Faculty of Engineering and Design
Summer Research Scholarships

2026/2027 Projects (Mechanical and Mechatronics Engineering)

Project code	ENG010
Project title	**Scaling Up Plasma-Assisted Polymer Processing for Recycling**
Discipline	Mechanical and Mechatronics Engineering
Supervisor(s)	Johan Verbeek, Jesna Ashraf
Contact details	johan.verbeek@auckland.ac.nz
Skills Needed	• Student from Mechanical or Chemical and Materials Engineering or possibly Chemistry programme

Project description Can recycled plastic be turned into strong, useful products instead of low-value waste? This project tackles that challenge using plasma, an energized gas, inside a plastic extruder, the machine that melts and mixes polymers. The goal is to improve mixed plastic waste, such as nylon with polyethylene or polypropylene, which is usually weak and hard to reuse. The exciting part is scaling this up from the lab to industry. At larger production rates, the machine, screw design, and plasma settings may behave very differently. The student will help investigate how processing speed, screw configuration, and plasma power affect performance. This will involve simple modelling, experiments, and close work with industry partners. The outcome will be practical design rules for scaling up this technology, helping create stronger recycled plastic products and supporting a more circular, sustainable manufacturing system.

Project code	ENG011
Project title	**From Plastic Waste to High-Performance Materials: Plasma Power in Action**
Discipline	Mechanical and Mechatronics Engineering
Supervisor(s)	Johan Verbeek, Jesna Ashraf
Contact details	johan.verbeek@auckland.ac.nz
Skills Needed	• Student from Mechanical or Chemical and Materials Engineering or possibly Chemistry programme

Project description (Max. 200 words)
This project focuses on turning low-value plastic waste into high-performance engineering materials using plasma, an energised gas that can modify surfaces without harsh chemicals. You will explore how simple, sustainable additives such as salt water, citric acid , and alcohols influence plasma behaviour and activate plastics during processing. These changes directly affect how plastics perform in real applications, including improved bonding, coating, printing, and compatibility with other materials. Using practical measurement techniques, you will analyse how the plasma treatment alters the chemistry and behaviour of recycled polymers. You will then connect these changes to performance outcomes, such as flow during manufacturing, adhesion strength, and suitability for advanced applications like composites. The project is strongly application-driven, with a clear focus on enabling a circular economy by upgrading waste plastics into higher-value products. It offers hands-on experience at the intersection of materials engineering and real-world manufacturing challenges.

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2026/2027 Projects (Mechanical and Mechatronics Engineering)

Project code	ENG012
Project title	**Learning to hear: improving second language listening through adaptive, gamified training**
Discipline	Mechanical and Mechatronics Engineering
Supervisor(s)	Justine Hui
Contact details	justine.hui@auckland.ac.nz
Skills Needed	• Some programming experience, an interest in building apps and linguistics. • No prior knowledge in phonetics needed, just motivation to learn.

Project description (Max. 200 words)

As anyone who has tried to learn a new language knows, understanding unfamiliar speech sounds can be challenging, especially when those sounds don't exist in your first language. One reason is that learners need to figure out which differences in speech matter and which can be ignored. For example, different people sound different even when saying the same word, and learners must learn to look past those differences.

In this project, you will design and build a mobile app that gamifies how we learn to listen to a new language. You will develop a data-driven system that tracks which voices a learner has heard and ensures they are exposed to a wide range early in training, rather than relying on random presentation. You will then test this idea by designing an experiment and collecting data, with the potential to write up your findings for a conference paper.

Faculty of Engineering and Design
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2026/2027 Projects (Mechanical and Mechatronics Engineering)

Project code	ENG013
Project title	**Carbon Fibre Thermoplastic Tape based Composites; Tape Development and Inline Quality Assessment**
Discipline	Mechanical and Mechatronics Engineering
Supervisor(s)	Prof. Simon Bickerton, Dr Nicola Shepherd
Contact details	s.bickerton@auckland.ac.nz
Skills Needed	• Interest in mechanics of materials, sustainable manufacturing, and sustainable materials' solutions • Interet in combining hands-on experimental lab work with digital data processing and computation • Some experience working with data in MatLab, Python, or similar would be vauable but is not required • Some experience working with digital sensors/actuators would be valuable but is not required

Project description (Max. 200 words)

Fibre reinforced thermoplastic composites are increasingly being applied in place of thermoset based composites, due to their greater recyclability and improved mechanical performance in several key areas. A large team at the Centre for Advanced Materials Manufacturing and Design has developed a continuous melt-impregnation process to create continuous fibre reinforced thermoplastic tapes, which can be used as feedstock for a range of automated composite manufacturing processes such as Automated Fibre Placement (AFP). New methods are required to continuously monitor the tape quality during manufacture, considering parameters such as the tape width, thickness, fibre volume fraction, or void content. The student will work with Dr Shepherd alongside the PhD and Master's students in the team to develop methods to measure key tape properties during manufacture. This will involve working with the melt-impregnation system to produce thermoplastic tape, using advanced sensing techniques such as InfraRed thermography and digital image processing to gather real-time data about tape quality, then processing and validating this data through offline mechanical testing and inspection. With this work, the team will be able to progress towards developing more consistent, high-quality thermoplastic tape for a range of sustainable composite applications.

Images for project ENG013:

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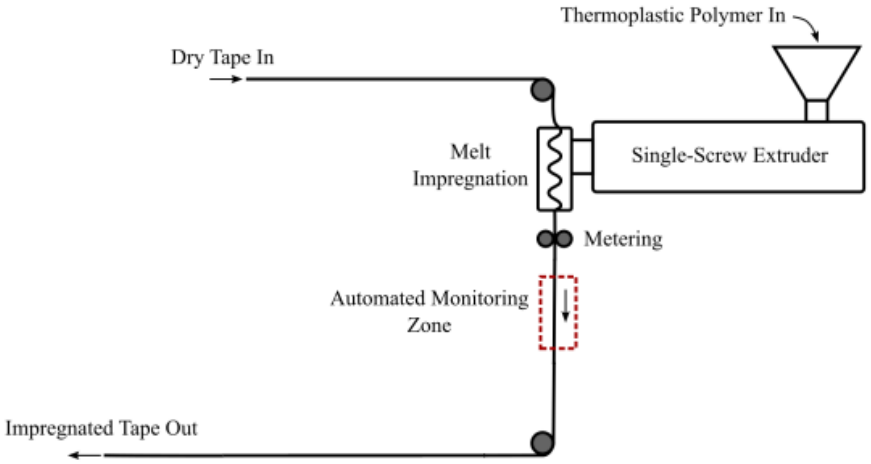
2026/2027 Projects (Mechanical and Mechatronics Engineering)



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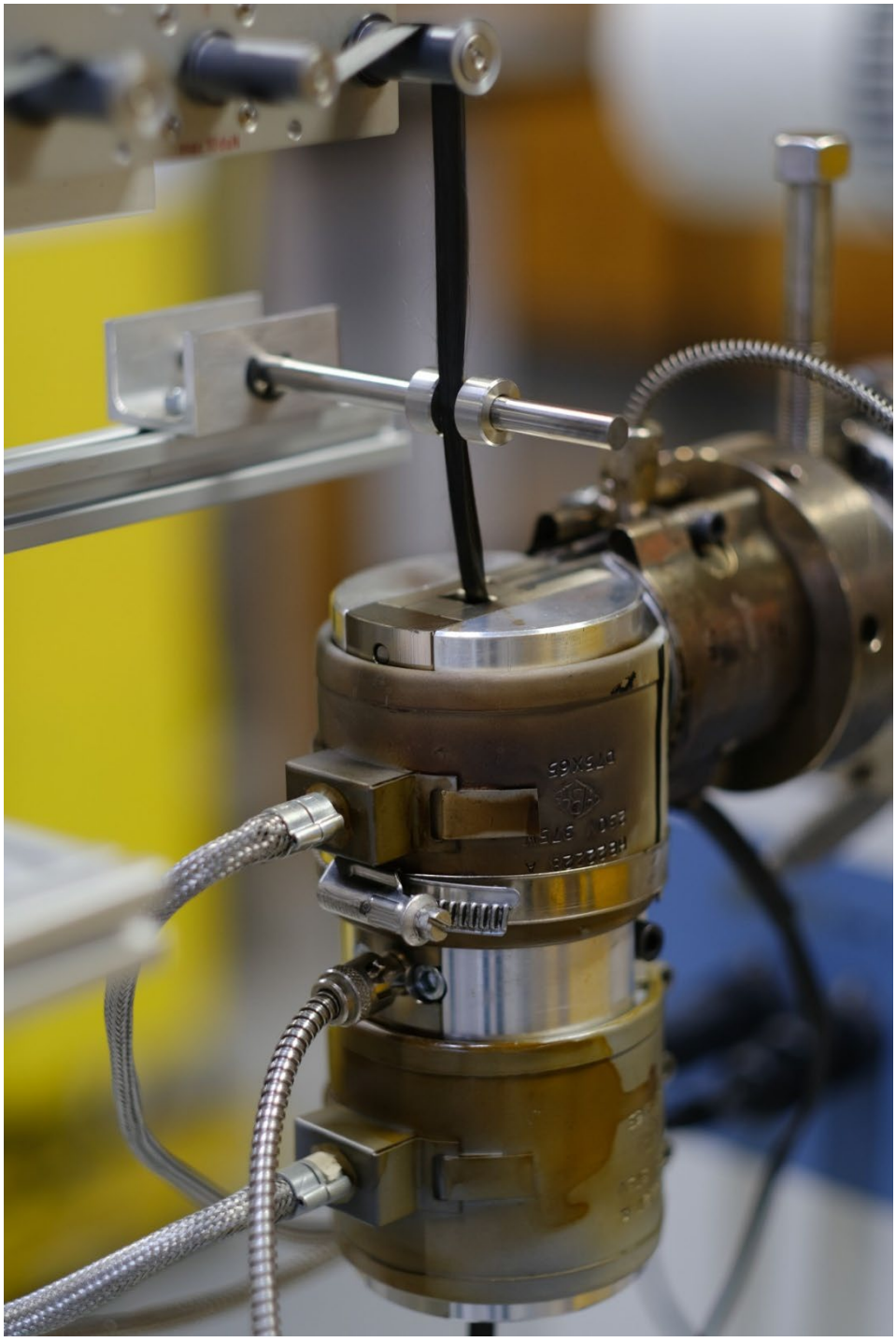
2026/2027 Projects (Mechanical and Mechatronics Engineering)



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2026/2027 Projects (Mechanical and Mechatronics Engineering)

Project code	ENG014
Project title	**Breaking the human-power watercraft record**
Discipline	Mechanical and Mechatronics Engineering
Supervisor(s)	Connor Pearson, Nicholas Aubin
Contact details	connor.pearson@auckland.ac.nz
Skills Needed	• Good proactive and engaged mindset, along with any 3 out of: • Mechanical design • Project management • Drivetrain design • Fluid mechanics • Structural design

Project description (Max. 200 words)

Human powered watercraft cover a wide range of designs. They include rowing and paddling crafts, pedalled powered variations with or without propellers and lately foil pumping propulsion has appeared on the leisure market. More exotic concepts such as hydrofoiling bikes have managed to establish speed records for this human powered watercraft category. The maximum speed record was established in 1991 by a MIT team led by Mark Drela, being slightly faster than 18knots. The project aims at breaking the maximum speed and endurance distance records using the engineering advancements in the fields of fluid dynamics, materials, sport and athletes physiology over the past three decades. Some of the latest advancements in cycling and foiling yacht technology could be leveraged to reach this goal. Such a challenge requires a multidisciplinary approach with in-depth optimisation.

This project will see you researching and developing new technologies and designs to make an attempt at the human-power watercraft record. This may involve the development of a lightweight hull system, development of a biomechanically efficient drivetrain, or evaluation and selection of a hydro- or aero-driven propulsion system. This offers a great chance for ownership and selection of your own direction. The main requirement is a proactive, curious, engaged and driven mindset, willing to explore a topic of thier choice, so long as it relates to the development of a human-powered water speed craft.

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2026/2027 Projects (Mechanical and Mechatronics Engineering)

Project code	ENG015
Project title	**Structural Optimisation of High-Performance Racing Yachts**
Discipline	Mechanical and Mechatronics Engineering
Supervisor(s)	Connor Pearson Tom Allen
Contact details	connor.pearson@auckland.ac.nz
Skills Needed	• Good understanding of structural FEA analysis • Python scripting • Composite manufacturing techniques • No prior experience in sailing is required

Project description (Max. 200 words)

The hull structures of high-performance America's Cup racing yachts are constructed from Stringer-Stiffened Composite Panels (SSCPs), which undergo significant water impacts and slamming while underway. Current design practises for these structures are simplified and out-dated, leading to the use of potentially sub-optimal designs and structures. Significant improvements to performance can be made by designing and optimising these structures for load cases that more accurately represent the true slamming event.

This project will see you developing an optimisation scheme which incorporates the physics of slamming, construction of a representative SSCP, and water impact testing using the University's unique slam testing system. Students will develop a strong understanding of composite materials, high-performance structural design, and complex experimental instrumentation and testing methods.

Faculty of Engineering and Design
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2026/2027 Projects (Mechanical and Mechatronics Engineering)

Project code	ENG016
Project title	**Wearable sensor and AI integration for post surgery digital twin**
Discipline	Mechanical and Mechatronics Engineering
Supervisor(s)	Andrew McDaid
Contact details	andrew.mcdaid@auckland.ac.nz
Skills Needed	• Software and AI

Project description (Max. 200 words)

This project will integrate Apple Health and Google Health into an AI-based app for remote healthcare monitoring of patients. The data will then be streamed in real-time to update digital twin representations of patients so the AI can understand how a patient is progressing after surgery. Data visualisation of the digital twin will alos be explored. The system will be deployed into a real software platform and tested before releasing to real patients.

Project code	ENG017
Project title	**Medical device for spinal stretching and strengthening**
Discipline	Mechanical and Mechatronics Engineering
Supervisor(s)	Andrew McDaid
Contact details	andrew.mcdaid@auckland.ac.nz
Skills Needed	• Mechanical design and build

Project description (Max. 200 words)

This project will support the development of a new medical device to help patients stretch and strengthen their spine in order to reduce back pain and posture issues and fowrad head postion which is cuased by prolonged computer and phone use. The device is purely mechanical mechanism based (i.e. not powered) and has multiple features includign height adjustability as well as configurations for both stretching and strengthening. A feature will alos be added to measure and track progression of improvement.

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2026/2027 Projects (Mechanical and Mechatronics Engineering)

Project code	ENG018
Project title	**Implementation and validation of an S-band satellite link capability**
Discipline	Mechanical and Mechatronics Engineering
Supervisor(s)	Ben Taylor, Vernon Lewis
Contact details	benjamin.taylor@auckland.ac.nz
Skills Needed	• Practical hands-on • Knowledge of radio and electronics

Project description (Max. 200 words)

The student will design, develop and implement an S-band RF capability to be installed at the Ardmore field station including antenna construction, link budget calculations, equipment testing, system check out and validation with the TPA-1 CubeSat currently in orbit. the student will work in the space institute labs, inclusing fabrication and assembly facility and mission operations, as well as supervised field work at Ardmore.

Project code	ENG019
Project title	**Optimizing Team Project Structure Based on Literature and Learning Objectives**
Discipline	Mechanical and Mechatronics Engineering
Supervisor(s)	Stephen Kavermann, Mark Jeunnette
Contact details	stephen.kavermann@auckland.ac.nz
Skills Needed	• Academic literature research • Interview skills • Thoughtful consideration of your own design courses

Project description (Max. 200 words)

Team projects in engineering education are essential to preparing graduates to work in industry settings. Their implementation, however, is often drive more by logistical constraints than considered educational pedagogy. This projects explores the current engineering education literature on team formation for small and large team projects in the context of two UoA Engineering courses in the MME department (MECHENG 235: Design and Manufacturing 1 and MECHENG 731: Mechanical Design Projects). Drawing on their own experience as an engineering student and a series of interviews of their peers and course coordinators, the researcher will build a base of evidence for the final recommendation. Optimizing for student learning and industry-relevant experience, the project will propose an array of recommended team assignment and management strategies correlated to the properties of different courses and their pedogogical aims.

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2026/2027 Projects (Mechanical and Mechatronics Engineering)

Project code	ENG020
Project title	**Remote Sensing for Small-Scale Agriculture**
Discipline	Mechanical and Mechatronics Engineering
Supervisor(s)	Mark Jeunnette
Contact details	mark.jeunnette@auckland.ac.nz
Skills Needed	• OpenCV • Python • Machine learning

Project description (Max. 200 words)

Remote sensing data (from satellites and drones, primarily) are already used in industrialized agriculture for identifying variations within large fields to optimize application of inputs (seeding layout, fertilizer, pesticides, water, etc.) for maximum yield with minimum cost and environmental impact. However, the multiple factors make this technology unreachable for small farms (which make up over 80% of farms worldwide - FAO).

This project involves the analysis of historical aerial and satellite remote sensing images, in addition to ground truth data, from a maize growing season in Kamuli District, Uganda, in 2021. The aim is to assess the ability of multispectral data to measure the following parameters during the season

• crop identification
• crop health
• crop yield measurement

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2026/2027 Projects (Mechanical and Mechatronics Engineering)

Project code	ENG021
Project title	**Design/Build Project Research for Mechanical and Mechatronics Courses**
Discipline	Mechanical and Mechatronics Engineering
Supervisor(s)	Mark Jeunnette, Stephen Kavermann
Contact details	mark.jeunnette@auckland.ac.nz
Skills Needed	• Design process • 3D CAD • Rapid prototyping • Technical drawing

Project description (Max. 200 words)

New design/build projects involve significan't preparation and experimentation, but academic and support staff rarely have the opportunity to test their ideas with students *before* the project is implemented in a full class setting. This project will provide staff with valuable feedback on the content, mangement, and assessment of design/build projects in preparation for future courses. The Summer Research Student will review the literature for similar design/build projects at other universities, identify intended learning outcomes for two design/build courses in MME, trial proposed design/build projects, and provide feedback from the student's perspective. A demonstration paper for the following year's AAEE conference may be produced.

Project code	ENG061
Project title	**Investigating the effect of façade modification on ventilation in high-rise residential building**
Discipline	Mechanical and Mechatronics Engineering
Supervisor(s)	Dr Ahmad Zaki Dr Ferdinand Oswald
Contact details	ahmad.zaki@auckland.ac.nz ferdinand.oswald@auckland.ac.nz
Skills Needed	• Strong interest in aerodynamics, natural ventilation, and / or sustainable building design • Background or enthusiasm in architectural technology and environmental design • Interest in academic research • Basic familiarity with design tools (preferred) • Experience or interest in wind tunnel testing or airflow analysis (a plus) • Open to Architecture students and one Aerodynamics

Faculty of Engineering and Design
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2026/2027 Projects (Mechanical and Mechatronics Engineering)

	student

Project description (Max. 200 words)

This project investigates how façade geometry influences airflow behaviour around a high-rise apartment building using wind tunnel testing. The student will explore how design features such as solid–void variation, volume articulation, and façade fins affect aerodynamic performance and natural ventilation potential.

The work involves developing a building model and testing it in a wind tunnel to observe and measure airflow patterns around and across façades. Through comparative testing. The student will assess how different façade configurations impact wind flow, pressure distribution, and ventilation effectiveness. The project connects architectural design decisions with measurable environmental performance outcomes.

The student should gain hands-on experience in experimental methods, model-making, and airflow analysis, while engaging with principles of sustainable building design and environmental performance.

Ahmad Zaki and Ferdinand Oswald are available to support students and provide guidance throughout the project. Students are encouraged to discuss their ideas prior to submission; please contact Ferdinand or Ahmad via email to arrange a meeting.

Image: Boundary Layer Wind Tunnel, University of Auckland