2021
He Arataki
Pūkaha

Introduction to Engineering

Bachelor of: Engineering with Honours Forestry Science Product Design
Ngā Kai o Roto | Contents

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COVER: Using Computer Vision, Machine Learning, and other computing techniques, Software Engineering students Eiran and Jennifer design and develop software for a flying drone in UC’s Drone Lab.

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The University’s official regulations are at www.canterbury.ac.nz/regulations

Rainbow Diversity Support

UC is proud to partner with Ngāi Tūāhuriri and Ngāi Tahu to uphold the mana and aspirations of mana whenua.
Nau mai ki te Pūkaha. Welcome to Engineering at UC.

Kōkiri mai rā e ngā mana puipuiaki, e ngā reo tongarerewa ki Te Whare Wānanga o Waitaha.

E tau mai nei ki Te Rāngai Pūkaha!

UC’s Te Rāngai Pūkaha | College of Engineering started life as the first Engineering School in Aotearoa New Zealand. We are now internationally recognised for the excellence of our teaching and research, and the calibre of our graduates.

We offer innovative degree programmes tailored to careers in the real world, with study options in various different types of Engineering including our unique qualifications in Humanitarian Engineering, Forestry Science, Product Design, and Data Science.

In the last few years, we have invested $163 million in new state-of-the-art laboratories and teaching spaces, providing our students with enviable, world-class study and research spaces.

UC also has close links with numerous local companies, which presents a unique opportunity for students to work alongside them as part of the reshaping of our new and vibrant city. Pictured above is our Engineering Core; we welcome you through those doors into Te Rāngai Pūkaha College of Engineering where we will help you along your journey to become one or more of many things — engineer, scientist, inventor, designer, builder, and great thinker.

Professor Jan Evans-Freeman Amorangi | Pro-Vice-Chancellor Te Rāngai Pūkaha | College of Engineering
Ōtautahi Christchurch is all about...

The city
Ōtautahi Christchurch, in the iwi region of Ngāi Tahu, is the largest city in Te Waipounamu South Island and the second largest in the country. It is also Aotearoa New Zealand’s most affordable major city.

An abundance of restaurants, cafés, and bars paired with a lively arts and entertainment scene mean you’ll find festivals, concerts, sports, and cultural events nearly every week of the year.

Riverside Market, on the corner of Lichfield St and Oxford Terrace, is a unique 7-day indoor farmers’ market and foodie experience. Connected to the market is Riverside Lanes, which has boutique shopping and further options for foodies.

www.canterbury.ac.nz/life/christchurch/city-renewal

The campus lifestyle
The Ilam campus, which sits within the hapū region of Ngāi Tūāhuriri, is the central hub where learning and living are combined. It houses teaching and learning facilities, accommodation, and leisure activities all together.

The campus contains 4 libraries as well as computer suites with 24-hour access, lecture theatres, laboratories, and studios. The campus is easy to stroll, cycle, or skate around and is linked together by shared walkways. Grab a snack or meet friends for a drink after class at one of the 15 cafés, bars, and eateries on campus.

www.canterbury.ac.nz/life/studentlife/explore

The clubs
160 student-run clubs and organisations support the varied intellectual, artistic, cultural, social, and recreational pursuits of the UC community. Whether you’re looking to take up a new hobby, find friends with similar interests, strengthen your connection to your culture, or gain academic support, joining a club is a great way to connect and get involved.

From engineering to film, rugby to board games, politics to religion, acting to motocross, we have a club for you!

www.canterbury.ac.nz/life/studentlife/clubs

Credit: ChristchurchNZ

2021 He Arataki Pūkaha | Introduction to Engineering
The adventure

Canterbury is made for outdoor recreation — from surfing and paddle boarding at local beaches, to walking, biking, and some of the best rock climbing and bouldering locations in Aotearoa New Zealand.

Not to forget... 4 dual ziplines at Christchurch Adventure Park, and 10 ski fields within two hours’ drive from Ōtautahi Christchurch.

You can walk the path the early settlers took and see what they would’ve seen of 1850s Christchurch.

There is something to match every enthusiasm and adrenaline level. Check out Port Hills for fantastic views of the Southern Alps, Banks Peninsula, the historic French town of Akaroa, the thermal Hanmer Springs, Arthur’s Pass National Park, and Kaikōura for whale-watching.

www.canterbury.ac.nz/life/get-active/outdoors

Mana whenua, mana tangata the opportunities

Ōtautahi Christchurch has transformed itself into one of the world’s most modern and sustainable cities with a strong focus on ensuring the unique history and narratives of Ngāi Tūāhuriri are included and celebrated in the city.

Through its strong partnership with Ngāi Tūāhuriri as mana whenua, the post quake landscape of Ōtautahi Christchurch now includes the many cultural narratives of the region woven into its city streets, spaces, and buildings.

With connected ecosystems that drive enterprise, education, and government, future-focused Ōtautahi Christchurch is a test-bed for innovation, sustainable businesses, and people who want to do things differently.

www.canterbury.ac.nz/life/christchurch/economy

14 ski fields
700 parks
plus more mountains, beaches, rivers, lakes — all accessible for a day trip

PS: Rents in Ōtautahi Christchurch are 30% cheaper than Tāmaki-makaurau Auckland, and 28% cheaper than Te Whanganui-a-Tara Wellington. (Source: ChristchurchNZ)

We are leading the way in global health tech, aerospace and future transport, food fibre and agitech, and hi-tech services.

Tūranga, the central library in Ōtautahi and the biggest and most modern library in Te Waipounamu South Island, houses more than 180,000 books. It features the country’s biggest digital ‘touchwall’.

www.canterbury.ac.nz
Study Engineering at UC

Te Rāngai Pūkaha | College of Engineering is always looking for ways to make everyday life better for everyone. Technology is relevant to all parts of society, but is changing fast... and we’re here to keep up and drive it forward.

Deep industry engagement
Our connections are based on ‘real’ interactions that make engagement more meaningful for both industry and student (page 6).

Global reach and recognition
Te Rāngai Pūkaha | College of Engineering is internationally respected, its qualifications are portable, and its graduates are snapped up both in Aotearoa New Zealand and overseas (page 7).

Passionate practiseing experts
UC lecturers teach and do. All of our staff are research-active practising experts, who work with industry, collaborating on projects, or acting as expert consultants (page 8).

State-of-the-art facilities
Over the last few years we’ve invested $163 million in new state-of-the-art laboratories, teaching spaces, and study areas (page 9).
Partnering with industry
All of our engineering students do a final year project, many of which are funded by industry, and may lead to jobs. Most project ideas come from industry partners looking for a solution to a problem, or to design a new product. Companies benefit from the creative problem-solving of students and, in many cases, use the opportunity to identify top students for future job opportunities. Many companies also provide scholarships to students.

Networking opportunities
UC hosts clubs such as the Engineering Students Society (ENSOC), Women in Engineering (WIE), and the UC Computer Society (CompSoc). Clubs engage with industry members throughout the year by running employer information sessions, careers fairs such as Engineering and Science Careers Fair and ICT Careers Fair, networking events, interview preparatory sessions, and guest speaker evenings.

Linking the energy industry to students
UC hosts the EPECentre (Electric Power Engineering Centre), a world-class power industry research incubator. They provide a link between academic research, industry, and students. With over 30 power industry partners, the EPECentre provides scholarships, careers fairs, field trips, and projects for students interested in the field of power engineering.

‘My project is co-funded by industry, so there’s been a lot of engagement for me. We produce work and present it directly to industry leaders. As PhD students, we always want our research to be useful to the wider world.

During my undergrad, I did a three month placement with Mighty River Power, now Mercury Energy. I was in Rotorua assessing the risk of “arching” in equipment at their geothermal generation stations. Arcing is essentially like lightning with the equipment which, if it’s powerful enough, can actually vaporise someone. It was a really cool project because I got to acquire a whole new skillset. I gained a lot of confidence from that.’

Luke
Ngāti Raukawa
Studying towards a PhD in Electrical Engineering
Global reach and recognition

The College is internationally respected, and your qualifications will open doors, both in Aotearoa and overseas.

Top rankings
We have an excellent reputation around the world for the quality of our teaching and calibre of our graduates, in all fields of study. UC is ranked:
• in the top 250 in the world for Engineering and Technology *
• in the top 100 for Civil Engineering. *

International experts
We host guest lecturers from around the world, giving students the opportunity to interact with world-leaders in their fields. UC’s unique Erskine programme brings up to 70 academics from around the world, from top universities. You will learn from experts in the field from the best universities across the UK, Europe, North America, and Asia, allowing you to gain a global perspective.

Accredited programmes
A UC Engineering degree is a professional degree. Our programmes are fully accredited by Engineering NZ, meaning they are benchmarked with other engineering programmes worldwide. A UC Engineering degree is therefore recognised internationally — a ticket to a career that can take you around the world.

Global student exchanges
We offer international exchange opportunities. Many of our Engineering and Forestry Science students go on a semester-long exchange to another university during their degree. You can study at some of the most prestigious universities around the world, diversify your degree, and make the most of global networking opportunities.

'An Engineering degree can take you pretty much anywhere in the world. There are so many job options, you don’t even necessarily have to become an engineer. The degree provides a really good grounding and teaches you skills you could apply in a range of fields.

I went to Purdue University in Indiana. It was great to be in different surroundings, although it took me a while to adjust to the -20°C temperatures! It was fun studying in an American university town. I met tons of people and got to go to spring break in Florida. If I could do it again I would. I just wish it was for longer!'

Sarah
Bachelor of Engineering with Honours in Civil Engineering

* QS World University Rankings by Subject, 2020.
World experts who teach
UC is leading the country for the proportion of researchers that teach and our lecturers are passionate about sharing their knowledge with you. From earthquakes to renewable energy, researchers across all our disciplines are among world leaders in developing new technology and responses.

Research meets industry
Te Rāngai Pūkaha | College of Engineering is home to several world-renowned research centres and the industry looks to us for solutions to problems.

Leaders in their field
UC is acknowledged as a leader in Computer Science education in Aotearoa. We are the home of award-winning, internationally recognised research groups, including Computer Science Unplugged and the Intelligent Computer Tutoring Group.

Passionate practising experts
UC lecturers teach and do — they are research-active practitioners who collaborate closely with industry.

We have, among others, UC QuakeCentre, Te Hiranga Rū QuakeCore, the Electric Power Engineering Centre (EPECentre), and the Wireless Research Centre (WRC).

We have one of only three human interface technology labs in the world — Hangarau Tangata, Tangata Hangarau | Human Interface Technology Laboratories (HIT Lab NZ).

Our staff has won national and international awards for their teaching and research in the field.

‘Our lecturers come from places all around the world and all have different stories. That’s great because you get exposed to lots of different perspectives and the quality of their knowledge is very good.

My computer programming lecturer runs the competitive programming group at UC, and is a super enthusiastic guy who has been involved in his field since forever. Another of my lecturers is doing active research into computer security. It’s very relevant stuff, and also very tricky! It’s great to learn from them because they know exactly what to teach and what’s most important for you to learn.’

Max
Bachelor of Science in Computer Science

A student hub

Our new Engineering Core is a student-hub, complete with a café, chill out spaces, computer labs, and lecture theatres. The Engineering Core hosts regular events for students and staff, and is frequently used by clubs for social, academic, and industry networking events.

Purpose-built facilities

UC has world-class engineering facilities including a futuristic augmented reality lab and a new Structural Engineering Lab (SEL). The SEL ensures our Civil Engineering students experience the most modern educational facilities in seismic testing available.

The SEL allows students to be exposed to modern testing techniques that provide first-hand experience of seismic loadings on structures and soils in real-time and at a realistic scale as part of their degree.

Innovative labs and equipment

We have rebuilt or completely refurbished every wing of the engineering precinct, including new teaching and research labs and equipment in all of our engineering departments. All of our departments and schools each have dedicated buildings, with modern teaching spaces and labs. Te Kura Hanga Otinga | School of Product Design is our newest school. It offers prototyping spaces, a virtual reality testing studio, high-end gaming computers, and a collaborative creative open space, encouraging students to share innovative ideas.

State-of-the-art facilities

Rata is one of the earliest engineers in Ngāi Tahu narratives, and the Engineering Core is designed to reflect the shapes of tools and resources that Rata used to fashion his waka (voyaging canoe).

The UCDroneLab is the combined expertise of our engineering and science faculties. We secured the first beyond-line-of-site test site in Aotearoa New Zealand.

‘The Chemical and Process Engineering (CAPE) lab is where we do the experimental work for our degree. My experiments included using a brand new biofuel reactor, where I got to test the efficiency of different oils. I also did a refrigeration lab where we had to change a certain variable to try to improve on the design.

It’s more interesting when you can physically see how something works. It also improves your understanding. You can ask questions and work things out as you go. The experiments we do give relevance to what we learn in the lectures.’

Sima
Bachelor of Engineering with Honours in Chemical and Process Engineering, with a minor in Bioprocess Engineering
Experience ‘on the job’

We ensure you step into the workforce with confidence, backed by skills and experience.

**Hit the ground running**
Students start developing workplace skills from the moment they begin their degree, progressively becoming more industry-ready by graduation. You will learn the professional skills you need at work — like communication and report writing, handling issues such as ethics, sustainability, safety, and interacting with customers and clients.

**Real-world problem solving**
Our graduates acquire a versatile skillset and knowledge base by combining the applied learning from labs and projects, balanced with academic theory, hands-on design, and industry projects. They learn to solve problems in real-world projects and have the opportunity to work for companies while they are still students, thus gaining a competitive edge in the job market.

**Work placements**
Practical work placements are an integral part of the Bachelor of Engineering with Honours and Bachelor of Forestry Science degrees. As an Engineering or Forestry Science student, you will complete 90–100 days of practical work experience for an organisation.

Work is generally done over the summers and is paid. Students often work for at least one company during their practical work placements, allowing them to gain broad experiences in industry while studying. Time in industry helps them to develop skills such as communication, teamwork, and leadership, and often leads to job opportunities upon graduating.

‘I’ve worked the last two summers for the same company out in Rangiora. The first summer I was mostly shadowing people and finding out how the company operates. The following summer, I had real projects, like harvest planning and calculating the carbon footprint for the shipping side of the business.

I went up to the head office in Auckland and worked for the export team. I got to meet the CEO and all the big shots which was cool! They gave me a lot of responsibility. I had my own ute to use and I was included in all the meetings. I really felt like part of the team.’

Sarah
Bachelor of Forestry Science
Problem-solving creativity

You will learn to look at problems differently and build creative solutions.

Bringing ideas to life

We use real-world and simulated projects to teach you the creative problem-solving skills that employers (and the world) need. For instance, our second-year Civil and Natural Resources Engineering students complete a bridge-design-and-building competition as part of their studies. Student groups must draw and design a bridge, while understanding material strength and estimating loads on structures before building and testing their bridge in a fun competition.

Humanitarian engineering

If you have a dream to use your engineering skills for humanitarian causes, we offer a unique humanitarian engineering programme. The Diploma in Global Humanitarian Engineering can be taken in parallel to your Engineering degree.

You can work on engineering issues and projects in disadvantaged or developing communities, in Aotearoa or overseas, and help address pressing global issues such as food and water shortages, power supply, or climate change, or whatever you’re impassioned about.

Ingenuity to entrepreneurship

At UC, our students are encouraged to research more and push the boundaries of their thinking. When our students go big, we’re here to back them with a solid grounding in science and technology, and the business and entrepreneurial skills they need to make their ideas happen.

Product Design students learn to combine creative design, science, engineering, and business studies to plan and develop products for use in homes, businesses, and communities (see page 29).

‘The Diploma has forced me to look at things differently. You have to change from a concise, logical, factual way of looking at things, to developing convincing ideas and arguments. It has definitely helped exercise the creative side of my brain!

For example, in your final year project you’re given a problem and you have to come up with the solution for it yourself. Creativity is so important in engineering. You have to be able to try different things if you want to succeed and be useful.’

Madeline
Bachelor of Engineering with Honours in Natural Resources Engineering
Diploma in Global Humanitarian Engineering
Studying towards a PhD in Civil Engineering

www.canterbury.ac.nz
Collaboration and teamwork

At UC you’ll pick up skills that will take you a long way.

**Working across disciplines**

At UC, you have the opportunity to work across disciplines. We encourage creative problem solving and collaboration between disciplines, through teamwork, group projects, communication, and leadership skills development.

Having Te Kura Pāngarau | School of Mathematics and Statistics in our College gives students a more integrated understanding of their application to problem solving. Mathematics and statistics underpins much of engineering, and is at the forefront of breakthroughs in science, technology, and finance.

Data Science is our newest subject on offer, combining mathematics, computing, technology innovation, and practical results.

**Bicultural competence and confidence**

Te Rāngai Pūkaha | College of Engineering is committed to strengthening staff and students’ bicultural competence and confidence. For example, bicultural competence and confidence is being embedded across our Engineering, Forestry Science, and Product Design degrees. Negotiation, and cross-cultural skills are taught in project management, and we engage kaikārahi as part of programmes.

**Student mentoring and engagement**

All first-year Engineering students are part of a peer mentoring group ENG ME!. Second and third year students, who have been-there-done-that, give advice, tips and tricks, and will answer all your questions, including where the cheap eats are. We host a schedule of events for you, such as TEDX-style talks from our Engineering programmes, a final year project showcase, and a look at what our innovative research centres do behind the scenes.

‘I like it when different areas combine because it means I’m not doing the same thing every day.

Everyone involved in a collaborative project has different passions, connections, and personalities. It’s anything but boring. Even when I was getting my undergrad and doing coursework, there were a lot of opportunities for collaboration. You become more independent as you go into graduate studies, so to be able to develop those connections throughout my time at UC has been really nice.’

Rory
Bachelor of Science in Mathematics
Postgraduate Diploma in Statistics
Master of Science in Statistics
Studying towards a PhD in Statistics
Final year projects

Beca, Dawn Aerospace, Fisher & Paykel, Taska, and Skyline are just a few industry names who have sponsored final year projects. Projects have spanned from building technologies to withstand earthquake damage, electric vehicles, robotic machines, rockets, and apps. You complete your project as part of a team, alongside industry and academic mentors, and deliver concepts, prototypes, test data, and detailed reports at the end of your project.

In the 2019 project showcase, a team of 4 students was the people’s choice winner for their vibration profiling of a rugged prosthetic hand, sponsored by Taska.

Student engineering design leading the world

UC Engineering students have competed in the international Formula SAE student competition for the last 7 years. Students design and build their own cars, using the latest electronics and software, and race them. The competition tests the depth of your knowledge in engineering, business, and management.

Our students have also created the world’s first 3D-printed titanium internal combustion engine, as part of the Shell Eco-marathon Asia, a global event that attracts over 100 university student teams around the Asia-Pacific region. UC teams have won Business, Design, and Innovation Awards for their cars at competitions over the years.

Specialist labs and field stations

Get hands-on experience by applying what you have learnt in lectures to the labs.

But, there’s more — field trips to Waitaha Canterbury’s indigenous and exotic forests are an integral part of the Forestry Science degree. UC’s unique field stations around Waitaha Canterbury and Te Tai Poutini West Coast support teaching and research, allowing you valuable learning experiences outside of the classroom.

‘Our faculty advisor is very passionate and sets a high bar for us. What comes together is a really beautiful piece of machinery. In 2016, we built an electric vehicle. I got to design a carbon fibre shroud for the motor controllers. All the knowledge and experience gets passed down each year from student to student.

It’s the perfect real-life application of all the engineering skills you get taught. With UCM, you get ten times the learning that you do in a lecture theatre. It equips students to be industry ready too, because they’ve had that interaction with professionals and the experience of working on a large project.’

Willy
Bachelor of Engineering with Honours in Mechanical Engineering
Part of UC Motorsport (UCM) & UC Formula SAE team

Our students have won INTERNATIONAL AWARDS for the design of their race cars as part of the Formula SAE competition.

Hands-on learning

Mentors, specialists, labs, and projects — you will be exposed to a lot of hands-on learning.

www.canterbury.ac.nz
Bachelor of Engineering with Honours. BE(Hons)

Engineers design the future. They provide innovative solutions to meet the needs of our modern world.

From buildings and bridges, to apps and smart devices, to pharmaceuticals and renewable energy, engineering feats are everywhere.

The Bachelor of Engineering with Honours is a four-year professional degree. The degree is accredited by Engineering New Zealand, allowing our graduates to work as professionally qualified engineers all over the world.

Entry requirements

Physics and mathematics secondary school study is essential to enter the first year of Engineering. Chemistry is also essential for some Engineering disciplines.

You should aim to have at least:

NCEA
- 14 credits in Level 3 maths or calculus including both differentiation and integration*
- 14 credits in Level 3 physics.

For students wishing to study Chemical and Process Engineering, Civil Engineering, Forest Engineering, Natural Resources Engineering, or Mechanical Engineering, you should also aim to have at least:
- 14 credits in Level 3 chemistry**.

18 credits are strongly recommended in all subjects.

International Baccalaureate (IB) Diploma
- minimum of 4 HL (or 5 SL) in maths (HL is recommended)
- minimum of 4 HL (or 6 SL) in physics (HL is recommended)
- minimum of 4 HL (or 6 SL) in chemistry**.

Cambridge International Examination (CIE)
- maths and physics — D grade or better at A level or A in AS level
- chemistry — D grade or better at A level or A in AS level**.

* Including achievement standards 91578 — ’Apply differentiation methods in solving problems’ and 91579 — ’Apply integration methods in solving problems’.

** The chemistry component is not required for the following Engineering disciplines: Computer; Electrical and Electronic; Mechatronics; Software Engineering.

Disciplines

- Chemical and Process Engineering
- Minors offered in Bioprocess Engineering, Energy Processing Technologies, and Environmental Process Engineering†
- Civil Engineering
- Minors offered in Water and Environmental Systems Engineering† and Structural Engineering†
- Computer Engineering
- Minor offered in Communications and Network Engineering
- Electrical and Electronic Engineering
- Minor offered in Power Engineering
- Forest Engineering
- Mechanical Engineering
- Minor offered in Biomedical Engineering
- Mechatronics Engineering
- Natural Resources Engineering
- Software Engineering

† Subject to Te Pōkai Tara | Universities New Zealand CUAP approval, due July 2020.

Career opportunities

Graduates have a wide range of employment opportunities, from private companies and consultancies through to government agencies. Many engineers progress into management.

www.canterbury.ac.nz/careers

Bachelor of Engineering with Honours – typical degree structure

First Year

<table>
<thead>
<tr>
<th>ENGR 100</th>
<th>ENGR 101</th>
<th>EMTH 118</th>
<th>EMTH 119</th>
<th>PHYS 101</th>
<th>COSC 131</th>
<th>100 Level</th>
<th>100 Level</th>
<th>100 Level</th>
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</table>

Second Year

<table>
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<tr>
<th>ENGR 200</th>
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Third Year

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<th>ENGR 101</th>
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</table>

Fourth Year

- Zero-points, zero-fees courses
- Required First Year courses in Engineering, Engineering Mathematics, Computer Science, and Physics
- Other First Year courses from Engineering or other subjects (depending on discipline)
- Three years of study in one of the Engineering disciplines

Each small block represents a 15-point course. However, some courses may be 30 points (or more). For full course requirements, go to www.canterbury.ac.nz/regulations.

Top achievers

Direct entry to the second year of Engineering is offered to students who have achieved excellent results in all relevant subjects.

Alternatively, a Modified First Year is offered to students who have taken the MATH 199 or relevant STAR Science courses, and/or have achieved excellent results in some subjects. You may be exempt from taking some of the required courses in the first year and offered advanced/interest courses in their place.

Introductory pathway

If you did not achieve enough credits, you can take introductory courses in specific subjects to start with (eg, MATH 101, PHYS 111, and CHEM 114). You could then take the first year courses in Semester 2 and over summer, or do an extra year of study.

Degree structure

The first year is comprised of nine courses (120 points). You study six compulsory courses, and three further first-year courses which vary depending on which discipline you want to specialise in.

Your first year is followed by three years of study in one of the Engineering disciplines. Entry into the disciplines is limited and based on your performance in the first year(s). All students must also complete 800 hours (approx. 100 days) of practical work placement.

As a BE(Hons) student you are able to take the Diploma in Global Humanitarian Engineering at the same time (see page 17).
Bachelor of Forestry Science. BForSc

The Bachelor of Forestry Science (BForSc) is a professional degree offered by Te Kura Ngahere School of Forestry. It is an interdisciplinary degree that prepares graduates for managing forest resources by combining core science courses with management, commerce, and technology.

Small classes and field trips make for an engaging and rewarding learning experience at UC. Forestry Science graduates are highly sought after by employers and follow exciting and rewarding career paths.

Recommended preparation

The Bachelor of Forestry Science is open to all students who gain University Entrance. It is recommended that prospective students take NCEA Level 3 biology and maths, including statistics and probability — or the IB/Cambridge equivalent.

You may be able to fast-track your degree and gain direct entry to the second year if you have excellent Year 13 results or a New Zealand Certificate in Science with outstanding merit. It is possible to gain entry into the second or third year of study with a Bachelor of Science (BSc) or a New Zealand Diploma in Forestry with outstanding merit.

If you have not studied Year 13 statistics, or if you feel you have a weak background in these subjects, you should consider enrolling in a UC Headstart preparatory course over summer.

Degree structure

The BForSc requires a total of 480 points over four years. The first year provides a strong base in pure science, which is necessary for the professional study of Forestry Science.

First year courses cover a broad range of topics from trees, forests, and the environment to the commercial aspects of forestry and the importance of ecology, diversity, and conservation. First year electives can complement the degree or be of general interest to students.

In the second, third, and fourth years, you will then apply your knowledge to the forest situation, with elective options available in the third and fourth years.

It is possible to study the first year of the BForSc at other Aotearoa New Zealand universities. Students considering this option should consult Te Kura Ngahere | School of Forestry for their course selection, which would include FORE 102 Forests and Societies or FORE 105 Forests of the World (available by distance).

www.canterbury.ac.nz/regulations

Bachelor of Forestry Science with Honours

Students with a good grade average across 200 and 300-level courses may be invited to undertake honours as part of the fourth year of their degree. Honours involves the completion of a research course FORE 414 Dissertation.

Double degrees

You can combine the Forestry Science degree with the study of another degree, such as a Bachelor of Commerce (BCom) or Bachelor of Science (BSc) degree. Normally you can complete the two degrees in five years, but some degree combinations may take longer. It is also possible to complete a BCom degree with a strong Forestry emphasis. If you are considering a double degree you should consult Te Kura Ngahere | School of Forestry or Te Rōpū Takawaenga | Liaison Office before enrolling.

There is also a Forest Engineering programme at UC, which students can study as a Bachelor of Engineering with Honours in four years.

Further study

UC offers a Postgraduate Diploma in Forestry for graduates looking to update or retrain, and a master’s and PhD for those who wish to advance their Forestry Science studies and research.

Career opportunities

UC students benefit from New Zealand Institute of Forestry meetings, lectures on campus, and summer work opportunities. Some of the biggest companies in Aotearoa hire UC graduates and many obtain work overseas.

Possible careers include forest management (plantation and native forests), conservation, harvesting, wood processing, planning, policy, forest science, timber appraisal, biosecurity, forest economics, sustainability, iwi advisory, and land management.

www.canterbury.ac.nz/careers

Te Kura Ngahere | School of Forestry
T: +64 3 369 3500
E: forestry@canterbury.ac.nz
www.canterbury.ac.nz/engineering/schools/forestry

Bachelor of Forestry Science – typical degree structure

<table>
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<tr>
<th>Year 1</th>
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<td>SOIL 203</td>
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<tr>
<td>Year 3</td>
<td>FORE 307</td>
<td>FORE 316</td>
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<td>Year 4</td>
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<td>FORE 447</td>
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</table>

Each small block represents a 15-point course. Each large block represents a 30-point course.

www.canterbury.ac.nz
Bachelor of Product Design. BProdDesign

Product Design combines creative design, science, engineering, and business studies. Product designers plan and develop items for use in homes, businesses, and industry.

From creating a new lightweight kayak or a phone app, to formulating rongoā (medicinal products) or a virtual training world, studying product design will equip you for a wide range of occupations.

Graduates will be able to develop creative ideas based on their knowledge of related sciences and engineering disciplines, as well as gain the practical business skills needed to commercialise new products.

With a structure that is unique among design qualifications, this is the only university product design degree available in Te Waipounamu South Island.

Entry requirements
Entry to the BProdDesign is open to all students with entry to the University. However, it is strongly recommended that you have at least 14 credits in NCEA Level 2 science and mathematics. Those intending to take the Chemical Formulation Design major should ideally have 14 credits in NCEA Level 3 chemistry (or the IB/CIE equivalent of these).

Credits in related subjects such as digital technologies, technology, or design and visual communication would be an advantage.

For more details on recommended preparation, including an outline for different qualification frameworks, go to www.canterbury.ac.nz/engineering/product-design

Degree structure
The BProdDesign is a three-year 360 points qualification with a combination of coursework and design projects:

- 135 points of Product Design courses
- 165 points of Science and Engineering courses
- 60 points of Business or Management courses.

The first year covers four compulsory courses in Engineering, Mathematics, Management, and Product Design.

The remaining three 100-level courses vary depending on which major you choose to study.

Majors
- Applied Immersive Game Design
- Chemical Formulation Design* 
- Industrial Product Design

*Name change subject to Te Pūkaha | University of Canterbury approval, due July 2020.

Design projects will involve independent work on open-ended projects, with a mix of individual and team-based activities, under close supervision by academics with experience in product design.

www.canterbury.ac.nz/regulations

Double and conjoint degrees
It is possible to combine the study of a BProdDesign with other degrees, such as a BSc or BCom. Conjunct programmes leading to a BProdDesign/BCom or a BProdDesign/BSc can be completed in just four years. Students considering a Double or Conjunt degree should seek advice from a Te Rāngai Pūkaha | College of Engineering Student Advisor.

Further study
Students may go onto postgraduate studies with the Postgraduate Certificate in Product Design, the Master of Product Design, and the Doctor of Philosophy (PhD) in Product Design.

UC also has a wide range of relevant options for postgraduate study, including qualifications in Engineering, Computer Science, Chemistry, Biochemistry, and Business and Marketing. See page 37 for more details.

Career opportunities
The scope of product design roles is widening from the traditional design of commercial products to include the design of user experiences, systems, and processes, as well as implementing virtual reality into existing applications.

Increasingly, many product designers work in multidisciplinary teams. Graduates may be employed in large manufacturing companies, design agencies, iwi, educational and training companies, engineering consultancies, and central and local government.

They may do design work for businesses in many industries such as medical, home appliances, packaging, computing, education, graphic design, cosmetics, or therapeutics and pharmaceutical companies.

Product designers can choose to start their own company.

More broadly, BProdDesign graduates will be prepared to work in a variety of roles for modern companies that not only require a technical background, but value innovation, customer focus, and business sense.

www.canterbury.ac.nz/careers

Te Kura Hanganga Otinga | School of Product Design
T: +64 3 369 4271 or +64 3 369 4272
E: productdesign@canterbury.ac.nz
www.canterbury.ac.nz/engineering/product-design
Diploma in Global Humanitarian Engineering

This diploma will allow you to apply your knowledge in engineering humanitarian service, broaden your skills, and widen your perceptions of engineering.

The Diploma in Global Humanitarian Engineering can only be completed in parallel with a Bachelor of Engineering with Honours degree, in any engineering discipline. It is an additional qualification that can be completed in the same time it takes to complete a four-year BE(Hons) degree.

Enrolment in this diploma is open to Engineering students in their second, third, and fourth years, from any discipline. To enter, you must have successfully completed the first year and your application will need to be approved by the College of Engineering Dean (Academic).

As part of this diploma you must complete a minimum total of 120 points, including:

- 45 points of which can be cross-credited from a BE(Hons) degree
- 45 points made up of courses from a list of humanities and social sciences courses
- A 30 point capstone course in humanitarian engineering, which includes either a professional report or practical component.

www.canterbury.ac.nz/regulations

Te Rāngai Pūkaha | College of Engineering
T: +64 3 369 4271 or +64 3 369 4272
E: engdegreeadvice@canterbury.ac.nz
www.canterbury.ac.nz/engineering

‘I got to travel to Nepal as part of the Diploma. We did workshops and language lessons, then travelled to some remote villages. It was an eye-opening experience to see first-hand how foreign aid influences these places. It showed me the importance of community consultation, not just overseas, but on local projects here in New Zealand too.’

Quinn
Bachelor of Engineering with Honours in Natural Resources Engineering, and a Diploma in Global Humanitarian Engineering

Photo: Australasia’s first Global Humanitarian Engineering students literally dug deep as part of their studies, tapping into a disused water well in Ilam Fields on Te Whare Wānanga o Waitaha | University of Canterbury campus as part of a hypothetical post-disaster scenario in which the local water supply was knocked out.
Diversity Agenda has a goal of 20% more female engineers by 2021.
Engineering

BE(Hons), DipGlobalHumanEng

Engineering is a challenging and exciting field that uses physical science and mathematics to solve complex problems. Engineers must enjoy design work, thinking creatively and analytically, working as part of a team, and communicating their ideas to others.

If you are interested in developing new, innovative technology to improve the quality of our lives and provide solutions to meet the needs of our modern world, then Engineering is for you.

Engineers understand the underlying mechanisms of how things work, ensuring that almost everything that underpins our society functions effectively, safely, and efficiently. They are responsible for designing, analysing, and improving basic infrastructure; water resource management; telecommunications systems; and the generation and distribution of electricity. Engineers improve the operation of processing plants and factories, and design new medical technology, digital systems, and electronics.

Why study Engineering at UC?

As a UC Engineering student, you will have access to some of the best engineering staff and resources in the world.

- UC is ranked in the top 100 universities in the world for Civil and Structural Engineering, and in the top 250 for Electrical and Electronic Engineering and Chemical Engineering (QS World University Rankings by Subject, 2020). UC is also ranked 8th in the world for Civil Engineering (Academic Ranking of World Universities, 2019).
- UC Engineering students have access to state-of-the-art labs and facilities in all engineering departments after a $163 million investment in infrastructure, including the Engineering Core space for students.
- UC has world-class engineering facilities including a futuristic augmented reality lab.
- UC Engineering has connections with a number of international universities, and Engineering students can do a semester abroad as part of a UC Exchange programme, adding an international flavour to your studies.
- We have specially-designed computer laboratories and software as well as a specialist Te Puna Pūkaha me te Pūtaiao Engineering and Physical Science Library.
- There are numerous scholarships available to Engineering students throughout your studies, many of which are industry-funded and include summer employment opportunities.
- We host clubs such as ENSOC, Women in Engineering, and Engineers Without Borders NZ, which provide tutoring, mentoring, industry networking, community engagement opportunities, and many social activities throughout the year.
- Our programmes are accredited by Engineering New Zealand. An Engineering degree from UC is internationally recognised, allowing graduates to work overseas upon gaining their degree.
- All first year Engineering students have access to peer mentoring opportunities and a schedule of engineering events.

Recommended background

Entry into the first year is open to any student with the relevant background. See the BE(Hons) degree information on page 14 or www.canterbury.ac.nz/engineering

100-level courses

The first year of the BE(Hons) consists of five compulsory courses essential for all Engineering disciplines (see below) plus four further courses specific to the Engineering discipline(s) you are considering studying from your second year onwards.

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course title</th>
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<tbody>
<tr>
<td>ENGR 100</td>
<td>Academic Writing Assessment (0 points, no cost)</td>
</tr>
<tr>
<td>ENGR 101</td>
<td>Foundations of Engineering</td>
</tr>
<tr>
<td>EMTH 118</td>
<td>Engineering Mathematics 1A</td>
</tr>
<tr>
<td>EMTH 119</td>
<td>Engineering Mathematics 1B</td>
</tr>
<tr>
<td>PHYS 101</td>
<td>Engineering Physics A: Mechanics, Waves, Electromagnetism and Thermal Physics</td>
</tr>
<tr>
<td>COSC 131</td>
<td>Introduction to Programming for Engineers</td>
</tr>
</tbody>
</table>

Other first year courses

Students will also be required to choose their remaining four courses from Chemistry, Computer Science, Physics, or other approved subjects to complete the nine courses (120 points) required in their first year. The particular combination of courses required depends on the Engineering discipline you intend to study in the following three years.

If you are undecided on which discipline you intend to study in the following three years, the first year courses are the same for all disciplines (see below) plus four further courses specific to the Engineering discipline(s) you are considering studying from your second year onwards.

Course code Course title
ENGR 100 Academic Writing Assessment (0 points, no cost)
ENGR 101 Foundations of Engineering
EMTH 118 Engineering Mathematics 1A
EMTH 119 Engineering Mathematics 1B
PHYS 101 Engineering Physics A: Mechanics, Waves, Electromagnetism and Thermal Physics
COSC 131 Introduction to Programming for Engineers

Lizzie

Studying towards a Bachelor of Engineering with Honours in Mechanical Engineering

“The internships helped me narrow down the type of industry that would suit me, and to succeed beyond the degree. My placement took place at Hamilton Jet in Christchurch. I worked for the manufacturing engineering department. Manufacturing Engineering is an area that I thought was interesting from my third-year papers. From doing the placement, I have identified what to look out for when looking at graduate positions.”
Entry into the following years of the Engineering programme is limited, however most students who pass their first year courses gain entry to their first or second choice of Engineering discipline. If you are not successful in gaining a place, or if you decide not to continue with Engineering, you can normally credit passes to the Bachelor of Science and other UC degrees. It is worth checking the website or contacting a Student Advisor to make sure you plan your first year to keep your options open.

200-level and beyond
Once you have completed the first year of the degree, you can apply for entry into one of the nine Engineering disciplines:

- Chemical and Process Engineering
- Civil Engineering
- Computer Engineering
- Electrical and Electronic Engineering
- Forest Engineering
- Mechanical Engineering
- Mechatronics Engineering
- Natural Resources Engineering
- Software Engineering.

Minor subjects
See page 14 for your minor options.

A Diploma in Global Humanitarian Engineering can be studied alongside any of the engineering disciplines, giving you an extra qualification and a point of difference without adding any time to your studies. Find out more at www.canterbury.ac.nz/study/undergraduate-certificates-and-diplomas/ diploma-in-global-humanitarian-engineering

Some limits on entry into each discipline apply, with selection based on your Grade Point Average achieved during the first year.

After first year, your studies will focus your learning on knowledge and skills that are relevant to your chosen Engineering discipline through a combination of lectures, laboratory work, and field classes.

In the third and fourth years, you will have the option of choosing courses which concentrate on a particular field (or fields) within your chosen Engineering discipline.

Practical work
Before graduating with the BE(Hons), you must complete 800 hours (approx. 100 days) of practical work in the engineering industry. This includes a compulsory zero fees work placement course ENGR 200 Engineering Work Experience during the second year, and further practical work normally carried out during the summer breaks of the following years.

You are also required to carry out a workshop training course or a site safety course during the second year. These courses will vary depending on Engineering discipline, and aim to prepare you in the use of common tools and equipment that you are likely to need for your practical work in industry. You must also hold a University-approved first aid certificate while enrolled in the BE(Hons).

For more information on the Engineering disciplines, see pages 20–27.

Career opportunities
Throughout their degree, students take part in practical work experience, on-campus events, careers fairs, and industry talks, giving them multiple opportunities to make industry contacts.

Engineering students work on final year projects as part of their degree, many sponsored by industry, which increases professional capability and encourage leadership, teamwork, and innovation.

Our graduates find work on projects of social, economic, and environmental significance to society. Many UC engineers progress into management or consultancy.

www.canterbury.ac.nz/careers/students/subjects

The Engineering courses here at UC not only teach you a lot about your specialisation, but also help you to develop a great set of problem-solving skills that you can apply to almost anything.

I like how with every project I work on I am exposed to more areas of research and get to learn from a range of disciplines and experts in order to come to up with solutions.’

Ben
Bachelor of Engineering with Honours in Chemical and Process Engineering
Studying towards a Master of Engineering with an endorsement in Chemical and Process Engineering
**Chemical and Process Engineering**

*BE(Hons)*

A Chemical and Process Engineering degree will develop your skills so you can add value to the world in a way that directly correlates to happiness, life-expectancy, and improves the sustainability of a modern lifestyle. You can achieve this by taking physics, chemical, or biological science ideas from the laboratory and deploying them on a commercial scale.

You will tackle society’s greatest challenges:
- Converting natural resources to high-value products
- Creating sustainable energy
- Harnessing microbes to produce designer chemicals and pharmaceuticals
- Improving society’s health and wellbeing
- Providing a sustainable food supply.

**Minor in Bioprocess Engineering**

This minor prepares biologically-minded engineers to meet industry demand for products such as medicines, vaccines, beverages, vitamins, alternative fuels, and clean water. You will learn about harnessing the natural power of bacteria and algae for creating new products and treating waste.

**Minor in Energy Processing Technologies**

This minor prepares energy-focused engineers to develop renewable and existing energy sources (such as hydrogen, solar, wind, natural gas, and oil).

You will understand how natural resources produce the power, fertilisers, and fuels that enable our society to function, and gain insight into electricity generation and storage, environmental issues, sustainable engineering, and energy stewardship.

**Minor in Environmental Process Engineering**

This minor prepares environmentally-minded engineers to meet society’s growing commitment to improving the environment. You will learn about strategies, legal requirements, and appropriate mitigation and treatment technologies for industrial pollution control, sustainability measures, and cultural issues related to environmental treatment technologies. We prepare you for designing, improving, and operating processes that treat contaminated water, air, and soil.

Why study Chemical and Process Engineering at UC?

- Our BE(Hons) in Chemical and Process Engineering is fully accredited by the Institution of Chemical Engineers (iChemE) as well as Engineering New Zealand.
- Class sizes of 60-75 students of diverse backgrounds encourage friendships and collaboration that will last the rest of your career.
- UC is ranked in the top 250 universities in the world for Chemical Engineering (QS World University Rankings by Subject, 2020).

**200-level and beyond**

Designing an entire chemical process and performing cutting-edge research is the culmination of your degree. The path starts with second year developing fundamental tools in chemical process technology, modelling, principles of biology, engineering chemistry, thermodynamics, and fluid mechanics.

The third and fourth years further develop your knowledge and skills into real applications. Specialised courses include bioprocessing, renewable energy, reaction engineering, separations, management, industrial pollution control, and advanced modelling.

In your final semester, you will be part of a four-person team in your design project, developing a complete process such as recycling and reprocessing plastic, recovering energy from sewage, creating high-value chemicals from wood, and extracting cannabidiol from cannabis. You will also complete an individual research project with one of the department’s academic staff — anything from extracting nutrients from waste food products, integrating a heating system for a hot spring resort, or developing new battery materials.

[www.canterbury.ac.nz/regulations/academic-regulations](http://www.canterbury.ac.nz/regulations/academic-regulations)

**Career opportunities**

Our previous graduates found positions in areas of renewable energy, biofuels, environmental control, consulting, fermentation, waste treatment, food production, biotechnology, pharmaceuticals, petrochemicals, resource management, and manufacturing.

Our graduates are eligible for full membership of both iChemE and Engineering New Zealand after a period of experience as a practising engineer.

[www.canterbury.ac.nz/careers](http://www.canterbury.ac.nz/careers)

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* Subject to Te Pōkai Tara | Universities New Zealand CUAP approval, due July 2020.

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**Civil Engineering**

*BE(Hons)*

Civil Engineers are entrusted to achieve a sustainable world and raise the global quality of life. They tackle challenges of the 21st century such as climate change and inequality, creating earthquake-resilient communities, and ensuring clean water for future generations.

Civil engineers are:
- Planners, designers, constructors, and operators of the built environment — the spaces where people live, and the infrastructure we depend on like buildings, bridges, transportation, drinking water, and wastewater systems
- Kaitiaki (stewards of our natural environment)
- Innovators and integrators of ideas, people, and technology
- Managers of risk and uncertainty. Civil engineers work in interdisciplinary teams and with communities, including mana whenua, to come up with cutting-edge and creative approaches to solve the complex and large-scale challenges we face.

Why study Civil Engineering at UC?

- UC is ranked 8th in the world for Civil Engineering (Academic Ranking of World Universities, 2019), and in the top 100 universities in the world for Civil and Structural Engineering (QS World University Rankings by Subject, 2020).
- World-class, high-tech laboratories on campus.
- Mentorship opportunities.
- Ability to build and compete in fun and engaging programmes, such as the bridge competition within your second year.
- Close community of students and professors.
- The Bachelor of Engineering with Honours in Civil Engineering is fully accredited by Engineering New Zealand.

[www.canterbury.ac.nz/careers](http://www.canterbury.ac.nz/careers)

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Department of Chemical and Process Engineering
T: +64 3 369 3784
[www.canterbury.ac.nz/engineering](http://www.canterbury.ac.nz/engineering)
Minor in Structural Engineering

Bridges, buildings, skyscrapers, dams, and towers are engineering structures that improve our quality of life. New materials and technologies allow us to design exciting structures to resist both natural and man-made hazards. The Christchurch and Kaikōura earthquakes demonstrated that there is still much to learn to withstand these extreme forces. UC staff are world leaders in the design and assessment of steel, concrete, and timber buildings and bridges. With this minor, you will learn state-of-the-art approaches, and gain the expertise to work in Aotearoa New Zealand and around the world in challenging and exciting large-scale structural engineering projects.

Minor in Water and Environmental Systems Engineering

The greatest challenges facing Aotearoa New Zealand and the world are dominated by environmental factors: climate change, natural hazards, river and water quality, food production, population health, etc. We need to find a way to effectively integrate the built environment with the natural environment. A minor in environmental systems focuses on solving this. The highest quality academic staff have been recruited globally to drive research and teaching activities relevant to these critical challenges. Environmental systems engineers integrate our understanding of engineering, communities, and the environment in a way that is ethical and effective.

200-level and beyond

The second and third years consist of introductory courses that provide a wide knowledge base of civil engineering. These include fluid mechanics, geotechnical engineering, materials, management, structural design, transportation, water quality, mathematics and data analysis, and systems analysis.

In the fourth year, you can choose to specialise in a specific area, or generalise. Course options include transportation, structural design, geotechnical engineering, earthquake engineering, fluid mechanics, fire engineering, engineering in developing communities, and renewable energy.

The final semester of the degree gives you the opportunity to solve real-world problems through both a research and design project. The research project is conducted with a partner, under the guidance of one of our academics. As part of the capstone design project, you join a multidisciplinary group and work on a community or industry-specific problem with specialist mentors from the Civil Engineering profession.

Career opportunities

Civil engineers have extensive career opportunities, with a strong demand in Aotearoa New Zealand and around the world. Most new graduates are employed by consultants (who design and manage), contractors (who build and maintain), or iwi, central, regional, and local government (who develop policy and manage the infrastructure of countries, cities, and communities). These jobs often involve flexible work, challenging problems, and attractive salaries, along with many international opportunities in a diverse range of fields.

Many civil engineers become experts in specialised fields to tackle the demand for climate-resilient infrastructure and support a future global population of 9 billion people. Expert areas include structural, water, geotechnical, transportation, fire and environmental engineering, and construction management.

www.canterbury.ac.nz/careers

Department of Civil and Natural Resources Engineering
T: +64 3 369 3113
www.canterbury.ac.nz/engineering/schools/cnre

Subject to Te Pōkai Tara | Universities New Zealand CUAP approval, due July 2020.

‘More than teaching you content needed for courses, university teaches you how to learn. My study has presented me with opportunities in research at two universities (UC and UoA) and in the workforce at local software engineering companies Verizon Connect and Trimble.

I feel equipped to take on IT roles not even aimed at computer engineers, because the experience I have had has prepared me to get up to speed quickly.’

Marc
Bachelor of Engineering with Honours in Computer Engineering, with a minor in Communications and Network Engineering
Computer Engineering

BE(Hons)

Computers are at the heart of most modern products, transforming them into devices capable of sensing, making intelligent decisions, and taking collaborative actions. The BE(Hons) in Computer Engineering brings together elements of electronics and software, giving you the knowledge and expertise to create the next era of powerful smart electronic devices.

This will involve building technical knowledge on sensors, controllers, processors and machine intelligence, and creativity, with a strong emphasis on application-specific design to solve real-world problems.

Portable electronics, autonomous robotics, biomedical devices, household electronics, telecommunications, manufacturing and infrastructure, and high-performance supercomputers are all associated with Computer Engineering.

Minor in Communications and Network Engineering

If you have an interest in the Internet, and specifically in the “Internet of Things”, the design and deployment of computer networks, and in a wide range of communications, the minor in Communications and Network Engineering would be a good choice to complement your Computer Engineering degree.

Aotearoa New Zealand has a large number of Internet service providers, communication and network equipment manufacturers, and infrastructure providers — spanning both major exporters and smaller companies, a number of which are based in Ōtautahi Christchurch. Currently, there is a need to increase the number of graduates with skills in both Computer and Network Engineering to fulfil these roles. Employment opportunities for graduates in this field are extensive, especially in the overseas marketplace.

Why study Computer Engineering at UC?

• The Bachelor of Engineering with Honours in Computer Engineering brings together the learning of circuit theory and digital electronics from the Electrical and Electronic Engineering degree, and computer programming, systems, and networking covered in the Computer Science degree. This provides students with the knowledge and expertise to create the next era of reliable smart electronic embedded devices.

• UC has world-class engineering facilities including a futuristic augmented reality lab.

• UC operates BlueGene, the first IBM Supercomputer in the southern hemisphere. UC HPC operates this high performance computing facility, which is available to staff and students and is an essential research tool.

• Te Rāngai Pūkaha | College of Engineering has specially-designed computer laboratories and software, as well as a specialist Te Puna Pūkaha me te Pūtaiao | Engineering and Physical Sciences Library.

200-level and beyond

The second and third years provide a wide, basic knowledge for the computer engineering professional. This includes programming and software engineering for embedded systems, digital electronics, circuits and signals, networking, operating systems, information processing, machine intelligence, and mathematics.

In the fourth year, students take courses that really solidify these subjects with practical design and build projects. Specialised optional subjects are also available on computer vision, cybersecurity, robotics, and digital signal processing. You also have the opportunity to complete an Honours industry-sponsored research project on a real-world design problem.

www.canterbury.ac.nz/regulations/academic-regulations

Career opportunities

With approximately 50% of the ICT industry in Aotearoa located in the Waitaha Canterbury region, Ōtautahi Christchurch is the ideal location for such a programme, offering abundant opportunities for work experience and excellent employment opportunities for graduates.

There are plenty of exciting job opportunities locally, nationally, and internationally for computer engineers, as they are in high demand. Many find employment with companies that create devices with embedded systems such as Tait Electronics, Allied Telesis, Fisher & Paykel, Dynamic Controls, and Trimble.

www.canterbury.ac.nz/careers

Electrical and Electronic Engineering

BE(Hons)

Electrical and Electronic Engineers harness one of the core forces of the universe to enable a sustainable future of our world and effectively combat climate change. They create systems to provide efficient and clean energy solutions for homes and industry, the hardware parts that transfer information between computers, and also the smart miniature devices we now see around us.

Digital television, unmanned aerial vehicles, robotics, medical imaging, and space exploration have all been possible in large part because of electrical and electronic engineering innovation.

Minor in Power Engineering

Efficient and sustainable power generation and transmission is highly important in our modern world. Studying the Power Engineering minor will allow you to investigate electric power generation, distribution, and usage. Systems such as generators, transformers, and motors are widely used across different industries, and therefore need graduates with the expertise to create and improve these.

You can find employment power generation companies, consultancies, transmission companies, contractors, energy retailers, equipment suppliers, and distribution companies. You may also find the knowledge gained through this minor useful in transport industries that deal with the design of electrical railways, aircraft, and electric motors.

Why study Electrical and Electronic Engineering at UC?

• UC hosts the Electric Power Engineering Centre, which coordinates a field trip for undergraduate students to visit some examples of electricity infrastructure eg, power stations.

• UC is ranked in the top 250 universities in the world for Electrical and Electronic Engineering (QS World University Rankings by Subject, 2020).

200-level and beyond

UC provides an engaging and solid programme in all core aspects of electrical and electronic engineering, as well as valuable project experience in building and testing real systems.

A significant amount of flexibility in course structure is available in the degree. Course topics include embedded computer systems (smart systems), digital electronics, robotics, renewable energy system design, nanotechnology, signal processing, communications engineering, and control systems.
All students take multiple courses in creative engineering design, such as solar-powered cars, guided rockets and robots, electric go-karts, and solar cell fabrication. The design projects give students the opportunity to apply their education and learn professional practice. The final year group projects are offered by industry sponsors who need engineering solutions in their businesses. Most honours projects are sourced from Aotearoa New Zealand industry; however, some come from large, well-known international firms.

Career opportunities
UC Electrical and Electronic Engineering graduates are well equipped to join the technological and information revolution, with a wide range of career options. Some these are an electronics design engineer, biomedical engineer, consulting engineer, entrepreneur, or an educator/researcher in industry, school, or university.

Now, and especially in the future, electrical and electronic engineers have the opportunity to develop innovative systems such as:
• new and sustainable ways of generating power from wind, hydro, and solar
• more precise and smarter medical devices, instruments, and scanners
• more efficient ways of using electric power and intelligent systems, such as autonomous cars or search-and-rescue robots
• new nano-scale devices and materials
• better ways of gathering information through sensor networks to help businesses make accurate decisions
• new ways of controlling the administration of medicines or the motion of rockets
• faster, cheaper, and more reliable ways of sending information through communication networks.

Forest Engineering
BE(Hons)
Forest engineering is a hybrid of engineering, forestry, and management. It requires people who can combine skills to solve engineering problems in the natural environment, with a focus on balancing economic, societal, and environmental requirements.

Forest engineers construct and evaluate the operational systems that make the forest industry work. This can include:
• designing and building new roads
• developing or modifying forestry equipment
• planning harvest operations
• optimising transport logistics
• integrating new technologies
• supervising employees and contractors
• ensuring safety standards are maintained.

Forest engineers work with public and governmental agencies. They look after the environment, and may steer projects through the resource consent process. Forest engineering graduates know the forest environment and forest products and processes, and they provide the essential link between the forest and the final product.

Why study Forest Engineering at UC?
• The Forest Engineering programme at UC is the only one of its kind in Australasia.
• Studying Forest Engineering includes courses and expertise taught through Te Kura Ngahere School of Forestry and the Department of Civil and Natural Resources Engineering.
• There is a real focus on ‘hands-on’ engineering practices, with many field trips to expose students to real-world engineering problems and opportunities.

200-level and beyond
The second year emphasises basic engineering subjects including forest engineering, forest economics, materials, mechanics, and forest measurement.

In the third year, this knowledge of engineering principles is consolidated and students are introduced to the principles of forest management, design, geotechnical engineering, infrastructure management, geospatial technologies in forestry, and wood science.
At this stage, there is an opportunity to go on exchange by studying at either the University of British Columbia in Vancouver, Canada, or the Virginia Polytechnic Institute and State University in Blacksburg, Virginia, USA.

Through formal exchange programmes, students spend 8–12 months in either Vancouver or Blacksburg, and no tuition fees beyond the usual UC fees are due.

The final year includes courses in harvest planning, transportation and road design, and forest engineering research. We also allow students to choose a number of electives from both Forestry and Engineering subjects, including advanced geotechnical or economics courses, or to discover new areas of study, such as international marketing.

www.canterbury.ac.nz/regulations
/academic-regulations

Career opportunities
Forest engineers have a wide skillset that provides work opportunities both at home and abroad. Graduates can take up employment in the forest industry, but because of the multidisciplinary nature of forest engineering, job opportunities are also available in areas including general engineering consultancy, local and regional councils, government agencies, resource management, and research.

Careers in these organisations are challenging, creative, stimulating, and offer great scope for advancement.

www.canterbury.ac.nz/careers

Mechanical Engineering
BE(Hons)

Mechanical engineers design and develop everything that is moving or has moving parts – from airplanes to wind turbines to dishwashers, as well as everything from macroscopic (large) down to nanoscopic (very small). Mechanical engineers are systematic thinkers with a sense of social responsibility that leads them to constantly seek better ways of doing things.

Many mechanical engineers specialise in areas such as materials, dynamics and controls, product design, manufacturing, energy and thermodynamics, and mechanics. Others cross over into other disciplines, working on everything from artificial organs in bioengineering to enhancing the field of nanotechnology.

The mechanical engineer may design a component, a machine, a system, or a process, and analyse their design using the principles of work, power, and energy to ensure the product functions safely, efficiently, reliably, and can be manufactured economically. Central to a mechanical engineer’s role is the design and the use of information technology.

Minor in Biomedical Engineering
For students who want to have a biotechnology focus and work in the medical industry, the minor in Biomedical Engineering offers a programme specialising in designing, testing, and implementing medical products for use in hospitals and clinics, and includes industry project work in this area.

As a priority industry in the 21st century, there is a growing need for life-changing engineering solutions that restore function and aid in diagnosis, monitoring, rehabilitation, and delivery of care. This field of study builds awareness and addresses challenges encompassing global health issues, for example our increasingly aging population, and a rise in illnesses from sedentary lifestyles. Biomedical Engineers will develop current and emerging devices, such as prosthetics, implants, heart-rate monitors, mobility equipment, medical imaging scanners, and assistive technologies.

Why study Mechanical Engineering at UC?
• Our students take part in a variety of research and development (R&D) projects with industry sponsors.
• UC hosts the Centre for Bioengineering, which collaborates with industry to conduct innovative research in biomedical and bioengineering areas which are adopted internationally.
• The Bachelor of Engineering with Honours in Mechanical Engineering is fully accredited by Engineering New Zealand.

‘I decided to investigate Forest Engineering and never really looked back. Because the School of Forestry is so well linked to industry you learn about things as they are being rolled out, and the courses are really up-to-date so it’s helped in both technical and practical ways.

There are so many different parts of the industry — I think a lot of people just assume that it’s only about cutting trees down, which isn’t the case at all. You can go all around the country, and most graduate packages are just as good (if not better) as other specialisations. There is a lot of scope to make a meaningful contribution through your final year project, as well as general work.’

Abby
Bachelor of Engineering with Honours in Forest Engineering
Graduate Forest Engineer, PF Olsen Ltd
200-level and beyond

The second and third years consist of compulsory courses dealing with the fundamentals of engineering science and design, and include courses on dynamics, mechanics, thermodynamics, fluid mechanics, materials, controls, and manufacturing. Most courses in Mechanical Engineering consist of lectures supplemented by tutorials and laboratory classes.

Having developed a core skillset in engineering science and design, the final year has more flexibility with a variety of elective subjects available to specialise the degree. Students select options in areas which are of particular interest to them. These include energy engineering, biomedical and bioengineering, computer-aided product development, robotics, aerodynamics, advanced materials, and acoustics, among others.

Research and Development Projects

Additional to elective courses, final year students take courses in mechanical system design, industrial management, and the Honours Research and Development Project. This unique industry project gives students the opportunity to apply their education and learn professional practice in industry-sponsored projects. These are conducted within the department under the joint supervision of staff members and an industry sponsor. Most projects are sourced from Aotearoa industry; however, some come from large, well-known international firms. This experience gives our students an employability advantage.

www.canterbury.ac.nz/regulations/academic-regulations

Career opportunities

Mechanical engineers may work in areas such as:

- product design — design and analysis of tools, toys, sporting equipment, domestic appliances, computer-aided design, finite element analysis, environmental lifecycle of products
- power generation — wind and water turbines, internal combustion engines, fuels, alternative energy sources
- transport vehicles — cars, ships, aircraft, trains, unmanned vehicles
- medical technology — medical devices for operating theatres, implants, insulin control
- building services — heating, ventilation, air conditioning, energy use analysis, water treatment plant
- manufacturing — design of manufacturing equipment, robots, design of assembly plants, industrial engineering, production management, minimisation of waste, vibration and noise
- controls — automatic control of industrial plant, instrumentation, hydraulics, pneumatics
- materials — metallurgy, composites, polymers, structural failure, recycling.

The degree programme at UC has a strong focus on engineering design and professional relevance. The programme is internationally accredited, and our graduates have gone on to excel in leading technical innovation in many sub-fields.

www.canterbury.ac.nz/careers

Mechatronics Engineering BE(Hons)

Mechatronics is the field behind the “Smart Products and Systems” that increasingly dominate many aspects of our lives. It sits at the intersection of mechanical, electrical, and computer engineering, and combines sensors, software, and motors to create innovative and amazing new devices.

These mechatronic systems can be found manipulating the smallest bits of matter, in spacecraft, as well as throughout your home and town. From smart phones and TVs, to smart energy grids to smart cars and smart medical care and devices. They are everywhere, making life better, greener, healthier, more productive, and more interesting.

During the coming decades, we will see an explosion of these automated systems further aiding our lives. Robots are widely used to automate manufacturing processes for productivity benefits, quality consistency, and reduction/elimination of physically hard and/or hazardous labour. Mobile machines, such as Unmanned Aerial Vehicle (UAV), Autonomous Underwater Vehicle (AUV), and Autonomous Ground Vehicle (AGV), are deployed to operate in such environments.

The vast discipline of Mechatronics Engineering does not stop at the visible world. Micro and nano electro-mechanical systems (MEMS/NEMS) are an ever-increasing branch of mechatronics research and technology for applications such as atom-scale microscopy and spectroscopy, micro and nano fabrication, big data storage, sensor technology, medical drug delivery, and many more.

Why study Mechatronics Engineering at UC?

- Mechatronics studies at UC is a project-based programme, with hands-on skills development and robotics laboratories throughout the degree.
- Final-year project work includes real-world research with UC’s industry partners, including commercial and industrial design.
- The Bachelor of Engineering with Honours in Mechatronics Engineering is fully accredited by Engineering New Zealand.

200-level and beyond

The programme consists of compulsory and elective courses from Mechanical Engineering, and Electrical and Electronic Engineering, as well as dedicated Mechatronics Engineering courses.

The second year introduces the topics of mechatronics design, computer systems, electronics and devices, dynamics and vibrations, machine elements, and engineering mathematics.
The third year focuses on mechatronics system design, control engineering, embedded systems, computational mechanical analysis, and power electronics. The final year allows students to take courses that suit their specific interest, and includes courses on electronics, aerodynamics, robotics, and computer vision. All students also take a course on modern control theory and complete a design and research project, which typically are real-life engineering projects offered by industry partners. This unique project approach gives our students an employability advantage at graduation.

At UC, special emphasis is placed on project-based learning that integrates mechanical, electronic, and computer engineering skills in each year.

www.canterbury.ac.nz/regulations /academic-regulations

Career opportunities

Graduates with a Mechatronics Engineering degree can take up careers in a wide spectrum of industries, including the robotics, aerospace, chemical, gaming, internet/cloud/software, defence, automotive, and manufacturing industries. Mechatronics graduates also work in businesses that require extensive computer infrastructure and algorithms, such as banking and commerce.

Within these industries, Mechatronics Engineering graduates could be design engineers, software engineers, project planners, product designers, or project managers.

www.canterbury.ac.nz/careers

Department of Mechanical Engineering
Mechatronics Programme
T: +64 3 369 2666
www.canterbury.ac.nz/engineering /schools/mechatronics

Natural Resources Engineering

BE(Hons)

Natural Resources engineers protect, improve, and maintain the sustainability of the natural resources we depend on. These resources include land, soils, water, the air and atmosphere, renewable energy, and biological resources (including agriculture and horticulture).

Natural resources engineering takes into consideration both the impact of humans on natural systems, and vice-versa. Specialists in this field work in interdisciplinary teams and partner with communities including mana whenua to come up with creative approaches to solve the complex and large-scale challenges facing our communities, like their development, food production, and the conservation and management of our natural resources.

Natural resources engineers are:
• Planners, designers, constructors, and operators of the built environment (the spaces where people live and our communities’ infrastructure systems)
• Kaitiaki (stewards of our natural environment)
• Innovators and integrators of ideas, people, and technology
• Managers of risk and uncertainty
• Leaders in discussions and decisions shaping public policy pertaining to the built environment and our community.

Why study Natural Resources Engineering at UC?
• UC is the only university in Aotearoa New Zealand that offers this programme.
• Civil and Natural Resources Engineering at UC is ranked 8th in the world for Civil Engineering (Academic World Ranking of Universities, 2019).
• World-class, high-tech laboratories on campus.
• Mentorship opportunities.
• Ability to build and compete in fun and engaging programmes, such as the bridge competition within your second year at University.
• Close community of students and professors.
• The BE(Hons) in Natural Resources Engineering is fully accredited by Engineering New Zealand.

200-level and beyond

The second and third years consist of introductory courses that provide a wide knowledge base of natural resources engineering. These include fluid mechanics, geotechnical engineering, materials management, structural design, transportation, water quality, mathematics and data analysis, and systems analysis.

In the fourth year, you can choose courses to specialise in a specific area, or generalise. Course options include ecological engineering, water resources, bio-resources engineering, land remediation, renewable energy, engineering in developing communities, geotechnical engineering, transportation, fluid mechanics, and fire engineering.

The final semester gives you the opportunity to solve real world problems through both a research and design project. The research project is conducted with a partner, under the guidance of one of our academics. As part of the capstone design project, you join a multidisciplinary group and work on a community or industry-specific problem.

www.canterbury.ac.nz/regulations /academic-regulations

Career opportunities

Natural resources engineers are scarce in the professional workplace and there are plenty of exciting careers, including research and academic opportunities in Aotearoa New Zealand and all around the world. Recent graduates have found positions with professional engineering consultancies, local and regional councils, primary industry companies, central government departments, and Crown Research Institutes.

www.canterbury.ac.nz/careers

Software Engineering

BE(Hons)

Our society relies in many ways on software or software-based systems and services, for example in transportation, entertainment, telecommunications, government, business, health, and avionics.

Very often software systems have a high degree of complexity, consisting of millions of lines of code, using a wide range of technologies, and produced by large teams of software engineers. We critically depend on their timely and cost-effective completion, and on their reliable and efficient operation. To meet all these targets, a disciplined and well-founded approach to the design, creation, operation, and maintenance of software (or software-based systems) under real-world constraints (economical, ethical, technical, legal) is needed.

The Software Engineering programme at UC is a unique blend of foundational courses in Computer Science and Engineering, and practical work through a series of projects.

Why study Software Engineering at UC?
• UC has world-class engineering facilities including a futuristic augmented reality lab.
• UC operates BlueGene, the first IBM Supercomputer in the southern hemisphere. UC HPC operates this high performance computing facility, which is available to staff and students and is an essential research tool.
• Te Rāngai Pūkaha | College of Engineering has specially-designed computer laboratories and software as well as a specialist Te Puna Pūkaha me te Pūtaha | Engineering and Physical Sciences Library.
200-level and beyond
In each year of the degree, there are foundational and advanced courses in core Computer Science and Software Engineering topics such as databases, operating systems, human-computer interaction, web-based systems, and software design and testing. Courses use a mixture of lectures, lab work, and practical projects.

An important aspect of the degree is the projects, one for each year. Students work in teams and use latest software technologies to develop and implement creative solutions to complex problems.

The project in the second year focuses on teamwork, and gaining experience with contemporary tools and technologies for testing, configuration, and build management.

The third-year project is a whole-year project with a focus on teamwork and interaction with customers and other stakeholders in an agile context.

The final-year project is a capstone project in which students apply all of their software engineering skills.

www.canterbury.ac.nz/regulations /academic-regulations

Career opportunities
There is a strong demand for Software Engineering graduates; Aotearoa New Zealand employers have commented that they often have to look overseas to find sufficiently qualified candidates who have a combination of technical expertise with good communication skills, teamwork ability, and other soft skills.

Software engineering is a widely applicable discipline and graduates are not only needed in software production companies, but also in other companies whose products involve significant amounts of software.

www.canterbury.ac.nz/careers

Department of Computer Science and Software Engineering
T: +64 3 369 2777
www.canterbury.ac.nz/engineering /schools/csse

Forestry Science

The Bachelor of Forestry Science (BForSc) is a professional degree offered by Te Kura Ngahere | School of Forestry. It is an interdisciplinary degree that prepares our graduates for managing forest resources by combining the study of core science courses with management, commerce, and technologies.

Forestry Science graduates are highly sought after by employers and follow exciting and rewarding career paths. As a graduate, you can choose a career in commercial forestry, conservation and restoration ecology, research, or policy and planning in Aotearoa New Zealand or overseas.

If you care about the management of natural resources and are interested in being part of a huge worldwide industry, of particular national relevance to Aotearoa, then forestry could be for you.

Why study Forestry Science at UC?
• UC is the only Aotearoa New Zealand university to offer a professional degree in Forestry.
• UC is located near plantations and native forests, which are used for both teaching and research, and students are able to visit other forestry organisations throughout the country.
• The School has exchange programmes with the University of British Columbia in Canada, and Virginia Polytechnic Institute and State University in the USA, which allow students to complete one or two semesters of their BForSc studies at those universities while paying UC fees.
• The BForSc equips you with a broad understanding of natural resource management issues. During the course of your studies you can specialise in a range of areas including forest engineering, wood science, forest management, forest science, forest marketing and finance, commerce, and conservation management.
• Small class sizes make the BForSc a friendly and social programme, and the Forestry Students’ Society (FORSOC) organises social functions throughout the year.
• UC Forestry students may be eligible for forestry industry scholarships. For more information, contact Te Kura Ngahere | School of Forestry.
• You may also enrol for both Forestry and Commerce, or Forestry and Science degrees, at the same time (double degree), or complete a Commerce degree with a strong Forestry emphasis.

‘Forestry Science is the best mash-up of different degrees, with a focus on trees. My study involves learning about the commercial and economic systems behind running a forest business. We learn alternative directions and mitigation strategies to prevent unsustainable and socially disruptive practices both in New Zealand and across the globe.

I have enjoyed the culture of UC the most — the mentorship opportunities have been really helpful with the transition from high school to university. I am a part of the Māori Development Team. First year students studying towards an Engineering degree are allocated two mentors who regularly hold study sessions to help with assessments and lectures.’

Robyn
Te Arawa, Ngāi Te Rangi
Studying towards a Bachelor of Forestry Science
Recipient of Ngā Karahipi Uru Rākau Scholarship
Research and fieldwork

Te Kura Ngahere | School of Forestry has excellent teaching and research facilities, and opportunities to work in the field are maximised. UC’s field stations located near Arthur’s Pass and at Kawatiri Westport are used for Forestry teaching and research.

Staff are actively engaged in research on forest management, conservation and restoration ecology, biology, silviculture, biosecurity, geospatial applications, tree and forest modelling, tree breeding, economics, harvesting and transport, timber processing, and marketing.

Te Kura Ngahere | School of Forestry is part of Te Rāngai Pūkaha | College of Engineering, and has strong links with Te Rāngai Umanga me te Ture | College of Business and Law, and Te Rāngai Pūtaiao | College of Science, which ensures that students receive a broad education and graduate with a wide range of career options.

Recommended background

The Bachelor of Forestry Science is open to all students who gain entry to the University. It is recommended that prospective students take NCEA Level 3 biology and maths, including statistics and probability — or the IB/Cambridge equivalent.

You may be able to fast-track your degree and gain direct entry to the second year, if you have excellent Year 13 results or a New Zealand Certificate in Science with outstanding merit.

It is possible to gain exemption for parts of the Forestry examinations with a Bachelor of Science (BSc) or a New Zealand Diploma in Forestry with outstanding merit.

If you have not studied Year 13 statistics, or if you feel you have a weak background in this subject, you should consider enrolling in a UC Headstart preparatory course over summer.

100-level courses

The following are the compulsory courses for the first year of the Forestry Science degree:

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course title</th>
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</thead>
<tbody>
<tr>
<td>FORE 111</td>
<td>Trees, Forests and the Environment</td>
</tr>
<tr>
<td>FORE 131</td>
<td>Trees in the Landscape</td>
</tr>
<tr>
<td>FORE 141</td>
<td>Forest Growth and Measurements</td>
</tr>
<tr>
<td>FORE 151</td>
<td>Commercial Aspects of Forestry</td>
</tr>
<tr>
<td>BIOL 112</td>
<td>Ecology, Evolution and Conservation</td>
</tr>
<tr>
<td>STAT 101</td>
<td>Statistics 1</td>
</tr>
</tbody>
</table>

Students must also take another 30 points of 100-level courses from any degree at UC in their first year.

The first year is best taken at UC, although it may be taken at any Aotearoa university. Students considering studying the first year of the Bachelor of Forestry Science at another Aotearoa university should consult Te Kura Ngahere | School of Forestry for their course selection, which would include the distance courses FORE 102 Forests and Societies or FORE 105 Forests of the World.

200-level and beyond

In the second year, the main focus is on Forestry courses with some supporting Science subjects.

In the third year, more applied Forestry courses are introduced. One further subject is taken from an option schedule available to both third and fourth-year students.

In the fourth year, students are required to take three compulsory courses and three further courses from the option schedule, which can include a course from another UC degree.

Students who attain a good Grade Point Average during the second and third years will be invited to consider undertaking honours in the final year of the degree. Those who choose to do so must complete a dissertation, which is a piece of original research on a Forestry topic usually chosen by the student.

Product Design

BProdDesign, BProdDesign/BCom, BProdDesign/BSc

Product Design is an interdisciplinary mix of creative design, with courses from science, engineering, and business.

Product designers plan and develop items for use in homes, businesses, and industry. From creating a new lightweight kayak or a phone app, to formulating natural cosmetics or a virtual training world, studying Product Design will equip you for a wide range of occupations.

UC’s Product Design degree offers majors in:

• Applied Immersive Game Design
• Chemical Formulation Design*
• Industrial Product Design.

Graduates will be able to develop creative ideas based on their knowledge of related sciences and engineering disciplines, as well as gain the practical business skills needed to commercialise new product ideas. This degree will prepare you for a modern career path in many areas of Aotearoa New Zealand’s innovative economy.

Why study Product Design at UC?

• The Bachelor of Product Design (BProdDesign) is a three-year professional degree — the only university degree of its kind in Te Waiapoulnam South Island.
• Conjoint programmes leading to a BProdDesign/BCom, or a BProdDesign/BSc, can be completed in just four years.
• Students will have access to state-of-the-art facilities such as laboratory, computer, and testing facilities.
• UC is ranked 240th in the world for Engineering and Technology, and in the top 250 universities in the world for Business and Management Studies (QS World University Rankings by Subject, 2020).

Recommended background

Entry to the BProdDesign is open to all students with entry to the University. However, it is strongly recommended that you have at least 14 credits in NCEA Level 2 science and mathematics, while those intending to take the Chemical Formulation Design* major should ideally have 14 credits in NCEA Level 3 chemistry (or the IB/CIE equivalent of these).

Credits in related subjects such as digital technologies, technology, or design and visual communication would be an advantage.

E: forestry@canterbury.ac.nz
T: +64 3 369 3500
www.canterbury.ac.nz/engineering/schools/forestry

Recommended background

The Bachelor of Product Design (BProdDesign) is a three-year professional degree — the only university degree of its kind in Te Waiapoulnam South Island.

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www.canterbury.ac.nz/engineering/product-design

* Name change subject to Te Pōkai Tara | Universities New Zealand CUAP approval, due July 2020.

www.canterbury.ac.nz 29
100-level courses
Product Design has three compulsory 100-level courses:

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course title</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROD 110</td>
<td>Product Design Principles</td>
</tr>
<tr>
<td>or ENGR 101</td>
<td>Foundations of Engineering</td>
</tr>
<tr>
<td>MGMT 100</td>
<td>Fundamentals of Management</td>
</tr>
<tr>
<td>PROD 101</td>
<td>Product Design 1</td>
</tr>
</tbody>
</table>

Students must also take one 100-level MATH or EMTH course. MATH 110 Foundations of Applied Mathematics and Statistics is recommended if you don’t have a strong mathematics background.

The majors also require additional compulsory PROD courses and courses from related subjects.

www.canterbury.ac.nz/engineering/product-design

200-level and beyond
Product Design at 200 and 300-level allows you to develop deeper understanding of the principles of product design, as well the principles of game design, industrial design, or chemical formulation design, depending upon your chosen major.

www.canterbury.ac.nz/courses

Career opportunities
The scope of product design roles is widening from the traditional commercial product design to include the design of user experiences, systems, and processes, as well as implementing virtual reality into existing applications. Increasingly, many industrial and product designers work in multidisciplinary teams.

Graduates may be employed in large manufacturing companies, design agencies, educational and training companies, game development companies, engineering consultancies, or central and local government. They may do design work for businesses in many industries such as medical, home appliances, packaging, computing, graphic design, education, cosmetics, or therapeutics and pharmaceutical companies.

More broadly, BProdDesign graduates will be prepared to work in a variety of roles for modern companies that not only require a technical background, but value innovation, customer focus, and business sense.

Product designers may choose to start their own company.

www.canterbury.ac.nz/careers/students/subjects

Te Kura Hanga Otinga | School of Product Design
T: +64 3 369 4271 or +64 3 369 4272
E: productdesign@canterbury.ac.nz
www.canterbury.ac.nz/engineering/product-design

Applied Immersive Game Design
BProdDesign

In the Applied Immersive Game Design major, you will acquire knowledge and skills in creative and technical game design, as well as business expertise within the gaming industry. You will have opportunities to design and develop games that meet end-user needs for entertainment, education, rehabilitation, and industrial applications.

Not only will you learn the theory of idea generation, game structure, and interface design, you will also gain practical experience in prototyping for a range of game engines and platforms with an emphasis on virtual, augmented, and mixed reality.

Career opportunities
The electronic entertainment and technology sector is one of the biggest earners worldwide, with the gaming industry in particular growing at an exponential rate.

Aotearoa New Zealand houses more start-up gaming developers per capita than any other country in the world, which benefit from graduates with ‘all-round’ skills — from technical aspects through to marketing and customer support — and a user-centred approach to game and software design, for example in the areas of entertainment, industrial, retail, tourism, education, behavioural intervention, robotics, and medical and rehabilitation.

Chemical Formulation Design*
BProdDesign

Chemical, biological, pharmaceutical, food, nutraceutical, and personal care products need to be crafted in a sustainable way, using active ingredients that enable their practical use. For example, to create a moisturising skin lotion that would be an attractive product for the consumer, it would need to contain moistening properties and other elements to create suitable viscosity, skin feel, and fragrance, and contain antimicrobial agents to enhance shelf life. You will explore innovative ways to better formulate these products, and to analyse existing products and suggest improvements.

This subject combined with others such as Biochemistry will help you understand the total product design process — from idea generation to commercialisation. Other skills you will gain include practical experience in product formulation prototyping, methods of analysis, commercial production, testing, and process economics.

“The School of Product Design and the faculty truly enable and guide you to come up with ideas and create solutions for day-to-day normal problems that a lot of people experience. To be completely honest, this kind of innovation is a hugely important part of our future. Especially as there is a major focus on sustainability in the course.

I would love to set up businesses around products that help people live a better life, then use the profits to give back to establishments that are doing something powerful for humanity.

I’m a dancer as well, so I would also love to choreograph and produce shows or creative arts events worldwide — creating products, and creating performances.’

Holly
Studying towards a Bachelor of Product Design in Industrial Product Design

* Name change subject to Te Pōkai Tara | Universities New Zealand CUAP approval, due July 2020.
Career opportunities

Graduates with this scientific background could pursue opportunities that lead to a career in the food, healthcare, and pharmaceutical industries. Possible jobs are formulation scientist, quality manager, chemist, laboratory technician, product/marketing manager, marketing analyst, portfolio analyst, business development manager. Some qualified product designers have chosen to start their own businesses for new product lines that they developed during their studies.

Industrial Product Design

BProdDesign

Products such as mobile phones, mobility-assist devices, automatic espresso coffee machines, microwave ovens or bicycles all have elements in both design and usability. This major will teach you how to design products that solve problems, as well as create interest for consumers.

You will also develop skills in product design methods such as sketching and computer-aided design, fluid flow, power and energy, and materials selection that is ergonomic, functional, and appealing. You will gain a practical understanding of the product design lifecycle – from idea generation to prototyping and commercialisation.

Industrial designers are imaginative, have good artistic skills, innovative, able to work well under pressure, and be good communicators who are open to criticism. They are also persuasive at selling their ideas to clients.

Career opportunities

Graduates will be able to develop creative product ideas based on their knowledge of related sciences and engineering disciplines, as well as practical business skills to commercialise these ideas.

Combining engineering and science with creative arts and business will help you shape a career with unlimited possibilities, as industrial designers work across many different industries. You can work in design departments of large manufacturing companies, design or engineering consultancies, architectural practices, or have the possibility to be self-employed with your own company.

Other example areas include furniture, electronics, packaging, medical appliances, consumer goods, vehicles, ergonomics, and recreational and sports equipment.

‘If you’re someone who likes solving riddles and puzzles, enjoys maths or music, or even design and architecture, or just likes knowing how things work, then a career in computer science or software engineering might be for you.

It was exciting to turn my hobby of programming into full-time study. The department has some of the loveliest people I’ve met in my life, and I made many friends who I still keep in touch with to this day. I was also heavily involved with CompSoc – it was a lot of fun to run, and we ran over 20 events a year!

At PageProof, I find the big advantage of small companies is the level of influence and impact you have on customers. In just a day, you can write code to make a lot customers smile and make their lives a little easier.’

Sam
Bachelor of Science with Honours in Computer Science Software Engineer, PageProof

Science

A BSc will extend your knowledge in multiple interest areas, satisfying questions you may have about the world and encouraging you to investigate even further.

Computer Science

CertSc, CertCom, BSc, BA (minor only), BCom (minor only), BSpC (minor only), BYCL (minor only)

When people think of Computer Science they often just think of programming, but there are many more aspects to the field, including interaction design, communications and networks, software design, computer security, information systems, big data, machine learning, graphics, operating systems, educational systems, artificial intelligence, and embedded systems (processors that are embedded in everything from mobile phones to cars). All of these areas are experiencing rapid growth both in Aotearoa New Zealand and internationally.

Computer Science is about helping people do their work efficiently and effectively by analysing needs and constructing appropriate solutions, such as designing systems that are fast, usable, reliable, secure, scalable, and make a positive impact on society and our environment.

Computer Science students learn techniques to tackle these challenges, for applications as diverse as monitoring the condition of patients in hospitals to designing educational games for smart phones.

Why study Computer Science at UC?

• UC is located in Waitaha Canterbury – the ‘Silicon Plains’ of Aotearoa New Zealand, where there are dozens of large, hi-tech companies employing UC graduates. Further afield, our graduates are in demand overseas and many come up with an idea for a product while studying, going on to become business owners and employers themselves.

• UC is acknowledged as a leader in Computer Science education in Aotearoa. It is the home of the award-winning Computer Science Unplugged project, and the internationally recognised Intelligent Computer Tutoring group. Several members of staff have awards for their work as computer science educators.

• We have a vibrant student community that encourages meeting up with like-minded students through clubs, including CompSoc and Women in Technology clubs. There is a good interface with industry, including an annual careers fair where students meet a host of employers.
Recommended background

It is possible to enrol in our courses with only a general computing background, but it is a significant advantage to have completed the NCEA achievement standards in programming and computer science (or IB/Cambridge equivalent).

A strong background in Year 13 calculus or statistics is recommended. A mathematical background is important for students who intend to advance beyond first year.

Advanced students

If you have very good results in NCEA programming and computer science (or IB/Cambridge equivalent), you can apply to join an advanced (‘overdrive’) class. Students with outstanding achievement in NCEA (or IB/Cambridge) and who have completed the Computer Science STAR programme can be considered for direct entry into second-year Computer Science courses, with a view to completing an honours degree in three years.

100-level courses

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course title</th>
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</thead>
<tbody>
<tr>
<td>COSC 101</td>
<td>Working in a Digital World</td>
</tr>
<tr>
<td>COSC 121</td>
<td>Introduction to Computer Programming</td>
</tr>
<tr>
<td>or COSC 131</td>
<td>Introduction to Programming for Engineers</td>
</tr>
<tr>
<td>COSC 122</td>
<td>Introduction to Computer Science</td>
</tr>
</tbody>
</table>

Students majoring in Computer Science are required to take COSC 122, MATH 102, MATH 120, and either COSC 121 or COSC 131. COSC 101 and STAT 101 is also strongly recommended for those who have not studied computer science previously.

It is possible to design a first year of study that enables you to either continue in your second year in Computer Science or go into Software Engineering, Information Systems, Data Science, Electrical and Electronic Engineering, or Computer Engineering. To keep your options open for this, talk with a Te Rāngai Pūkaha College of Engineering Student Advisor.

200-level and beyond

A variety of courses in Computer Science are available after the first year. These cover topics such as algorithms, software engineering, data communications and networking, database systems, artificial intelligence, data and network security, microprocessor systems, computer graphics, wireless security, and computer vision.

As part of the Bachelor of Science, students can also choose courses from other Science subjects and non-Science subjects.

www.canterbury.ac.nz/courses

Career opportunities

There is a strong demand for graduates who are qualified in Computer Science, particularly those with technical skills and good communication skills and teamwork ability. Waitaha Canterbury’s leading-edge IT sector is facing a shortage of qualified graduates, meaning that UC-qualified Computer Science graduates are highly sought-after.

Many employment opportunities exist with organisations that run large computer-based systems, such as finance companies, airline industries, government departments, state-owned enterprises, consultancies, and computer organisations themselves. Work with these organisations often involves international travel opportunities. Many of our students start up their own software companies.

Your degree can also be used as a good basis for a career in the many areas where computer systems are applied, including education, computer forensics, embedded systems and computer organisations themselves. Work with these organisations often involves international travel opportunities. Many of our students start up their own software companies.

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Department of Computer Science and Software Engineering

T: +64 3 369 2777
E: admin@cosc.canterbury.ac.nz
www.canterbury.ac.nz/engineering
/schools/csse

Data Science

CertSc, BSc, BA (minor only), BCom (minor only), BSpC (minor only), BYCL (minor only)

Organisations are increasingly making use of large volumes of digital data, from personal medical histories, to socio-economic statistics, to internet trends. Data science is one of the newest professions to come from this demand for effective storage, maintenance, and use of ‘big data’.

Data Science combines mathematics, statistics, computing, technology innovation, and practical results. You will study at the forefront of modern practices and issues in the digital world, including ethics and security of data, strategy development, and statistical programming.

With such a wide range of industry applications and career opportunities, Data Science has been identified as one of the most essential and employable skills of the 21st century.

Why study Data Science at UC?

• Aotearoa New Zealand is ranked as the #1 country for starting a business (World Bank Group Doing Business 2020 Report), and Ōtautahi Christchurch is home to a number of computing technology and innovation industries, with many start-up companies searching for skilled graduates from UC.

• A number of research centres at UC utilise data science, including the Toi Hangarau Geospatial Research Institute, Hangarau Tangata, Tangata Hangarau | HIT Lab NZ, Wireless Research Centre, Te Kāhui Roro Reo NZ Institute of Language, Brain and Behaviour, and Te Pokapū Aronui 3-mathihiko | UC Arts Digital Lab.

Recommended background

Year 13 studies in maths, statistics, or computing will give you a good background for your first-year courses, however these are not essential to major in Data Science.

100-level courses

The first-year, 100-level courses required to complete a Bachelor of Science majoring in Data Science are:

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course title</th>
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</thead>
<tbody>
<tr>
<td>COSC 121</td>
<td>Introduction to Computer Programming</td>
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<tr>
<td>or COSC 131</td>
<td>Introduction to Programming for Engineers</td>
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<tr>
<td>COSC 122</td>
<td>Introduction to Computer Science</td>
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<tr>
<td>MATH 102</td>
<td>Mathematics 1A</td>
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<tr>
<td>or MATH 199</td>
<td>(a STAR course for secondary school students)</td>
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<tr>
<td>STAT 101</td>
<td>Statistics 1</td>
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</tbody>
</table>
200-level and beyond

After your first year, Data Science courses will further expand on data ethics, algorithms, database systems, statistical analysis and computer modelling, and data wrangling and data mining.

www.canterbury.ac.nz/courses

Career opportunities

Graduates of Data Science will find their knowledge is in high demand, as there is a global shortage of expertise to support the steady growth in data collection and digitisation.

You can find employment in business and technology sectors as a data scientist, data advisor, data/analytics consultant, and insight analyst. With this degree you will also have a background in project implementation, research, critical analysis, problem solving, and communication skills in discussing and explaining data findings, all of which are useful skills in a number of careers.

www.canterbury.ac.nz/careers/students/subjects

School of Mathematics and Statistics
T: +64 3 369 2233
E: enquiries@math.canterbury.ac.nz
www.canterbury.ac.nz/engineering/schools/mathematics-statistics

Financial Engineering
CertSc, BSc

Want to understand the complexity of capital markets? How to manage different types of risks? Interested in studying a challenging technical degree with flexible career opportunities?

Financial Engineering is a cross-disciplinary field combining financial and economic theory with the mathematical and computational tools needed to design and develop financial products, portfolios, markets, and regulations. Financial engineers manage financial risk, identify market opportunities, design and value financial or actuarial products, and optimise investment strategies.

Similar to other professional degrees at UC, in your first year of the Bachelor of Science in Financial Engineering we will teach you technical skills and knowledge across the key disciplines of finance and economics, mathematics and statistics, and computer science and software engineering.

Why study Financial Engineering at UC?

• This is the only programme targeted towards this career in Aotearoa New Zealand and echoes trends in the UK, USA, and Europe. This subject was created in response to employer demand and international growth in Financial Engineering and related fields like the wider actuarial and business analytics industries.
• The Bachelor of Science (BSc) major offers students a cross-disciplinary pathway across commerce, science, and engineering subjects, and utilises expertise from all these areas of strength at UC.

Recommended background

Previous study of mathematics (calculus and/or statistics) is recommended at Year 13 level.
If you haven’t studied mathematics or statistics for some time or lack confidence in your skills, we help you out with Headstart courses in January/February.

www.canterbury.ac.nz/get-started/transition/headstart

‘The wide range of courses in the Financial Engineering degree was the biggest draw. I knew I wanted to study some form of mathematics/statistics at university, and Financial Engineering allowed me to tie in some Computer Science, Finance, and Economics. The Statistics major followed naturally as it strengthened the quantitative aspect of my degree.

At the end of 2017 I travelled to India as part of the NZ-India Sustainability Challenge. There I worked with a couple of students at Manipal University on VaxiBead, an app for tracking children’s vaccinations in India (and perhaps the world). I learned a lot about the state of healthcare in India and made some lifetime friends.’

Nic
Bachelor of Science in Financial Engineering and Statistics
Bachelor of Science with Honours in Computational and Applied Mathematics

www.canterbury.ac.nz
100-level courses

The first-year, 100-level courses required to complete a Bachelor of Science majoring in Financial Engineering are:

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course title</th>
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<tbody>
<tr>
<td>COSC 121</td>
<td>Introduction to Computer Programming</td>
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<tr>
<td>or COSC 131</td>
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<tr>
<td>COSC 122</td>
<td>Introduction to Computer Science</td>
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<tr>
<td>ECON 104</td>
<td>Introduction to Microeconomics</td>
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<td>or ECON 199</td>
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<td>MATH 102</td>
<td>Mathematics 1A</td>
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<tr>
<td>or MATH 199</td>
<td>(a STAR course for secondary school students)</td>
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<td>MATH 103</td>
<td>Mathematics 1B</td>
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<td>STAT 101</td>
<td>Statistics 1</td>
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</table>

Plus 30 points from 100-level Science or any other UC courses.

It is also recommended to consider studying FINC 101 Personal Finance, ACC1 102 Accounting and Financial Information, INFO 125 Introduction to Programming with Databases, or MATH 120 Discrete Mathematics depending on your specialisation interests.

200-level and beyond

The broad foundation of your first year is then built upon over the next two years, where you will undertake further core courses across the disciplines and can choose specialisations within Financial Engineering.

If you wish to major in Financial Engineering you will be required to take a number of core courses at 200 and 300-level. For the list of required courses, see the Regulations for the BSc at www.canterbury.ac.nz/regulations

www.canterbury.ac.nz/courses

Career opportunities

Upon graduation, you will be ready for the global workplace in the finance industry and related fields. You will also be well prepared for further study in this field in order to attain positions at higher technical levels.

Employers range from private industries, such as banking, investment, capital industries, security, data analysis, risk management and insurance, to the public sector, such as Te Pūtea Matua | Reserve Bank, Kaituhutuhu Kaupapa Rawa | Treasury, or regulatory bodies. Other cross-disciplinary career possibilities include investment brokers, actuaries, statisticians, and data scientists.

Previous graduates of the contributing departments from related paths of study have been employed by Macquarie Capital, Deloitte, BNY-Mellon, First NZ Capital, Te Pūtea Matua | Reserve Bank, Vero Insurance, Wynyard Security Group, and many government agencies like Kaituhutuhu Kaupapa Rawa | Treasury, Tataranga Aoteaora | Stats NZ, and Hikina Whakatutuki | Ministry of Business, Innovation and Employment.

www.canterbury.ac.nz/careers/students/subjects

Te Kura Pāngarau | School of Mathematics and Statistics
T: +64 3 369 2233
E: enquiries@math.canterbury.ac.nz
www.canterbury.ac.nz/engineering
/schools/mathematics-statistics

Mathematics

CertArts, CertSc, BA, BSc, BCom (minor only), BSpC (minor only), BYCL (minor only)

Our modern society is underpinned by many mathematical insights. Mathematics is a living subject with ideas, techniques, and theorems constantly being created, tested, and explored.

Mathematicians are at the forefront of breakthroughs in science, technology, and finance. Did you know:

• Money is kept secure when using internet banking protocols based on mathematical cryptography and prime numbers.
• Medical images such as MRI are reconstructed using mathematical tools that were first developed in the early 1800s.
• The mathematics of wavelet transformations helps us to understand seismic activity, which may one day assist us with the prediction of earthquakes.
• Mathematicians can find solutions to equations that govern the universe to help us understand physical phenomena, without the need for expensive experiments.
• Mathematical modelling can help with the protection of our native flora and fauna.
• Mathematical thought is one of the greatest human achievements, and has been around for over 4,000 years. In all these millennia, mathematicians have been one step ahead and are already preparing for the technological advances of the coming generation.

Why study Mathematics at UC?

• UC is known internationally for its involvement in Mathematics and Statistics education and research. Several members of staff have awards for their work in this area.
• Our research expertise informs our teaching.

• Every year Te Kura Pāngarau | School of Mathematics and Statistics welcomes visiting scholars on the Erskine Fellowship Programme. Students benefit greatly from their teaching and the diverse perspectives they offer.
• We actively support undergraduate research through summer projects and honours dissertations, with some of our recent budding scholars heading to Oxford, Harvard, and Yale for postgraduate work.
• We have a thriving culture that encourages meeting up with like-minded students through clubs.

Recommended background

Entry into MATH 101 and MATH 110 is open to all students with entry to the University. A background of Year 12 Mathematics is highly recommended.

Entry into MATH 102 requires 14 credits at NCEA Level 3 maths. If you haven’t studied mathematics or statistics for some time or lack confidence in your skills, we help you out with Headstart courses in January/February.

www.canterbury.ac.nz/get-started
/transition/headstart

100-level courses

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course title</th>
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<tbody>
<tr>
<td>MATH 101</td>
<td>Methods of Mathematics</td>
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<tr>
<td>MATH 102</td>
<td>Mathematics 1A</td>
</tr>
<tr>
<td>MATH 103</td>
<td>Mathematics 1B</td>
</tr>
<tr>
<td>MATH 110</td>
<td>Foundations of Applied Mathematics and Statistics</td>
</tr>
<tr>
<td>MATH 120</td>
<td>Discrete Mathematics</td>
</tr>
</tbody>
</table>

The core of the 100-level programme consists of linear algebra and calculus, found in MATH 102 and MATH 103. MATH 102 is a prerequisite for MATH 103. Together, these courses will allow you into almost any 200-level Mathematics course and are necessary for those wishing to major in Mathematics.

MATH 102 is also required or recommended for people intending to major in any of several subjects, including Economics, Statistics, Data Science, Financial Engineering, and Physics. Anyone planning to study Engineering will require the Engineering Mathematics courses EMTH 118 and EMTH 119.

MATH 120 is an introductory course in discrete mathematics, which is the basis of many areas of modern-day science including cryptography, coding theory, and computational biology. MATH 120 is required for people intending to major in Data Science and Computer Science.
200-level and beyond

UC offers a wide variety of courses at 200 and 300-level. These include courses in discrete mathematics, linear algebra, calculus, differential equations, mathematical modelling, and statistics.

If you are majoring in Mathematics, you need 45 points from selected MATH 200-level courses which must include MATH 201 and either MATH 202 or MATH 203, and at least 60 points from MATH 302–394. If you are unsure which courses best suit your needs, contact a Student Advisor.

It is good to include other subjects at 200-level - popular choices include Chemistry, Computer Science, Economics, Management, Physics, and Statistics.

www.canterbury.ac.nz/courses

Career opportunities

One of the most important qualities a Mathematics graduate develops is the ability to reason logically and in depth. Mathematics is a creative, collaborative pursuit.

Mathematics graduates are highly employable, in computing, finance, commerce, insurance, scientific institutions (such as Crown Research Institutes), law, teaching, and many other fields.

Employment opportunities are particularly good for people who combine qualifications in Mathematics with qualifications in other disciplines such as Physics, Statistics, Computer Science, Engineering, Management, and Economics.

Previous graduates have been employed by Macquarie Capital, Deloitte, BNY-Mellon, First NZ Capital, Te Pūtea Matua | Reserve Bank, Vero Insurance, Wynyard Security Group, and many government agencies like Kaitohutohu Kaupapa Raw | Treasury, Tatauranga Aotearoa | Stats NZ, and Hikina Whakatutuki | Ministry of Business, Innovation and Employment.

www.canterbury.ac.nz/careers/students/subjects

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www.canterbury.ac.nz/engineering/schools/mathematics-statistics

Statistics

CertArts, CertSc, BA, BSc, BCom (minor only), BSpC (minor only), BYCL (minor only)

We are increasingly becoming a data-driven society, with advances in technology and the accumulation of massive data.

Statisticians make sense of data, and use those insights to explain what is observed and predict what is as yet unknown. There are many avenues for study and work, from statistical theory to its application in biology, climate science, forestry, medicine, the social sciences, engineering, physics, agriculture, finance and economics, and even history and archaeology.

It is up to the statistician to use appropriate logic, collect the necessary data, develop or apply the correct methodology, and interpret the results accurately. Then there is the challenge of communicating those results to the wider public.

Some of the statistical projects done right here at UC are:

• using neural networks to predict climate extremes
• using random forest method to find rogue pine trees
• using Bayesian statistics for early prediction of grape yield
• showing equivalence of alternative test strategies to reduce the number of animal trials in the pharmaceutical industry
• using historical records to study changes in crime rates and punishment practices over the last 400 years
• studying the effects of intervention programs on the success of various student groups.

A large number of students benefit from taking an introductory course in Statistics because it is used in so many subjects, including Engineering, Physics, Computer Science, Data Science, Financial Engineering, Biological Sciences, Psychology, Forestry Science, Geography, Speech and Language Pathology, and Management.

Why study Statistics at UC?

• Every year Te Kura Pāngarau | School of Mathematics and Statistics welcomes visiting scholars on the Erskine Fellowship Programme. Students benefit greatly from their teaching and the alternative perspectives they offer.
• We actively support undergraduate research through summer projects and honours dissertations, with some of our recent budding scholars heading to Oxford, Harvard, and Yale for postgraduate work.

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• using Bayesian statistics for early prediction of grape yield
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• using historical records to study changes in crime rates and punishment practices over the last 400 years
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• We actively support undergraduate research through summer projects and honours dissertations, with some of our recent budding scholars heading to Oxford, Harvard, and Yale for postgraduate work.
• We have a thriving culture that encourages meeting up with like-minded students through clubs.
• UC has been recognised internationally for our teaching of statistics to first-year students.

Recommended background
Entry into the 100-level Statistics course is open to all students with entry to the University.
Logical thinking, a flair for numbers, curiosity, and the ability to live with uncertainty are the qualities that combine to make a good statistician. In school, it is important to do as well as possible in Year 13, particularly in statistics and/or calculus.
Students who have performed very well in Year 13 statistics and/or calculus may be eligible for direct entry into a 200-level Statistics course.

100-level courses

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course title</th>
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<tbody>
<tr>
<td>STAT 101</td>
<td>Statistics 1</td>
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</table>

The introductory Statistics course STAT 101 is designed to provide students with a solid background in statistics, critical thinking, and in the use of computers. Students use computers to graph and analyse data. Even if you are not majoring in Statistics, learning how to use Excel spreadsheets will still be a very useful part of your education at UC.
This course is taught using a novel approach, with fewer classroom-style lectures and more computer-based learning through online tutorials. There is a strong emphasis on using computers to work with data. Student feedback on this approach to learning has been very positive.
If you are planning to major in Statistics, it is recommended that you take STAT 101 and MATH 103 (depending on which degree you wish to obtain — see the regulations for the Bachelor of Arts and the Bachelor of Science).

200-level and beyond
Five 200-level courses are offered, covering a range of topics from data analysis through to inference and probability.
If you are majoring in Statistics, you need three courses from STAT 201–294 and four courses from STAT 310–394. MATH 103 (or MATH 199, a STAR course only available to secondary school students) is also required. If you are unsure which courses best suit your needs, contact a Student Advisor.
It is good to include other subjects at 200-level — popular choices include Mathematics, Data Science, Management, Economics, Physics, Chemistry, and Computer Science.

Career opportunities
There is a growing demand for data analytical skills everywhere.
Many of our graduates are employed with Tatauranga Aotearoa | Stats NZ as statisticians, and in other organisations, such as Plant and Food, Fonterra, District Health Boards, and the Department of Conservation as research officers, analysts, and statistical programmers. Crown Research Institutes also employ a large number of statisticians. Other graduates are employed in the financial sector and by insurance companies, and industrial and commercial companies. Many large companies employ statisticians to deal with the increasing demand for the collection and interpretation of data.
Many other jobs, while not requiring people with a degree in Statistics, need employees with a working knowledge of statistics, in particular competence in using statistical software packages.

Te Kura Pāngarau | School of Mathematics and Statistics
T: +64 3 369 2233
E: enquiries@math.canterbury.ac.nz
www.canterbury.ac.nz/engineering/schools/mathematics-statistics

www.canterbury.ac.nz/courses

www.canterbury.ac.nz/careers/students/subjects
The College offers taught or coursework-based qualifications as well as research-based qualifications. Further studies in Engineering, Forestry, and Product Design include postgraduate certificates, diplomas, master’s, and doctoral degrees.

These qualifications can be completed in a range of subject areas, as shown in the table.

We also offer specialist postgraduate qualifications in Fire Engineering, Human Interface Technology, Transportation Engineering, and Engineering Management.

**Erskine programme:** Usually, the College hosts up to a dozen visiting academics from top international universities as part of the University’s unique Erskine programme, providing opportunities for our students and staff to interact with world leaders in their respective fields.

Engineering, Forestry, and Product Design academics also travel overseas as part of the Erskine scheme. This allows them to increase their knowledge of teaching methods used by other institutions and bring new experiences back to UC to benefit our students.

Considerable resources are available, including well-equipped workshops, laboratories, and computer facilities, and a specialist Te Puna Pūkaha me te Pūtaiao | Engineering and Physical Sciences Library which houses over 100,000 volumes and holds over 1,000 current serial subscriptions.

Postgraduate students also benefit from the College’s close interaction with industry. Such relationships help to attract financial support for research as well as provide opportunities to establish professional networks.

A number of university and industry scholarships are also available. Many research centres are housed in Te Rāngai Pūkaha College of Engineering and there are strong relationships with other research centres at UC and in Aotearoa New Zealand — some of which are showcased on page 38.

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### Subject areas

<table>
<thead>
<tr>
<th>Subject</th>
<th>PG Cert or Dip</th>
<th>Master’s</th>
<th>PhD</th>
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</thead>
<tbody>
<tr>
<td>Applied Data Science</td>
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<td>Architectural Engineering</td>
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<td>Bioengineering</td>
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<tr>
<td>Chemical and Process Engineering</td>
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<td>Civil Engineering</td>
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<td>Computational and Applied Mathematical Sciences</td>
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<td>Computer Science</td>
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<td>Construction Management</td>
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<tr>
<td>Data Science</td>
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<tr>
<td>Digital Civil Engineering*</td>
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<td>Earthquake Engineering</td>
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<td>Electrical and Electronic Engineering</td>
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<td>Engineering</td>
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<td>Engineering Management</td>
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<td>Financial Engineering</td>
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<td>Forest Engineering</td>
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<td>Forestry Science</td>
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<td>Geotechnical Engineering*</td>
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<td>Human Interface Technology</td>
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<td>Mathematics</td>
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<td>Mechanical Engineering</td>
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<td>Renewable Energy</td>
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<td>Smart Infrastructure*</td>
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<td>Software Engineering</td>
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<td>Statistics</td>
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<td>Structural Engineering*</td>
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<td>Structural Fire Engineering*</td>
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<td>Transportation Engineering</td>
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<td>Water Engineering*</td>
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* Subject to Te Pōkai Tara | Universities New Zealand CUAP approval, due July 2020

For more information, see [www.canterbury.ac.nz/engineering/qualifications-and-courses/postgraduate-information](http://www.canterbury.ac.nz/engineering/qualifications-and-courses/postgraduate-information)
Research centres

Biomolecular Interaction Centre (BIC)
The Biomolecular Interaction Centre (BIC) is a multidisciplinary centre dedicated to the study of molecular interactions critical to biological function. Understanding biomolecular interactions is central to a range of fundamental sciences, new treatments for disease, and a wide range of highly functional products.
www.canterbury.ac.nz/bic

Centre for Bioengineering
The Centre for Bioengineering represents a group of internationally recognised researchers across numerous biomedical applications. The centre has prompted numerous clinical practice changes and scientific discoveries.
www.canterbury.ac.nz/engineering/schools/mechanical/bioengineering

Electric Power Engineering Centre (EPECentre)
The Electric Power Engineering Centre is Aotearoa New Zealand’s Centre of Research Excellence for electric power engineering. Its core areas of operation are education, research, and industry interaction, and aims to create and foster power engineering innovation.
www.canterbury.ac.nz/epecentre

Human Interface Technology Laboratory (HIT Lab NZ)
Hangarau Tangata, Tangata Hangarau | Human Interface Technology Laboratory New Zealand is a world-leading, human-computer interface research centre hosted at UC. HIT Lab NZ is focused on providing people with technological support for experiencing various realities to enhance work and daily life.
www.hitlabnz.org

Spatial Engineering Research Centre (SERC)
SERC addresses the engineering problems of modern day navigation and remote sensing geo-referenced data collection. Investigation into the links between positioning and data collection is the fundamental baseline for many geospatial sciences.
www.canterbury.ac.nz/serc

QuakeCentre
Te Pokapū Rū | Quake Centre, hosted at UC, is a dynamic partnership between the engineering industry and UC. It is funded by industry to deliver solutions to their identified needs. It has developed strong collaborations with Te Whare Wānanga o Tāmaki Makaurau | University of Auckland and other partners, to provide world-class knowledge, research, and solutions for seismic issues.
www.quakecentre.co.nz

QuakeCoRE
Te Hiranga Rū | QuakeCoRE is a Centre of Research Excellence for earthquake resilience hosted at UC. Informed by internationally-leading research excellence, the CoRE supports the development of an earthquake-resilient Aotearoa, so our communities can recover rapidly after major earthquakes through mitigation and pre-disaster preparation.
www.quakecore.nz

Wireless Research Centre (WRC)
The Wireless Research Centre (WRC) joins together leading academic researchers, technology and communication-based companies, students, and government to undertake groundbreaking research in the field of wireless communication.
www.canterbury.ac.nz/wrc

Wood Technology Research Centre
The Wood Technology Research Centre was established as a means of information exchange among staff engaged in wood-related research and to facilitate research programmes and technology transfer to end users.
www.canterbury.ac.nz/engineering/schools/forestry/research/woodtech
UC’s Te Rāngai Pūkaha College of Engineering offers many scholarships for prospective first-year students.

A few of the scholarships available specifically for Engineering, Forestry Science, and Product Design students are shown in the table. For a full list of UC scholarships (including general scholarships for all prospective students) see www.canterbury.ac.nz/scholarships

Many scholarships close on 15 August 2020 and are available for both Aotearoa New Zealand and international students. It is a good idea to apply for all the scholarships you are eligible for, as you can hold more than one scholarship at a time.

### Key dates and events

UC hosts many events for prospective students and their parents.

- **Hui Tairanga ki Ōtautahi**
  - Christchurch Information Evening – 3 June
- Information evenings in other regions around Aotearoa New Zealand – throughout May and June
- **Rā Tōmene | UC Open Day**
- Scholarships application deadline – 15 August
- **College of Engineering Final Year Projects Day** — 14 October
- Students can start their application to enrol at any time, but enrolment begins from 1 October.

Please note: At the time of print the above information is current and correct, but some dates may be subject to change. Students are advised to check www.canterbury.ac.nz/events or contact the College.

### Some scholarships for first-year students

<table>
<thead>
<tr>
<th>Scholarship name</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>UC Engineering Top Scholars Award</td>
<td>$10,000 ($5,000 per annum) x 10 awards</td>
</tr>
<tr>
<td>UC Engineering High Achievers Award</td>
<td>$3,000 ($1,500 per annum) x 30 awards</td>
</tr>
<tr>
<td>UC Product Design Scholarship</td>
<td>$10,000 ($5,000 per annum) x 10 awards</td>
</tr>
<tr>
<td>UC Electric Power Engineering Centre Scholarship (for students intending to study Electrical and Electronic Engineering)</td>
<td>Up to $15,000 x 8 awards, for up to 4 years</td>
</tr>
<tr>
<td>UC Engineering Māori Scholarship</td>
<td>$1,000–5,000 x 3 awards, for 1 year</td>
</tr>
<tr>
<td>UC Engineering Pasifika Scholarship</td>
<td>$1,000–5,000 x 3 awards, for 1 year</td>
</tr>
</tbody>
</table>
| UC College of Engineering International Scholarship (for international students) | $15,000 x 35 awards, for 1 year  
Note: Applications close on 15 August 2020, 31 October 2020, and 1 March 2021. |
| UC School of Forestry High Achievers Award | $2,000 x 5 awards, for 1 year |
| UC Computer Science High Achievers Award | $2,000 x 5 awards, for 1 year |
| UC Mathematics and Statistics High Achievers Award | $2,000 x 5 awards, for 1 year |
| UC College of Engineering Mathematics and Statistics STAR Scholarship | $5,000 per annum x 3 awards, for up to 3 years |
| AIMS Scholarship | $5,000 x unlimited awards, for 1 year |

www.canterbury.ac.nz/engineering/scholarships-and-funding
What subjects do I need to study at Year 13 to study Engineering?

NCEA Level 3 mathematics or calculus (must include achievement standards 91578 and 91579) and physics are required. NCEA Level 3 chemistry is required for most disciplines, and highly recommended for anyone considering an Engineering degree. Depending on your results from school, you may need to also enrol in summer school or pursue the First Year over a two-year track.

Is chemistry at NCEA Level 3 required for Engineering?

NCEA Level 3 chemistry is required for students who wish to pursue Civil, Natural Resources, Chemical and Process, Mechanical, and Forest Engineering disciplines.

However, if you do not have a background in chemistry, you may still be able to study these disciplines by taking an introductory chemistry course (CHEM 114 *) first, before taking the first-year Chemistry course (CHEM 111).

Do I need to gain credits at Excellence or Merit in my required mathematics and physics NCEA subjects (or equivalent at CIE or IB)?

Students require a minimum of 14 credits, at any endorsement level, in each of NCEA Level 3 mathematics or calculus (with required standards), NCEA Level 3 physics and NCEA Level 3 chemistry (for disciplines that require chemistry). We recommend you have 18 credits in each subject area to enhance chances of success.

Are there other ways into an Engineering degree?

If you have previously studied at another Aotearoa New Zealand university or polytechnic, there may be different entry levels based on your academic history and relevant work experience.

* In this course, it is assumed students have some chemistry background. Students should seek advice regarding this pathway into chemistry.

How many Engineering disciplines are there?

There are 9 Engineering disciplines within UC’s Bachelor of Engineering with Honours degree — Chemical and Process, Civil, Computer, Electrical and Electronic, Forest, Mechanical, Mechatronics, Natural Resources, and Software Engineering.

Students tailor their first-year courses to keep options open for more than one discipline. You will then apply for entry into your preferred discipline at the end of your first year, applications for which close on 1 December (at the end of your first year).

Can I switch to another degree?

Our First Year courses are designed so students can either pursue an Engineering degree in their chosen discipline or transfer to another degree, such as a Product Design or Science degree. A student who wishes to switch to Science after one year in Engineering can use their points, from passed courses, towards a Bachelor of Science without losing credits.

www.canterbury.ac.nz/engineering/qualifications-and-courses/engineering/first-year

Larissa, UC Mechanical Engineering graduate, shares her experience with year 12 female students at WiE CAN 2020, UC’s Women in Engineering residential programme. Larissa, who starred in The Great Kiwi Bake-Off, did a two-week field study in a simulated Mars mission at the Mars Desert Research Station in Utah, USA.

Can I get Direct Entry into Second Year?

If you have an excellent academic record at school, especially in mathematics and physics (and chemistry if required), you may be able to get Direct Entry into your Second Year at the College of Engineering Dean (Academic)’s discretion. Students with STAR courses (from UC or another university) will also be considered.

A Modified First Year option, which involves taking alternative or advanced courses in place of standard Engineering First Year courses, can also be offered to top students.
Useful UC links

Enrol
www.canterbury.ac.nz/enrol

Fees
www.canterbury.ac.nz/get-started/fees

Code of Practice
www.canterbury.ac.nz/support/code

Clubs and Societies
www.canterbury.ac.nz/life/studentlife/clubs

Support Services
www.canterbury.ac.nz/support

Te Rōpū Takawaenga | Liaison Office
www.canterbury.ac.nz/engage
/school-resources/liaison

Te Rōpū Rapuara | UC Careers
www.canterbury.ac.nz/careers

Te Waka Pākākano
www.canterbury.ac.nz/support/akonga-maori

UC Pasifika
www.canterbury.ac.nz/support/pasifika

Whare Hauora | UC Health Centre
www.canterbury.ac.nz/healthcentre

UC contact
T: +64 3 369 3999
Freephone in NZ: 0800 VARSITY (827 748)
E: info@canterbury.ac.nz

AskUC Chat is available between
8am–5:15pm Monday–Friday
(except NZ public holidays).
www.canterbury.ac.nz

UC social media

facebook.com/universitycanterbury

instagram.com/ucnz

twitter.com/ucnz

snapchat.com/add/uc.nz

youtube.com/UniversityCanterbury

linkedin.com/school
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