had a wonderfully broad coloured spectrum of Mech Seminars in 2025, covering topics from bio-inspired propulsion and forensic tissue mechanics, all the way to AI ethics in justice systems, rare earth metal production, UAV rotor design, and residential energy equity. Our invited speakers joined us from several different countries, and the postgraduate series showcased the depth and diversity of research happening right here in our own department. Across the year, talks drew strong and consistent audiences, a testament to the genuine curiosity and collegiality within our community. We look forward to continuing our department seminars next year!

Social Media

In 2025, the UC Mechanical Engineering LinkedIn page published 30 original posts, generating over 90,000 impressions and growing its audience from 755 followers in January to 1,262 by December, a 67% year-on-year increase. Content focused on postgraduate completions, student achievements, industry engagement and outreach activities, with consistently strong engagement throughout the year. Interestingly, last year our most successful post was the post about the Mech Connect Annual Report. If you see the post for this year's Annual Report, please feel free to share it with your connections!



Follow us on LinkedIn by scanning the QR code.



Achievements & Awards

2025 Templin Scroll Competition

The Templin Scroll is a prestigious academic competition held annually by ENSOC. The competition was established by John Templin to encourage engineers to master the art of communicating their ideas with clarity and impact.

The Winner of the Templin Scroll for best written and presented paper has been awarded to Mechanical Engineering student Charlotte MacFarquhar for her paper, "Sit-To-Stand Fall Prevention in Older Adults."

The Templin Prize for best written paper has been awarded to another of our students, Hasidu Wanniarachchi for his paper, "Feasibility Study on a 500kV AC for South Island Transmission Backbone."



NVI finalists (from the left): Assoc. Prof Matthew Cowan, Fred Pankhurst, Dr Tim Giffney, Lydia Burnett, Samuel Taylor, Will Maxted and Eve Hudson

ENVI awards

Lydia Burnett, Eve Hudson, Will Maxted, Fred Pankhurst and Samuel Taylor, a group of final-year Mechanical and Mechatronics Engineering students, have been named finalists for the Student Engineer Award in the 2025 Engineering New Zealand ENVI Awards for their animatronic kōkako project. The Student Engineer Award was awarded to another outstanding UC Engineering graduate, Finn Trass from the Chemical Process and Engineering Department.



ENVI finalists' poster 'The South Island Kakako Animatronic Model'

Mech PG Recognition Event

In early December, the Mechanical Engineering Department held the first ever edition of the Research Student Recognition Event. Developed in tandem by the post-graduate director and post-graduate representatives, this event aims to recognise and award post-graduate students (both recently graduated and present) for their achievements and leadership in the fields of Teaching, Research, and Service. With this successful first edition, the department means to establish this initiative on an annual basis.

This year's awards went to Nicholas Lam, Baxter Kamana-Williams, and Pavithran Devananthan for their outstanding efforts in Teaching, Research, and Service, respectively.



PG Award winners (from the left): Nicholas Lam (Teaching), Baxter Kamana-Williams (Research), and Pavithran Devananthan (Service)



UCM Team in the Formula SAE Australasia competition.

UC Motorsport – 2025 Formula SAE Australasia EV Champions

UC Motorsport delivered its strongest performance to date at the 2025 Formula SAE Australasia competition, securing 1st place overall in the Electric Vehicle (EV) category. This result marks the team's second overall victory, following its first win in 2023.

Across the competition, the team competed in a full suite of static and dynamic events assessing engineering design quality, manufacturing execution, vehicle performance, efficiency, and reliability. UC Motorsport achieved multiple podium finishes and demonstrated a consistently competitive and well-rounded vehicle throughout the event.

Notably, the team recorded its first dynamic event victory since 2016,

winning the Skid Pad and setting the fastest lap time of the competition in Autocross. These results highlight the performance capability of the car and the effectiveness of the team's design, development, and testing programme.

The standard of the vehicle was also recognised by competition officials, with the Formula SAE commentator describing it as the best finished car seen across more than two decades of Formula SAE Australasia competition.

Heart Hackathon competition in Vienna

UC Biomed team represented New Zealand at the 2025 Heart Hackathon finals, hosted in Vienna, Austria, showcasing the novel pump design and commercialisation strategy. Although the team didn't win, students came home proud of how they presented their work. They learnt a great deal from the other teams and the academics along with ideas for the next year.



Pump design presented at 2025 Heart Hackathon finals

Te Titoki Mataora (TTM) Healthtech Week Awards

PhD students Jordan Hill and Jaimey Clifton won the Research Exchange Pitch competition and a \$20,000 TTM RAP Stage 1 grant for work on Positive Airway Pressure (PAP) to treat Obstructive Sleep Apnea (OSA) in Pregnancy (no acronym). This prestigious award recognizes exceptional research projects that address major healthcare challenges, demonstrate innovation, and show strong potential for real-world application or commercialisation.

Post Doc Ella Guy was 3rd in the ECR 3 min pitch competition for her work on A home-based "breathalyser" for managing chronic respiratory diseases.



Research Exchange Pitch competition grant winners Jaimey Clifton and Jordan Hill

UCSA Student Choice Awards

Since 1995, the UCSA Student Choice Awards (formerly Staff of the Year Awards) have given students the opportunity to nominate staff members who have gone above and beyond and made a real difference. This encompasses lecturers, supervisors, administrators, and other non-academic staff members on campus. This year's winner from the Faculty of Engineering was recent Mechanical Engineering postgraduate Dr Nicholas Lam.



Nicholas Lam with his trophy



Dr Ella Guy with prototype device

Marsden Fast Start Funding Success

Classification of lung disease using normal breathing data through an at-home device to support patient decision making and disease management

Dr Guy was awarded a 2025 Marsden Fast-Start Grant which will support her research and collaboration with Christchurch Hospital. The grant will enable prototype development towards a patient operated tool to be used independently in home settings. A well as allowing for progression of clinical testing from the feasibility stage to targeted recruitment trials and longitudinal testing. The grant will also fund an engineering PhD student and a clinical Masters student.

UC Teaching Excellence Award

UC Teaching Awards recognise excellence in undergraduate and graduate teaching. The three award categories are: Teaching Excellence Award, Outstanding Teaching and Learning Transformation Award and Hapori Community of Practice Award. We are very proud of this year's Teaching Excellence Award winner, Debbie Munro.



Congratulations moment (from the left): Stefanie Gutschmidt, Debbie Munro, Saurabh Sinha

The Acoustic Society of New Zealand awards

PhD student Xinyu Zhao (Supervised by Prof Dan Zhao) has been recently awarded the Best Student Prize by the Acoustical Society of New Zealand for his original research on thermoacoustic instability published on Physics of Fluids.

From the Workshop to the Operating Room—Bridging Mechanical and Biomedical Engineering



For UC Mechanical Engineering student Liam Bately, a recent internship in France provided an invaluable opportunity to apply his skills in a real-world medical setting. As a student pursuing the Biomedical Engineering Minor, Liam was eager to explore how mechanical engineering principles contribute to healthcare innovation. So, he spent 2024 researching and making connections to align the stars and make this a reality.

Hosted in Paris and Saint-Étienne, his internship took him into the heart of medical research and clinical practice. He spent time observing orthopaedic surgeries, where he witnessed the practical application of surgical instruments—tools similar to those he had fabricated during his previous practical internship at Enztec in Christchurch.

“It was incredible to see the full loop—fabricating and assembling surgical instruments, then watching them in action in the hands of skilled surgeons,” Liam shared. “So many incredible people with so much knowledge and experience to learn from.”

Beyond the operating room, Liam worked on hands-on experimental research, including:

- Measuring increased pressure in superior intervertebral discs caused by various spinal instruments.
- Studying tribological interactions between PEEK and titanium prosthetics to understand wear and material performance.
- Analysing patient-reported outcomes to assess the impact of orthopaedic procedures on quality of life.

This experience reinforced Liam’s passion for developing patient-focused solutions in biomedical engineering. He gained insight into how engineering innovations translate into clinical practice, further strengthening his interest in medical device development.

As Liam continues his studies at UC, he hopes to inspire more students to explore the Biomedical Engineering Minor—a pathway that bridges mechanical engineering expertise with cutting-edge healthcare applications.

Liam’s journey is a testament to the diverse career opportunities available to mechanical engineering students, and we look forward to seeing where his passion for biomedical innovation takes him next!



Liam had an opportunity to observe orthopaedic surgeries, analyse patient-reported outcomes, and conduct hands-on experiments

Bio-X International Summer Leadership Academy



Bio-X International Summer Leadership Academy participants

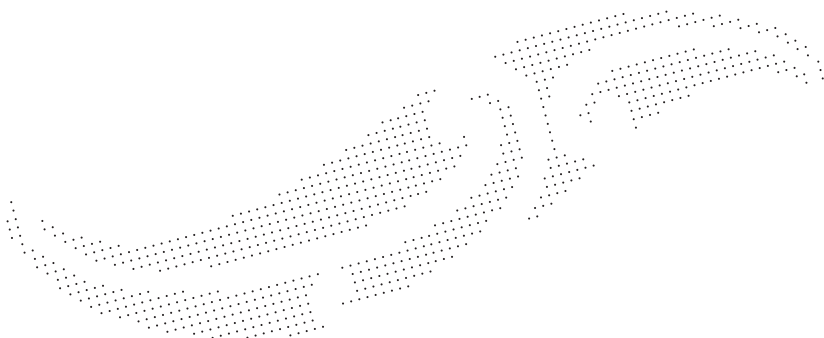
Mechanical Engineering PhD students Samantha Couper and Jessica Sewell (supervised by Dist. Prof Geoff Chase), were the only participants from New Zealand at the Bio-X International Summer Leadership Academy, held in late May on the Greek island of Rhodes. The programme, which focused on AI in Healthcare, Medicine, and Biology, offered a week of inspiring lectures, international networking, and knowledge exchange with top researchers and peers from around the globe.

UC student Robbie White continues impressive road tri ascent with Osaka top 10

Mechanical Engineering student Robbie White has claimed his maiden continental top-10, topping the Kiwi results at Asia Triathlon Cup Osaka Castle with 8th in the Japan sprint.



White crossing the line at Triathlon Cup Osaka Castle



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Student-Led Clubs & Social Activities

Student-Led Clubs



UC Aerospace rocket launch



UCM team at 2025 launch night

UC Aerospace

2025 was another successful year for UC Aerospace, with plenty of progress both on the ground and in the workshop. One of the biggest achievements came from our hybrid engine team, who built and test-fired our first full-scale hybrid motor. The engine hit 2 kN of thrust and wrapped up the year in great shape, ready for next year's students to pick up and refine as we work toward a SRAD entry at the 2027 Spaceport America Cup. Our rocket-powered plane project, Huia, also moved forward, with most of the main systems close to testing and integration.

Our Level 1 program continued to be one of the club's biggest activities, with more than 100 students launching their 1/4-scale Patriots during the annual launch weekend. Tāwhaki oversaw this year's flights at Kaitorete, giving us a valuable connection to their facilities for future launches. At the same time, members working toward Level 2 certification kept developing their rockets, aiming to fly them at National Launch Day in 2026.

Although membership dipped slightly from previous years, involvement across projects, workshops, and events stayed high. We also kept growing our outreach, working with Children's University to bring Hot Rockets to schools across Christchurch.

Heading into 2026, we're gearing up for AURC, continuing development of both Huia and the hybrid engine through new final-year teams, and strengthening our ties with Tāwhaki, NZRA, and the wider community

UC Motorsport

The University of Canterbury Motorsport (UC Motorsport) club provides students with the opportunity to design, build, and compete with a full electric race car as part of the international Formula SAE Australasia competition. The club serves engineering students across multiple year levels, offering hands-on experience that complements academic study through real-world design, manufacturing, testing, and project management.

In 2025, UC Motorsport had its strongest year to date, highlighted by winning 1st place overall in the Electric Vehicle category at the Formula SAE Australasia competition in Melbourne. This marked the team's second overall victory, following its first win in 2023. Across the competition, the team achieved multiple podium finishes, recorded its first dynamic event win since 2016, and set the fastest lap time of the event in Autocross. These results reflected a near-complete redesign of the car and a year of intensive engineering work across mechanical, electrical, and manufacturing disciplines.

Beyond competition, community engagement was a key focus throughout the year. UC Motorsport continued its Formula RC programme, which introduces younger students to engineering through hands-on, accessible projects and provides an early pathway into the club. The team also participated in Children's University, travelling to primary

schools across Christchurch to deliver interactive workshops where students assembled and drove simplified Formula RC cars while learning basic engineering principles.

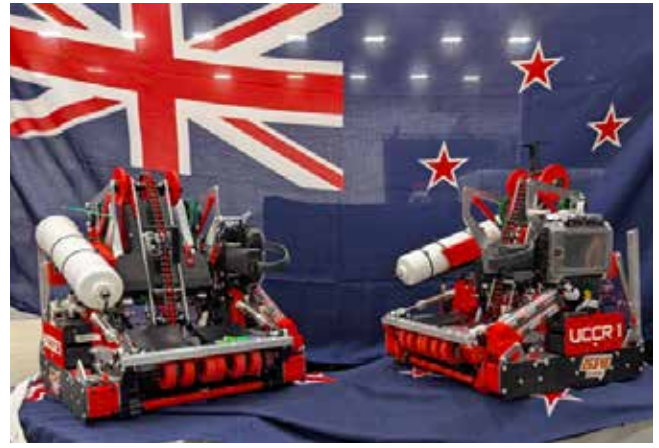
High school outreach remained an important part of the club's activities, with UC Motorsport attending the St Andrew's College Engineering Evening alongside industry organisations such as HamiltonJet and Air New Zealand. The team also engaged with the wider community by attending public events including the Ayrburn Classic, Twin Rivers Motoring Extravaganza and the SouthMach Expo, helping to promote engineering and student innovation to a broad audience.

Internal engagement and skill development were supported through technical workshops such as composite learning sessions, giving members hands-on experience with carbon fibre manufacturing, alongside regular social activities that helped maintain a strong and inclusive club culture.

UCM's 2025 season reflects the commitment and teamwork of its members, and the strength of a club built around hands-on learning and shared ownership. The team is looking ahead to the coming year with a focus on consolidating its success, continuing to grow student involvement and delivering meaningful engineering experiences both on and off the track.



UCHP Team with their brand-new recumbent streamliner, 'Mako'



UCCR 1 Robots at VEXU World Championship in Dallas, Texas.

UC Human Powered

2025 marked a landmark year for the UC Human Powered Club, highlighted by the successful design, construction, and record-breaking performance of a brand-new recumbent streamliner, 'Mako'. Developed from initial concept through to final testing by a dedicated team of 11 fourth-year engineering students, the vehicle achieved an incredible top speed of 82.6 km/h, breaking the New Zealand human-powered land speed record.

The streamliner featured a tricycle design for stability and a window vision system for simplicity, allowing the rider clear forward visibility while maintaining full aerodynamic enclosure. The project demanded close collaboration across mechanical design, manufacturing, aerodynamics, and systems integration, providing students with a true end-to-end engineering experience. From early CAD modelling through to construction and testing, the team demonstrated exceptional commitment and technical capability.

The project also created valuable opportunities for younger students within the club, who assisted with manufacturing and testing. This involvement helped ensure knowledge was passed forward to future project teams.

Building on the success of this year's achievement, the project will continue into 2026 with a new cohort of students developing the next evolution of the vehicle. With ambitions set firmly on surpassing the long-term Project100 goal of 100 km/h, the incoming team aims to push the boundaries of human-powered vehicle performance even further.



Weekly flying session at Ilam Fields

UC Flight

UC Flight is a diverse group of students with a shared interest in things that fly, ranging from quadcopters and remote-controlled (RC) planes to microlights and other manned aircraft. In 2025, we focused on growing the club by flying weekly out on Ilam Fields and developing a program for teaching new club members how to fly our planes. These events, alongside big turnouts on the UCSA Club Days, have helped to grow our membership to 95 members in only our second year. We also designed and flew an initial prototype of a custom RC plane known as Kereru. We have made an effort to be sustainable, choosing to use old real estate signs as the primary building material for the aircraft we construct. UC Flight has also

had the chance to make connections with the local industry, and we were able to take club members to visit the facilities at ENI Manufacturing and Kea Aerospace. In 2026, UC Flight plans to continue organising visits to aviation organisations as well as beginning work on a new engineering project and continuing to fly on Ilam Fields every week.

UC Robotics

UC Robotics (UCR) focuses on providing students with opportunities in robotics which they may not usually have access to. This includes the VEX Robotics Competition, Combat Robotics, and various smaller robotics-related events that we have hosted throughout 2025, as well as the new events we will be hosting in 2026.

We started this year successfully with two teams competing at national championships, UCCR1 achieved both Tournament Champion and Robot Skills Challenge Champion in the VEXU High Stakes New Zealand National Competition. Following Nationals, UCCR1 went on to compete and represent New Zealand and the University of Canterbury at the VEXU World Championship in Dallas, Texas.

UCR has an exciting year planned for 2026, starting the year with two teams competing at the national level to qualify for the next VEXU World Championship. In semester 1, UCR will be running robotics challenges and introducing robotics-themed meets. We are also increasing our outreach efforts with programs tailored to get high school students interested in engineering through events with a focus on demystifying robotics.

UC BioMed

Events, Projects and Growth:

In 2025, UC BioMed has run one of its most active and engaged years yet. The club hosted a range of successful events, including multiple BBQs, industry nights, and a final-year project presentation evening, providing members with valuable opportunities to connect, learn, and showcase their work. Several recurring projects also ran throughout the year, including the Heart Hackathon sessions and HACKberry workshops, which provided students with practical learning opportunities through hands-on engineering work.

The club has also experienced significant growth this year, with membership numbers increasing by 70% compared to 2023. Member engagement has been fantastic, with strong attendance at events and increased involvement in club projects.

Heart Hackathon

UC BioMed has continued its support of the Heart Hackathon FYP team, tasked with designing and developing a total artificial heart capable of supporting human life. This problem combines aspects of hydraulics, magnetics, electronics, biomaterials, and more to address one of the deadliest issues facing New Zealand: heart disease. With combined efforts from the club, a novel pump was developed, along with an IP strategy, and a pathway for US commercialisation. The team represented New Zealand at the 2025 Heart Hackathon finals, hosted in Vienna, Austria, showcasing the novel pump design and commercialisation strategy.

Club members have also been involved in the project, contributing their time and skills to support the FYP team. One team developed a commercialisation strategy, detailing costs of development, novel IP claims, and market strategy. Another team utilised a custom-built mock circulatory loop to assess how the pump performs under various physiological conditions. The extra effort provided by the club members has been invaluable in making the total artificial heart a realistic product.



FYP Team working on Heart Hackathon design (FYP Presentation Day)

HACKberry Prosthetics

The HACKberry hand is an open-source, 3D-printed prosthetic arm design, created using simple electronics to create a functional and low-cost hand and forearm prosthetic. It is designed to be simple and accessible, offering a cost-effective solution for those in need. To assemble a HACKberry arm, the HACKberry control board is soldered and fitted into a fully 3D printed arm after it is assembled. Motors are fitted into the 3D-printed housing to create a fully functioning arm.

At UC BioMed, we ran workshops where club members learnt to slice and print the HACKberry CAD models and worked in teams to solder the control board. These sessions provided students with hands-on experience in both the fabrication and electronics aspects of prosthetic development.

Looking ahead to 2026, we plan to refine the design with a focus on enhancing the mechanical components of the arms, thereby providing members with deeper biomedical design skills and practical project experience.

Children's University Workshop Collaboration

In collaboration with the Children's University, UC BioMed hosted a prosthetic arms workshop at Ngutuawa School for a group of 10 tamariki aged 7 to 14. The club utilised an open-source prosthetic arm design from e-NABLE, a global organisation with volunteers who provide prosthetic devices to children and adults in need. These designs were printed and organised in individual kits for the children to assemble.

This hands-on workshop fostered an environment for curiosity and creative thinking. The kids constructed and



UC Biomed club member helping kids to build a prosthetic arm

tested their own prosthetic arms, which they could take home as tangible reminders of what they learned. By answering questions as broad as 'What is engineering?', UC BioMed introduced the young minds to the impactful field of engineering and healthcare technologies.

With unwavering enthusiasm and engagement, it was inspiring to watch the children's interest in applied technology grow throughout the session. UC BioMed is proud to support initiatives that encourage young learners to engage in biomedical engineering and innovation.

Tonga Biomedical Service Trip

UC BioMed has completed three service trips to Tonga (2019, 2024, and 2025), sending student teams and academic supervisors to repair and maintain vital hospital equipment. Our mission is to collaborate with local communities to enhance Tongan healthcare through practical biomedical solutions, education, and sustainable practices.

During the 2025 trip, the team worked closely with hospital technicians and clinical staff to repair hospital beds, restore essential sterilisation infrastructure, and assess long-term equipment reliability. A strong emphasis was placed on knowledge transfer, with students delivering hands-on training, developing clear maintenance documentation, and designing solutions that could be locally supported beyond the duration of the trip.

The trip focuses on creating lasting impact through both technical improvements and capacity building, reinforcing our commitment to collaborative, sustainable healthcare development in the Pacific. By prioritising co-design, adaptability to local constraints, and long-term usability, UC BioMed continues to ensure that each service trip strengthens local capability rather than creating reliance on external support.



UC Biomed team in Tonga

UC Sustainable Design Society (SUSD)

For the Sustainable Design Society, 2025 has been a year of connection and networking. In the past our activities revolved around the US Department of Energy Buildings NEXT student design competition, the Solar Decathlon. With this being cancelled for this year, we had the opportunity to focus on a wider range of social events to connect our members with each other and with industry experts.

The connection-building has been a major highlight, with our industry nights enabling our members to gain insights into the processes behind New Zealand's industry leaders in sustainable development. This also gave them an opportunity to learn about internships their business of choice is putting forward and start building connections for when they are looking for their dream role. This year, we have had the honour to host businesses such as Slowjam, a solar energy company developing a new solar farm near Christchurch Airport, and Fabrum, industry leaders in hydrogen innovation and cryogenics. Our members really enjoyed these, and it was great watching students start building connections with industry experts.

Though it hasn't all been serious business. Our Pizza in the Garden social brought students together in the campus community garden for food, fun, and brainstorming. From that event came a wave of fresh ideas, and the new Exec have been hard at work laying the foundation to bring these ideas to life. This includes series such as hands-on workshops and mini design competitions for the club's future. They will be for anyone looking to flex their creativity, sharpen DIY skills, and shape sustainable solutions for tomorrow. We're excited to bring these to life, continue fostering industry connections and helping to build our member's skills for the sustainable design industry.

TronSoc – UC Mechatronics Society

Introducing the University of Canterbury Mechatronics Society, aka TronSoc.

Having only been established in 2020, our club has grown rapidly from 50-odd members to over 300 this year! Our focus remains the same: to create a supportive and engaging community for students interested in mechatronics, and to offer academic, professional, and social opportunities.



TronSoc team during a friendly football game against the MECHSoc team

The inaugural UC Engineering Challenge is a nationwide event that introduced mechatronics-style problem solving to high-school students. We engaged with 320 students from nearly 70 schools, giving them the chance to take on an open-ended engineering problem. The event was a rewarding experience for our committee and a great way to help secondary school students explore mechatronics engineering skills. This year's problem tasked students to 'Design a full-scale home surveillance system.' We'd like to thank UC Engineering's Outreach team for their amazing support, alongside Holmes, TENZ, and Fisher & Paykel Appliances for partnering with us for the event.

We also pioneered several other initiatives. The Internships 101 workshop tackled a common pain point for many students by providing experience-informed advice on CVs, applications, and interviews. The workshop was extended into two industry nights, featuring companies like Holmes, Enztec, HamiltonJet, and Dawn Aerospace. The Mechatronics Mentors program built on this by providing close-quarters support on internship advice and other topics our 2nd-year students were curious about. Finally, in partnership with Entre and the Engineering clubs, we hosted the inaugural Presentation Competition featuring participants from across the disciplines.

It wouldn't truly be TronSoc without a few fun social events sprinkled in: the intense Mechanical vs. Mechatronics football match refereed by both Geoff Chase and Stephanie Gutschmidt ended in a draw after penalties. Our post-Robocup Beers 'n' Bowls event had our third-year students let off some steam after a treacherous few all-nighters in the Tron Lab. We then capped the year off with a Secret Garden ball, in collaboration with MECHSoc and CivNatSoc, an unforgettable night with amazing food, drinks and live music.

Overall, 2025 has been a year that has built some great momentum. We were nominated for four Supreme Clubs



MECHSoc at Clubs Day

Awards and took home the title of 'Best Sustainability Initiative' for our UC Funkit and free-range allen keys drive. We managed to do all this on an operations budget of less than \$500, and we're extremely proud of it. We're super excited to continue this growth next year with even more opportunities (and budget), so keep your eyes and ears out!

MECHSoc — UC Mechanical Engineering Society

Who we are

MECHSoc is the student-led home of Mechanical Engineering at the University of Canterbury. We exist to help Mech students thrive academically, professionally, and socially, through creating a tight, supportive community and a clear bridge between classroom learning and real-world engineering.

2025 in review

This year we focused on three pillars: connection, capability, and career. We kicked off with strong first-year onboarding and cross-year mixers to make the department feel smaller and more connected.

On the professional side, MECHSoc hosted industry evenings and Q&A panels with graduates and practising engineers across product design, manufacturing, energy, and consulting. These events demystified pathways from second year to final-year projects and into that first role, with plenty of candid advice on CVs, interviews, and how to get the most from internships. We complemented these with skills workshops of short, hands-on sessions on topics like CAD habits, prototyping basics, data handling, and communicating technical work keeping everything practical and immediately useful.

Community remained at the heart of the society. Social events such as barbecues, quiz nights, friendly competitions, and joint gatherings with other engineering clubs kept momentum high and gave students

space to reset between deadlines. Behind the scenes, we strengthened our committee processes so events stayed consistent, inclusive, and easy to jump into as a volunteer.

What's next

In 2026 we'll scale what worked: more structured mentoring, tighter study support around peak assessment windows, and an expanded line-up of employer touchpoints (site visits, guest talks, and project showcases).

If you're keen to get involved whether as a participant, mentor, or event helper MECHSoc is a great place to grow your skills, meet good people, and make your time in Mechanical Engineering more rewarding.

Social Activities

Table Tennis Tournament

Another year, another table tennis tournament held to bring people in the department closer together. Thirteen teams made up of people of different genders, skill levels, and occupations went toe to toe, not just for the glory and the fame, but also for the friendships and teamwork fostered along the way (but mostly for the glory and the fame).

Congratulations to the champions, Jinshen Tong and Xinyu Zhao, and to the runners-up, Lev Chernyshev and Zhiwei Liu, for their strong effort in the final match.



George & Phil vs Alex & Stefanie

MECHSoc vs TRONSoc football match

One Saturday afternoon, students and staff from the Departments of Mechanical and Electrical Engineering came together for the inaugural MECHSoc vs TronSoc football match, held at Ilam Fields. The event drew strong participation, with over 50 players across both teams and was well supported by a large crowd of spectators. Several academic staff members contributed by volunteering as referees.



TronSoc Team after winning the trophy

The match was played over 60 minutes and concluded in a draw, even after a penalty shootout, reflecting the evenly matched and good-spirited nature of the game. The event struck a balance between healthy competition and community engagement, with a focus on promoting student wellbeing and interdepartmental connection.

Following the match, participants and supporters enjoyed a catered post-game meal from Bacon Bros, with bacon butties proving a popular highlight and providing a relaxed setting for socialising.

This football match marks the beginning of what is intended to become a lasting tradition, celebrating collegiality, active participation, and a strong sense of community within the College of Engineering.

PG Seminars

In 2025, the post-graduate representatives, in tandem with the Mechanical Engineering Department, organised seven post-graduate seminars, where 14 students (Masters, PhDs and even fourth-year ICoS students) had the opportunity to introduce their research topics to their peers, promoting discussion and collaboration among students and staff alike.

Women and Gender-Diverse Students in Mech Morning Tea

MechSoc hosted a Women and Gender-Diverse Students in Mech Morning Tea, bringing together undergraduate and postgraduate students for an open and supportive conversation. Attendees heard from lecturers and postgrad students who shared their experiences of being women and gender-diverse in mechanical engineering. The event had a light-hearted, welcoming atmosphere that fostered genuine connection and a strong sense of community among participants, and included a Q and A session with our own Head of Department, Stefanie Gutschmidt.



Women and Gender-Diverse Students shared their experiences with Mech Eng HoD Stefanie Gutschmidt

Watch this space

25th Australasian Fluid Mechanics Conference (AFMC), 7–11 December 2026 hosted at UC

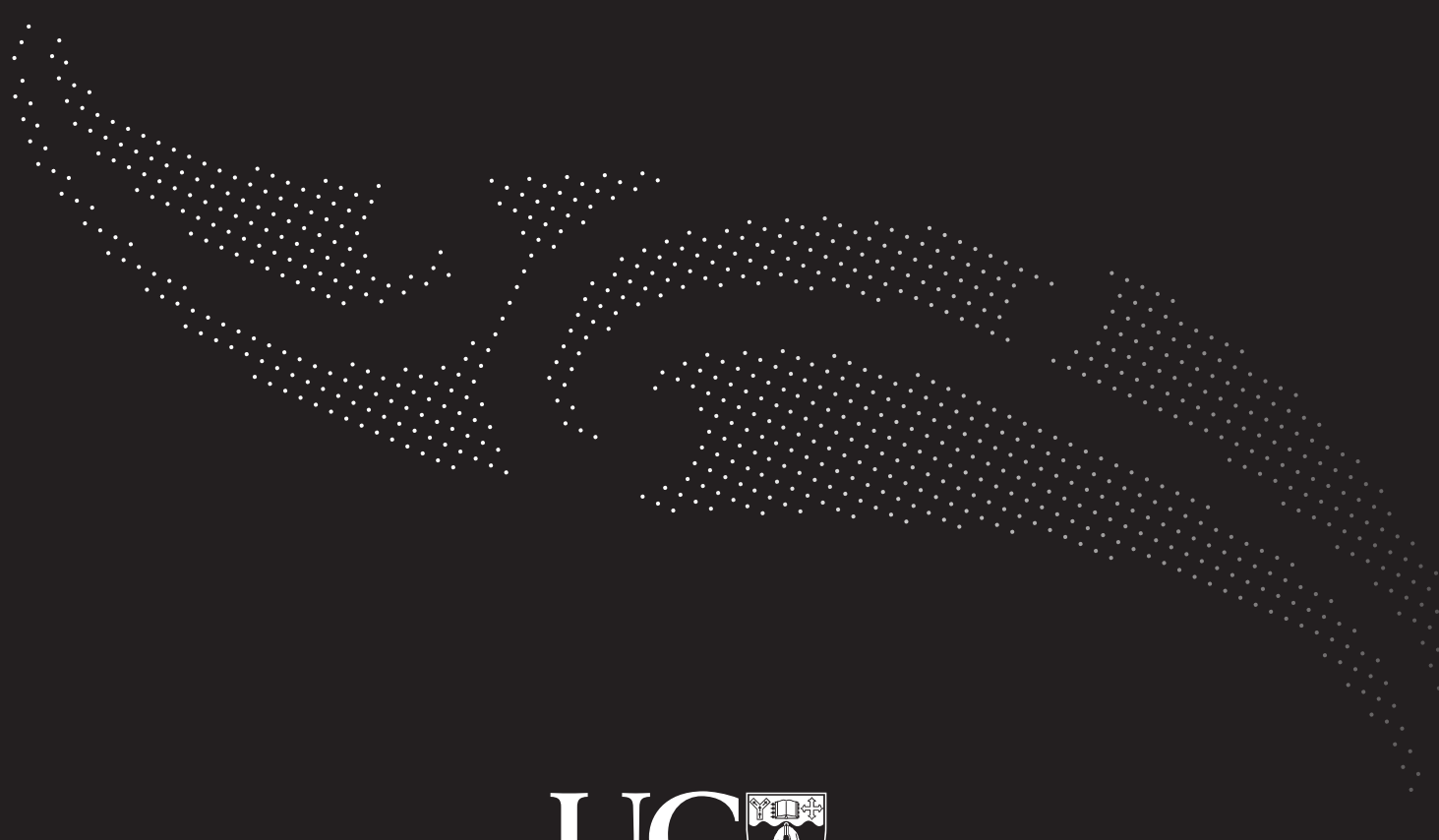
In 1974, the University of Canterbury hosted the 5th AFMC. More than 50 years later, we once again have the privilege of welcoming the fluid mechanics research community to New Zealand. A large number of experts from around the world will come together to discuss the frontiers of research across the broad field of fluid mechanics, spanning topics such as sports aerodynamics, granular flow, rheology, microfluidics, and atmospheric science, to name just a few.

Please scan QR code for more details.



140th Anniversary of the Faculty of Engineering

In May 2027, UC School of Engineering, established in 1887, will be celebrating 140 years of engineering education, research, and innovation, marking a significant milestone in NZ's oldest tertiary engineering institution. More details to come!



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CANTERBURY**
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND