Sample internship projects:

Energy Project: Modelling of the energy sufficiency of a country

Description: This is a new area where the initial work is to develop a basic systems model (on paper) of an imaginary country that is changing from mostly oil based industry for vehicle fuel to more renewable sources, including electric vehicles. It also considers micro grid adoption in small communities.

Two students will work together with a lead researcher to develop the initial model parameters and will then start the first iteration development in AnyLogic, a mixed model environment. The development environment is object based and requires very little programming (a bit of Java).

Interns: Two students with a background in systems thinking, or that want to learn about it, would be welcome. They need a good applied mathematical background and skills in physics and chemistry and some Java programming. The students will learn how to approach an energy sufficiency project from a holistic perspective and how to build system level decision models in a modern software package. This will give them a good understanding of the expected changes in the world of energy.

Carbon Footprint Project: Development of a low carbon footprint community model.

Description: The project is considering the development of a low carbon footprint community with a circular economy. A systems dynamics and agent based approach will be used to develop a simulation model that shows what is required for a small community to be self-sustaining and to limit their carbon footprint.

Interns: Students with a mathematical background and skills in agriculture, plant science and sustainability architecture are welcome. We require two students to work on this project. The students will learn how to integrate several knowledge fields into a simulation model that will demonstrate vertical farming, the use of biodigesters and aquaculture.

Technology and GIS, GIS mapping, data and image analysis

1. Key skill – Technology and GIS: To look at methodology and develop a way to monitor cattle position and movement in a paddock. Up to 40 cattle, and for one week max of measuring each time. Idea is to build off the data being caught in the beef and lamb project – this would give us insights into how the cattle are interacting with the seeps and waterways on farm. Client Wintec

2. Key skill – GIS, image analysis: To analyse the red blue green imagery caught from flying over a mussel farm. Would be looking for nutrient movement, temperature changes and any other imagery that could indicate mussel health. Private aquaculture company
3. Key skill – GIS, image analysis, 3D modelling: To analyse photographic imagery of mussel farm infrastructure to see if we can determine when things are going wrong with the mussel lines and buoys. Private aquaculture company
4. Key skill – GIS mapping and data representation, good searching skills: To locate, quantify and map all of the different types of waste in New Zealand using GIS systems. Methodology provided. Government ministry.
5. Key skill – GIS, image analysis, ENVI: To work with close up drone imagery to use the ENVI suite of GIS tools to develop model to count onion seedlings, then to assess size in subsequent image runs. Private company and a trust.
6. Key skill – GIS, image analysis, multi and hyperspectral: To look at satellite hyperspectral imagery from river grown salmon farms to assess amount of nutrients that travel downstream and how far they travel.
7. Key skill – Big data analysis: To work with a large farming client to analyse an extensive set of data collected for 9 years.

Past project options

Characterisation of Soil Moisture sensors

Description: We have an industry based project where we are using cost effective soil moisture sensors. In one application we will use a field of 20 locations, with 4 sensors at each location in different depths (10cm, 20cm, 30cm, 40cm) on a dairy farm. Core soil samples will be taken at the time that the soil moisture sensors are installed, which will be used to characterize the soil moisture sensors for these positions. Students will be asked to categorize the soil cores, and carry out experiments on each category. These experiments will look at the following characteristics – soil structure, soil composition, how the signal from the soil moisture sensors compare with different soil types and moisture content. To ensure that the work is not boring, we will ask the students to create a work method and test the work method, rather than do all the samples.
What is in it for the Intern: This work is part of a real-life collaboration between Wintec and two industry organisations. The student will have contact with English speaking clients and contribute to a real solution.
Ideally suited for: Agriculture Engineering, Chemical engineering, Soil Science, Electronics.

Design and Build a Wind Vane

Description: Wintec owns an outdoor sensor network, the network is modular and generic in nature. This means that we can add as many sensors and different kinds of sensors to this network. One of the configurations we have is a weather station. We have recently re-designed the electronics for the wind vane, and we need to re-design the complete mechanical structure of the wind vane. We would like to make use of students to co-create the concept of the wind vane (to fit around the electronics) and then translate this concept into a physical CAD (or Solidworks) design. This design then needs to be 3D printed (we have a high definition 3D printer) and tested. Modifications needs to be applied if needed.

What is in it for the Intern: This design and implementation is a good project for a student who wants to design and implement a piece of technology that is used in the real world. There is a satisfaction element involved where the student would be able to see his/her design used.
Ideally suited for: Mechanical Engineer, Design Engineer
Number of students: A maximum of two students can be accommodated in this project
Ideal Grouping: Design/Mechanical Engineer (Can be done by one person).

Design and Build a UV sensor holder

Description: Wintec owns an outdoor sensor network, the network is modular and generic in nature. This means that we can add as many sensors and different kinds of sensors to this network. One of the configurations we have is a weather station. We have recently re-designed the electronics for the UV sensor, and we need to re-design the complete mechanical structure of the sensor. We would like to make use of students to co-create the concept to fit around the electronics, and specify the materials required for the UV-to-atmosphere window (it is a materials problem) and then translate this concept into a physical CAD (or Solidworks) design. This design then needs to be 3D printed (we have a high definition 3D printer) and tested. Modifications needs to be applied if needed.
What is in it for the Intern: This design and implementation is a good project for a student who wants to design and implement a piece of technology that is used in the real world. There is a satisfaction element involved where the student would be able to see his/her design used.
Ideally suited for: Mechanical Engineer, Design Engineer, materials scientist
Ideal grouping: A Design Engineer and a Materials Scientist

Advancement in hydroxyl cellulose based resources for sustainable Ink challenges

Description: The overall goal of this project is to reformulate the ink product through replacing the original native starch with commercially available modified starches that are stable and resistant to retro gradation. Sourcing of modified starches within New Zealand has identified the majority offering from commercial outlets is primarily Waxy Maize and Waxy Rice. The reformulation tests to date have outlined that the replacement of native rice starch with available waxy starch is not a simple procedure and technical issues quickly arise. Therefore, the optimized task is to produce modified starch at low cost with properties such as permanent, waterproof and eco-friendly.
What is in it for the Intern? This helps the student to get industry exposure and networking skills.
Ideally suited for: all possible science and engineering students.

Polymeric materials for cancer cell targeting

Description: The project focus on therapeutic target development, and polymeric biomarkers for genetic predisposition, early detection, prognosis, and treatment response indicators. Our objectives will inform and drive improved clinical practice, and are outlined as follows: a) Develop, evaluate, and validate novel biomarkers conjugated polymers for breast cancer detection. b) Accelerate discovery and pre-clinical development of candidate drugs, and commercial development of anti-cancer therapeutics
What is in it for the Intern? Knowledge about pharmaceutical industry
Ideally suited for: undergraduate or post graduate students with minimal polymeric knowledge.