Faculty of Engineering and Design
Summer Research Scholarships

2026/2027 Projects (Civil and Environmental Engineering)

Project code:	ENG001
Project title:	**Smart Sensors for Drainage Pipe Condition Assessment**
Discipline:	Civil & Environmental Engineering
Supervisor(s)	Kobus van Zyl
Contact details	k.vanzyl@auckland.ac.nz
Skills Needed	• Ability to conduct laboratory experiments • Data analysis

Project description

Sanitary and stormwater sewers are critical assets that reduce risks to public health and the environment. Due to their buried nature, sewer pipes are rarely inspected or monitored to ensure optimal operation. Thus, slowly developing defects, such as structural failure, sedimentation and root intrusion, are not detected until the system fails, resulting overflows causing flooding, public health risks and environmental pollution.

Smart sensor systems can provide low-cost, frequent, and data-driven features for regular monitoring applications. This study will continue earlier work on smart sensors for sewer systems.

The aims of this project will be to run tests in an existing setup in the Fluids Laboratory that replicate flow conditions in sewer pipes and evaluate the response of a small floating pod to changes in flow rate, features and different types of defects. The project may include sensor design tasks, laboratory testing and data analysis.

Project code:	ENG002
Project title:	**Documenting pipe failure patterns from photographic evidence**
Discipline:	Civil & Environmental Engineering
Supervisor(s)	Kobus van Zyl
Contact details	k.vanzyl@auckland.ac.nz
Skills Needed	• Ability to make repated and accurate measurements • Data analysis

Project description

Watercare is responsible for water and sewer services in the Auckland region. They are New Zealand's largest water supplier, drawing water from 27 sources and distributing it to 1.7 million people through a vast network of pipes.

Pipes deteriorate over time and water loss through pipe networks is an international problem. For instance, Watercare repairs approximately 10,000 leaks every year. Despite frequent pipe failures across the world, very little is known about the distribution of leak types and dimensions in different pipe materials. This lack of information limits efforts to better understand and manage water losses in distribution systems.

The aim of this study will be to document the type and dimensions of leaks in the Watercare system based on photographs taken by the repair teams. The data will be collected, documented and analysed to describe leakage patterns in different pipe materials.

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2026/2027 Projects (Civil and Environmental Engineering)

Project code:	ENG003
Project title:	**Waves, flows and hazards**
Discipline:	Civil & Environmental Engineering
Supervisor(s)	Colin Whittaker, Liam Wotherspoon
Contact details	c.whittaker@auckland.ac.nz
Skills Needed	• Basic interest in fluid mechanics, hydraulics and coastal engineering • Completion of CIVIL 202 (minimum requirement) and CIVIL 302 (helpful but not essential)

Project description

Tsunamis and storm waves are periodic in nature, and their propagation is well understood. When they make landfall, these waves become overland flows, which are hazardous to people and infrastructure. However, the transitions between the wave and flow physics, and how this affects hazards, are poorly understood. There are also overlaps between the overland flows and other hazards such as river floods; however, the different types of hazards are often described differently in design guidance. This project will research the properties of both waves and different hazardous flows (including from riverine sources), and how these are represented in hazard design guidance, with the goal of more physically appropriate and holistic hazard intensity measures and design guidance in the coastal zone. Numerical modelling of waves and hazardous flows will be employed to complement the desktop study, as appropriate.

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2026/2027 Projects (Civil and Environmental Engineering)

Project code:	ENG004
Project title:	**Developing tools to demonstrate complex geotechnical concepts**
Discipline:	Civil & Environmental Engineering
Supervisor(s)	Andrew Stolte Arezoo Rahimi Liam Wotherspoon Rolando Orense
Contact details	andrew.stolte@auckland.ac.nz
Skills Needed	• Interest in geomechanics and soils • Fabrication skills to build hand-held physical demonstrations – or – basic programming skill to develop applications/web tools for demonstration

Project description

Geotechnical Engineering is a sub-discipline of Civil Engineering that fundamentally requires understanding complex multi-phase material that is soil and rock. Concepts such as phase diagrams, effective stress, seepage, lateral earth pressure are difficult for many students to understand and thus engage with. This project involves the development of hands-on or digital, teaching and research tools to help demonstrate fundamental geotechnical concepts. The student would work with the geotechnical engineering academic team to build understanding and facilitate the development of the tools. This may include work in the geomechanics laboratory, working in fabrication spaces, or developing digital tools using python (supported by generative AI tools).

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2026/2027 Projects (Civil and Environmental Engineering)

Project code:	ENG005
Project title:	**Characterisation of chemical and biological contaminants in Auckland's waterways**
Discipline:	Civil & Environmental Engineering
Supervisor(s)	Naresh Singhal
Contact details	n.singhal@auckland.ac.nz
Skills Needed	• Interest in environmental engineering and science • Willingness to undertake field sampling • Experience or interest in laboratory chemical and biological analysis

Project description

This project establishes baseline contamination profiles for Auckland's urban waterways using non-targeted chemical and biological screening. You will collect water samples across four stormwater catchments representing diverse land-use pressures, characterise the antimicrobial and chemical contaminants present, and compare contamination patterns across sites. The four study catchments are:

(i) Meola Creek receives discharge from multiple engineered overflow points. The catchment contains a closed landfill adjacent to the stream, with land use ranging from businesses and residential areas to conservation zones and light industry.

(ii) Papakura Stream is a large, mixed-use catchment covering rural land, rural production, light industry, a town centre, and residential areas, with several legacy contaminated sites.

(iii) Oteha Valley is home to the Rosedale wastewater treatment plant, a closed landfill, a business park, light industry, and residential areas.

(iv) Puhinui catchment houses heavy industry, quarries, businesses, residential areas, and conservation land.

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2026/2027 Projects (Civil and Environmental Engineering)

Project code:	ENG006
Project title:	**Developing tools to demonstrate complex geotechnical concepts**
Discipline:	Civil & Environmental Engineering
Supervisor(s)	Cody Mankelow Kobus van Zyl Hukerenui Bonnet
Contact details	c.mankelow@auckland.ac.nz
Skills Needed	• Interest in environmental engineering and surface water • Travel, field work and site visits, driver's license

Project description

Environmental Engineering is a sub-discipline of Civil Engineering. Despite New Zealand's clean, green image, the latest estimates indicate that 44% of New Zealand's total river length is unsafe for swimming due to E. coli contamination. While 31% of sites show worsening nitrogen levels, and 59% worsening phosphorus levels. This project will work with community trust to explore the restoration of a river impacted by farming that discharges into an estuary. The project will focus on community group engagement, scoping project requirements, initial site surveys and water quality sampling up the impacted river.

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2026/2027 Projects (Civil and Environmental Engineering)

Project code:	ENG007
Project title:	**Transport Materials Testing and smart transport pavement instrumentation**
Discipline:	Civil & Environmental Engineering
Supervisor(s)	Doug Wilson
Contact details	dj.wilson@auckland.ac.nz
Skills Needed	• Interest in transportation engineering and transport materials • Smart instrumentation and data analytics • Fabrication skills to build demonstrations.

Project description

This project, based within the **Transportation Engineering and Transportation Materials group** in the Department of Civil and Environmental Engineering, will investigate the development and application of **"smart aggregate-sized sensors"** for monitoring infrastructure condition and performance. The research will explore the design of compact, resilient sensing devices capable of measuring key parameters such as **orientation (x, y, z axes), strain, and movement** within transport materials. These sensors will be embedded within laboratory test specimens and, ultimately, field environments to better understand material behaviour under realistic loading and environmental conditions.

A key innovation of this project is the use of **3D-printed casings** that mimic the physical characteristics of aggregate particles, enabling the sensors to integrate seamlessly into pavement and rail materials exposed to **high moisture, heavy loads, and complex stress states**. The study will include laboratory validation and exploratory field deployment concepts, with the aim of advancing **smart infrastructure monitoring techniques** that support improved asset management, resilience, and performance in New Zealand's transport network. The outcomes will contribute to the development of next-generation **ITS-enabled condition monitoring systems** for real-world infrastructure applications.