Want to ENGINEER the world you live in? Push the BOUNDARIES of TECHNOLOGY?

Know your Mind? Decide for yourself.
NAU MAI, HAERE MAI,
AND WELCOME TO THE FACULTY
OF ENGINEERING AT VICTORIA
UNIVERSITY OF WELLINGTON

INTERNATIONALLY
ACCRREDITED DEGREE

GRADUATE JOB READY

7 MAJORS:  ⫸
FROM COMPUTER GRAPHICS TO
RENEWABLE ENERGY SYSTEMS

2020

NZ’S ONLY CYBERSECURITY
UNDERGRADUATE DEGREE

WELLINGTON
INNOVATION AND TECHNOLOGY
CAPITAL OF NEW ZEALAND

LECTURERS WHO ARE EXPERTS
IN THEIR FIELD ✓

1,000+
STUDENTS

1,300+
ALUMNI

100+
SUMMER SCHOLARSHIPS

LEADERS
IN AI RESEARCH
ACCESS TO INDUSTRY CONNECTIONS:
Google, Spark, TradeMe, Weta Digital, Xero, and more
Welcome to Engineering
Accreditation
Diversity and inclusion
Āwhina
Pasifika students
Getting advice

**Bachelor of Engineering with Honours**

- Cybersecurity Engineering
- Electronic and Computer Systems Engineering
- Software Engineering

**Bachelor of Science**

- Computer Graphics
- Computer Science
- Electronic and Computer Systems
- Renewable Energy Systems

Admission
Careers
Disability Services
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Who to contact

Victoria University of Wellington has been awarded five stars overall in the QS global university ratings. In addition, the University received five stars in each of the eight categories.

Important notice: Victoria University of Wellington uses all reasonable skill and care to ensure the information contained in this document is accurate at the time of being made available. However, matters covered by this document are subject to change due to a continuous process of review, and to unanticipated circumstances. The University therefore reserves the right to make any changes without notice. So far as the law permits, the University accepts no responsibility for any loss suffered by any person due to reliance (either whole or in part) on the information contained in this document, whether direct or indirect, and whether foreseeable or not.

Cover and inside cover: Victoria University of Wellington provides its Engineering and Computer Science students the opportunity for hands-on experience in a range of digital engineering courses. Jasper Kueppers is pictured exploring the functionality of the University’s customised replica of a NASA robot, and being assisted by Kirita-Rose Escott, an assistant lecturer in the School of Engineering and Computer Science.
Welcome to Engineering

Do you want to make the next major breakthrough in technology, help save a life, build the next big game, or start the next Facebook? Are you someone who likes problem-solving, creativity, and building things? If so, welcome to the School of Engineering and Computer Science (ECS)—we can’t wait to show you what ECS has to offer you!

As Dean of the Faculty of Engineering, I often think about the things I want to achieve, especially within Victoria University of Wellington. Our student numbers are growing and, in fact, we’re the fastest-growing engineering faculty in Australasia. It’s a great time to be an ECS student! An especially warm welcome to those of you who are soon to be on campus for the first time. We’re excited about providing an environment for you to learn, to grow, and to help you to get where you want to go in the world.

You can choose the course of study that best suits your interests. Our Bachelor of Engineering with Honours programme is a four-year professional accredited degree with majors in Electronic and Computer Systems Engineering and Software Engineering. We also offer a major in Computer Science within the three-year Bachelor of Science degree. Our focus on digital-based technology provides you with the knowledge to succeed in the modern workplace—from day one you will be designing and building autonomous robots, smartphone apps, and computer games.

Technology is changing all the time—but that is our challenge. We aim to be New Zealand’s leading institution for high-tech ICT and engineering training to prepare you for the careers of the future. To achieve this, we are introducing an exciting new major in Cybersecurity in addition to our very popular Computer Graphics programme (taught by staff who have worked on The Matrix and Avatar).

We have developed a well-deserved reputation for the quality and
employability of our graduates, with many of our alumni pursuing amazing careers all over the world. But what’s also important is that, as new students, you feel a real sense of belonging to your faculty from the very beginning, that your lecturers care about your progress, and that there is support there when you need it.

Our experienced, international staff are of the highest calibre and are passionate about supporting students to follow their natural curiosity into new areas of study and research. Victoria University of Wellington is also New Zealand’s number one ranked research university, valuing the professional skills of entrepreneurship, ethics, and sustainability. We are all here to help you succeed and to make sure you maintain a healthy work–life balance at university, thanks to our exemplary pastoral care team.

We want to be New Zealand’s best high-tech engineering faculty with student wellbeing at the heart of all we do. Our motto within the School of Engineering is, “Think it! Plan it! Build it!” This motto not only refers to new technology such as the awesome robots you will be designing from your first year, but also applies to your academic career. Think about what you want! Plan how to get there! Build the skills and tools you need to do so!

It is a real privilege to be the dean of such a buzzing faculty full of dedicated staff and outstanding students. Engineers and computer scientists are some of the most sought-after professionals in today’s society, with interesting and well-paid careers. If you’re looking for a future where you can make a real difference—and one that is rewarding and enjoyable—come and join us at ECS. I sincerely look forward to announcing your name at one of our graduation ceremonies in years to come.

Professor Dale Carnegie
Dean of Engineering
The Electronic and Computer Systems Engineering (ECEN) major in the Bachelor of Engineering with Honours is fully accredited by Engineering New Zealand under the Washington Accord. Our exciting new major, Cybersecurity Engineering (CYBR) will also go through the same rigorous accreditation process.

The Software Engineering (SWEN) major in the Bachelor of Engineering with Honours has been recognised with full accreditation by both Engineering New Zealand under the Washington Accord and IT Professionals New Zealand under the Seoul Accord.

You can be confident knowing that your degree will be recognised internationally.

In a world where equality and equal opportunity for all is yet to be fully realised, we pride ourselves on creating an inclusive, welcoming environment where each and every individual can achieve their full potential.

Our commitment to non-discrimination communicates our desire to support anyone and everyone who wants to work or study with us, regardless of perceived differences—and we believe that these differences are our greatest strengths as we unite in the pursuit of academic excellence.

The Faculty of Engineering welcomes students, staff, and visitors regardless of ethnicity, gender, national origin, religion, or sexual orientation. The Faculty is committed to teaching and research that is free from all such discrimination.

In the following pages, you can read about Engineering student Hannah Craighead who is following in the footsteps of her grandmother Carol Moffatt, and learn about the teams that support and celebrate Māori and Pasifika Students.

Students from all walks of life who come to study with us experience our exemplary pastoral care and graduate with academic success and bright futures at the end of their journey with us.
Hannah Craighead may have already completed two internships at Google in Sydney and started a full-time position there, and given the graduation address at her graduation ceremony, but she’s not the first in her family to forge a career in IT. Her grandmother Carol Moffatt was not only an early adopter of computer technology in the 1970s and 1980s, she was also responsible for its introduction into New Zealand schools and awarded the Queen’s Service Order (QSO) for her efforts.

“Carol always used to bring home really cool gadgets, like the first iPads,” says Hannah, whose major was Software Engineering, “so that’s probably where my love for programming first began. My dream was always to work for Google, but I thought I wasn’t smart enough to do tech at university.”

However, when she attended an open day at Victoria University of Wellington, she got talking to Associate Professor Peter Andreeae who challenged her perceptions. “I told him I hadn’t done coding or electronics at college so I couldn’t study computer science, but he convinced me that it didn’t matter. And despite a rocky first day, feeling intimidated by another student who had done electronics at school, he was right, and I’m so glad I listened to him rather than my self-doubt!”

Hannah says she learnt from her grandmother to ask questions and that helped get her through to her final (Honours) year. “If I didn’t understand something, I just asked and the tutors were only too happy to help.”

Another skill she learnt at her grandmother’s knee was to be open to new opportunities.

“Carol started her career as a teacher, but she had the foresight to see that computers had huge potential to help kids learn,” says Hannah. She took a polytech class in 1980 to learn basic programming (followed by numerous other qualifications) and she’ve been using her education background and IT skills to improve education outcomes in New Zealand ever since.

Understandably, Carol is “proud and delighted” that Hannah has chosen to follow in her footsteps. “I want to travel and learn new things,” says Hannah, “and we agree that a career in IT will give me opportunities to do both.”
At Āwhina, our kaupapa (goal) is to provide academic and holistic support for Māori students enrolled in any degree or course. Our experienced staff offer one-on-one advising and mentoring sessions, tutorials, and study wānanga, and a range of workshops to help you achieve your study goals. Our culturally inclusive environment includes whānau rooms with computer facilities, study areas, free tea and coffee, a small kitchenette to prepare food, and space to meet with peers or tuākana (older students). We can help you transition successfully from secondary education or work into tertiary education. Nau mai, haere mai—come and visit us at the Kelburn, Pipitea, and Te Aro campus spaces listed on our webpage.

SCHOOLS AND COMMUNITY OUTREACH

Tūhono i te Ao / Connecting the Worlds is the Āwhina outreach programme. It aims to provide an engaging platform that will excite and inspire Māori youth and communities into science, technology, engineering, architecture, and design using mātauranga Māori (Māori knowledge) and astronomy as a focal point. We do this by holding wānanga (gatherings) throughout the country where we combine science and mātauranga Māori activities for participants. The activities are exciting, interactive, and a great way to showcase the wonders of two worlds coming together.

Naku te rourou nau te rourou ka ora ai te iwi.

With your basket and my basket, the people will live.

ĀWHINA

Room CO133, Cotton Building, Kelburn Campus

04 463 5987

awhina@vuw.ac.nz

www.victoria.ac.nz/awhina

Raiatea Barlow-Kameta

I was raised in Tauranga, but have been living in Wellington for the past five years where I’ve completed a Bachelor of Science in Geology and Geography and am now pursuing a Master of Science in Physical Geography.

Becoming an Āwhina mentor allowed me to support others. I’ve come to realise that we all must do our part to help each other (‘when one falls down, we pull them back up’). I really enjoy speaking to young people out of university and, hopefully, inspiring them to pursue higher education. Āwhina has helped me with multiple tasks such as scholarship applications, mentoring, assignments, and learning how to effectively communicate and be part of a team.

Once I graduate, I’m hoping to go into a career in climate change science or research and, from there, to give back to my iwi for their support through my studies.
Ali Leota

I was born in Dunedin, raised in Porirua, and am in my third year of study.

Being a mentor has reminded me of the key cultural concepts I was raised on—fa’aaloalo (respect), alofa (love), and tautua (service). The role of a mentor has allowed me to incorporate all three aspects into the real world. I am really supportive of the kaupapa of giving back and I am keen to help raise the visibility of the STEM area for our Pasifika students and communities.

Staff and fellow mentors have offered great course advice and networking opportunities. Even better, advice always encompasses my culture.

After I graduate, I’m hoping to have a satisfying and successful career in inspiring other young Pasifika people to be the difference in their communities, whether it is through science, health, or policy.

Teneya Nicol

I have completed a Bachelor of Science in Marine Biology and am now studying for a Master of Science in Science in Society.

I decided to become a mentor to help students in the years below me succeed and enjoy the courses as I did. I believe that if we work together as whānau, we succeed together as whānau. Being a mentor has given me the opportunity to be a student leader, to go on outreach, and to make connections with people in other organisations and industries.

Through the support of this group, I have been able to succeed with my courses. I highly recommend getting involved. Make the most of the support around you, ask for help early—don’t wait until it’s too late. Get involved with some of the activities and events that happen around campus and have fun.
Pasifika engagement advisers and mentoring coordinators foster Pasifika learning and teaching communities in an environment that is welcoming, safe, and focused on academic excellence, personal growth, and wellbeing. Our students have access to a mentoring programme, course-specific study sessions, exam-oriented preparation, and workshops that support learning and development as well as meeting cultural desires. Holistic support could include chatting over a cup of tea, devising time-management strategies, and discussing learning objectives. Our team is here to help you navigate the crossing into tertiary study and looks forward to welcoming you on board. We have Pasifika spaces at the Kelburn, Pipitea, and Te Aro campuses.

Pasifika Haos
15 Mount Street
Kelburn Campus

✉ pasifika@vuw.ac.nz

ℹ www.victoria.ac.nz/pasifika
We are committed to supporting students throughout their studies. University programmes have a higher workload than students would have experienced at secondary school, and many students are away from home for the first time.

Right from the start, our student development and engagement manager Craig Watterson, and our senior tutors Howard Lukefahr and Morgan Atkins assist new students in the transition to university study. Craig, Howard, and Morgan maintain regular contact with students who need help with life and study issues.

Craig is here to offer advice, support, and help. He has extensive knowledge about the services offered by the University, including academic support, clubs, and financial, medical, and counselling services. Craig is also the first-year programme director and is responsible for co-ordinating first-year teaching across the School, so he has a wealth of knowledge about the courses and processes.

Howard is our go-to person for subject tutorials and specific academic support in Engineering, Mathematics, Physics, and our core Engineering courses. Howard really enjoys helping students achieve their study goals and conducts voluntary extra evening tutorials. These tutorials have been a huge success and are designed to help with assignments and subject revision for the first-year Engineering, Mathematics, Physics, Computer Science, and Computer Graphics courses. He also offers some individual one-to-one help. You will see Howard teaching in many of our regular weekday laboratories and tutorials.

Morgan is our resident computer programming wizard. Like Howard, Morgan runs tutorials and help sessions for some of our key Software Engineering and Computer Science courses. First-year students will encounter Morgan teaching and supervising laboratories and tutorials in the core first-year second-trimester programming course COMP 103, and then regularly in many second-year courses. Both Morgan and Howard are passionate educators who sought out positions helping students and have a wealth of professional and educational backgrounds.

No question is a silly question at university and we want to help all our students. If you want advice about what course to take in your first year, or need help with your study, contact Craig at omg-help@ecs.vuw.ac.nz
MAJORS

The four-year Bachelor of Engineering with Honours, or BE(Hons), is a professional degree with a choice of three majors: Cybersecurity Engineering (CYBR), Electronic and Computer Systems Engineering (ECEN), and Software Engineering (SWEN).

SECONDARY SCHOOL SUBJECTS

If you are planning to enrol in a BE(Hons), it is important to study Computing, Mathematics with Calculus, Statistics, and Technology at school. We also encourage you to take Physics.

- You should have at least 16 NCEA Level 3 credits in Mathematics (or equivalent secondary school qualification).
- We encourage students taking ECEN to have 18 NCEA Level 3 credits in Physics, including standards AS91524 (mechanical systems), AS91526 (electrical systems), and AS91523 (wave systems), or AS9152 (practical investigation), or an equivalent secondary school qualification.

Bridging courses are available if you do not have the prerequisites. All students are expected to have experience using computers, although the programme does not assume any background in computer programming. If you have a background in computer programming—14 NCEA AS Level 3 credits in Digital Technology, including 6 credits in Computer Programming—you may wish to enrol in COMP 112 instead of COMP 102.

The University’s BE(Hons) focuses on the design and implementation of real-world systems. A common thread of practical application of knowledge runs through the degree, helping you build a solid grounding in the underlying principles of mathematics and science—essential for professional engineers.

Design and project work are common throughout the degree, giving you an understanding of the practical aspects of engineering design and development. All students undertake a major group project in their third year and a research project during the last year of the programme. These projects aim to help you produce a real engineering system.

In addition, the BE(Hons) programme provides training for you in the practical skills required to be a success in your chosen career. This is complemented by 800 hours of industrial work placement.

The solid scientific underpinnings of the programme, in combination with extensive practical work, will enable you to thrive in a range of careers, including software and systems development for applications that underpin all areas of society; communication network design and management in a massively connected world; cybersecurity analyst and developer for a new era of cyber threats; and electronics, mechatronics, and robot design for next-generation devices. Our graduates are creating new systems that make more efficient use of our limited energy supplies, increase the safety of our transportation systems, and improve our healthcare—not to mention enhance our entertainment.
FIRST-YEAR PROGRAMME STRUCTURE

The set of courses you choose in your first year of Engineering will depend, in part, on which major you intend to take.

Most students should attempt to complete all the requirements of Part One of the BE(Hons) programme in their first year. A full programme of study consists of eight courses per year. SWEN students will need to complete a physics-related paper in their first two years, and courses from a range of options, including CGRA 151, ENGR 141, and ENGR 142.

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<tr>
<th>All first-year CYBR students should take these 100-level Part One courses</th>
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All first-year SWEN students should take these 100-level Part One courses

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<td>ENGR 123 Engineering Mathematics with Logic and Statistics</td>
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<tr>
<td>CYBR 171 Cybersecurity Fundamentals</td>
<td>Optional course of your choosing: many students take CGRA 151 Introduction to Computer Graphics</td>
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All first-year ECEN students should take these 100-level Part One courses

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<td>ENGR 141 Engineering Science</td>
<td>ENGR 142 Engineering Physics for Electronic and Computer Systems</td>
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Students may substitute MATH 142 and MATH 151 for ENGR 121 and ENGR 122 if they intend to take mathematics at higher levels.
Cybersecurity is at the forefront of modern technology and focuses on protecting and safeguarding computers, networks, and data from unauthorised access, attack, and damage. You will learn how to recognise these security threats and the practical skills needed to prevent them.

Your study will include a range of technology-based courses and interdisciplinary courses that include aspects of law, policy, social and human factors, ethics, and risk management.

The cybersecurity major has been developed to meet the increasing demand for cybersecurity graduates.

Our Cybersecurity programme will give you the technical and communication skills needed to excel in this profession. You will:

- apply secure programming techniques, software development methods, cryptographic mechanisms, and assessment of human factors to networks and operating systems to develop secure computer systems, security mechanisms, and assessment tools
- learn how to apply adversarial thinking, security evaluation techniques, risk assessment methodologies, and incident handling best practices to the operation, maintenance, and analysis of computer systems, including hardware, software, networks, and people
- develop an understanding of the role of integrity, ethical behaviour, legal constraints, relevant professional standards, and local and international policy in practising as a computer security professional
- gain knowledge of a range of fundamental principles of security engineering that will provide the basis for future learning and enable you to adapt to the rapid development of the field
- gain experience working in a team to build, operate, analyse, and test the security of computer systems
- learn skills that enable you to communicate confidently, including writing effective reports, policies, and procedures, summarising information, giving effective oral presentations, and delivering clear oral instructions.

### All first-year CYBR students should take these 100-level Part One courses

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As an artist, Amber Joseph was initially surprised by how creative she found software engineering. Now, her goal is to create beautiful, innovative, and intuitive software that improves the lives of users.

“Being able to code is, I believe, the fastest, most scalable, creative, and effective way to share your ideas with the world. It has no boundaries on what you can create—be it an app, website, or software for your car—and can change millions of people’s lives all over the world. If you’re looking for a creative challenge to push your limits and make you really think, engineering is the field you need to be in.

“Cybersecurity is something I really enjoy because it combines problem-solving with human behaviour. In a lot of ways, it’s like a game of capture the flag—who can find the best way to protect their own flag and how can we capture the other teams’ flags? The mix of team work, critical thinking, and competition is addictive. In many ways, it is that creative aspect of thinking up new strategies that I love most.”

Amber was the recipient of the Prime Minister’s Scholarship for Asia and the Government Communications Security Bureau Tertiary Scholarship for women studying science, technology, engineering, and mathematics. She says the support of lecturers and tutors has been invaluable in gaining these scholarships. “They often go out of their way to help you understand a topic or answer any questions you may have. The community of students taking the course is also extremely supportive and, in all honesty, the biggest asset in terms of study.

“Wellington for me has truly become home. I love the vibrant city, with its secret cafés, twisty stairs, and arty street scene. There are always events on, including live music, art exhibitions, and performances. Victoria University of Wellington is a perfect match for the city. It’s fun, vibrant, and exciting. You really are in the centre of New Zealand in terms of technology, government, and experiences.”
Electronic and computer systems engineers can be found in many areas, covering communications and control, electronic design, power systems, and signal processing. Your programme will therefore be broad, covering a range of engineering and scientific ideas.

During the first year of studies in Electronic and Computer Systems Engineering, you will learn digital electronics and build a robot, while developing sound foundations in Computer Science, Mathematics, and Physics.

In the later years of the programme, you will further develop your design skills as you study various majors within the field. The courses include extensive practical components, culminating with a full-year engineering project in your final year. As the programme progresses, you will be able to concentrate on areas of the curriculum that particularly interest you.

There are many careers available to graduates of the Electronic and Computer Systems Engineering programme. Your degree will provide you with a range of electronic and mechanical hardware design skills. You will also understand how to use embedded programming, control engineering and communication techniques and signal processing to produce the intelligence needed for modern devices. Whatever field you decide to pursue, your studies will provide you with the tools for a career of solving real problems.

**All first-year ECEN students should take these 100-level Part One courses**

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While he was still a PhD student in the Faculty, now-lecturer Dr Daniel Burmester was on a mission to slash the cost of living and, at the same time, reduce New Zealand’s carbon emissions.

Daniel’s PhD project was on residential renewable energy systems that aim to make renewable energy financially viable for homeowners.

“In New Zealand, selling power back to the grid is uneconomical,” says Daniel. “To get value for money from a solar installation, the best bet for a homeowner is to use as much of their produced power as possible. The system I looked at shifts around background household devices to make the most of power being produced during the day.”

Daniel also completed his undergraduate degree at Victoria University of Wellington and, in his third year, was selected to undertake a summer scholarship project installing a micro wind turbine.

“During the project, my ethics and research interests aligned—and I wanted to continue exploring the subject,” he says. “People know about climate change, but addressing a massive issue like that is problematic for them because they feel like they can’t make a difference on an individual level.

“If we can break it down to deliver a system that saves people money within a reasonable timeframe, it will be an incentive for people to switch to carbon-neutral options to run their homes.”

Daniel enjoyed working with his supervisor, lecturer Dr Ramesh Rayudu, in an area that is advancing so quickly.

“There is so much happening in the renewable energy field and there are so many research avenues—it’s a really exciting area to be involved in,” says Daniel.

“I would love to see a practical realisation of the system I am working on.”

Now a lecturer in the School of Engineering and Computer Science, Daniel is happy to be continuing his research and passing on his knowledge to others.
SOFTWARE ENGINEERING

Software engineering drives many of today’s most exciting and innovative companies, such as Google, Twitter, Facebook, Dropbox, and Trade Me. Software makes these sophisticated systems and networks possible and, in doing so, opens up new opportunities for collaboration, sharing, trade, and enterprise. Without software systems and networks, there would be no social media, Skype, Google Maps, Wikipedia, online games, and communities. This is equally true of the developing world, where software helps people cross previously impossible boundaries. Software engineers are becoming the most sought-after graduates because they provide the core skills on which the modern world is built.

In the future, the physical world will be networked together by billions or trillions of sensors spread across the globe, allowing us to hear the ‘heartbeat’ of the world. Monitoring this heartbeat could help us solve problems such as climate change or world hunger. By becoming a software engineer, you can become an active participant of this revolution in human society and go from being a consumer to a creator.

Our Software Engineering programme will give you the technical and communication skills needed to excel in this profession. You will:

■ learn how to write code proficiently in modern object-oriented languages
■ learn both the principles and the practice of networking and distributed systems
■ learn the importance of developing good user interfaces
■ learn about penetration testing and network security
■ learn how to design and implement complex algorithms
■ work in teams, using state-of-the-art tools to manage your code
■ gain experience with the art of ‘sprinting’ through agile software development
■ have opportunities to contribute to large open-source projects to enhance your portfolio
■ cut your teeth on important practical topics, including compilers, databases, design patterns, distributed systems, the internet of things, software modelling, touch-screen and gesture-based interfaces, server-side and app development, web services, and more
■ get exposure to the latest research being conducted by our world-renowned scientists.

Graduates from the University’s Software Engineering programme have gone on to work for companies such as Xero, Trade Me, Weta, Google, Apple, Intel, LinkedIn, Microsoft, MetService, Amazon, Facebook, Aura Information Security, Harmonic, CityLink, and Palantir. Others have joined exciting start-ups, developing technology for mobile phones, financial models, and more.
All first-year SWEN students should take these 100-level Part One courses

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</tr>
<tr>
<td>ENGR 121 Engineering Mathematics Foundations</td>
<td>ENGR 123 Engineering Mathematics with Logic and Statistics</td>
</tr>
<tr>
<td>CYBR 171 Cybersecurity Fundamentals</td>
<td>Optional course of your choosing: many students take CGRA 151 Introduction to Computer Graphics</td>
</tr>
</tbody>
</table>

The BE(Hons) degree also requires a first-year physics-related course that can be chosen from a list of introductory physics courses that includes CGRA 151 Introduction to Computer Graphics due to its coverage of basic physics of objects in the real world. Or, you can take ENGR 141 in your second year.

Students who choose to study Software Engineering can optionally elect to complete one of two specialisations—Artificial Intelligence or Networked Applications—by choosing specific courses within the major.
With an interest in technology, problem-solving, and creativity, Divya Patel realised that software engineering was the perfect match for her.

A Bachelor of Engineering with Honours, majoring in Software Engineering, was a natural progression and a great way of exploring the creative side of engineering. Divya really enjoyed the practical component of the programme.

“As I got further into the programme, I found that a larger proportion of the courses were very practically focused and had a range of group projects. In industry you work with a team, so learning how to handle team projects was very useful.

“Some highlights for me include developing a 3D game, designing an online shopping platform, creating a water-quality-testing pod for an underwater remotely operated vehicle, and making a website to showcase a range of different interactive visualisations.”

The Engineering degree requires students to complete at least 800 hours of practical work experience during their years of study.

Divya found that this particular component of the degree prepared her for the working world. “While studying at Victoria University of Wellington, I completed two internships as a software engineer at Google. Through these, not only did I develop my technical skills, but I also improved my communication skills and learnt a lot about project management within a wider organisation.

“I currently work at Xero as a graduate data scientist. In my final year of study, I enjoyed the machine learning courses I took. I found them to be challenging, but rewarding, and decided that I wanted to explore the area further. My current job allows me to do this, with a large part of my time dedicated to learning more about machine learning models and what can be achieved by applying them in various areas of the business.

“Data science is a new area for me. I hope to become better in this area and continue working in an environment where I am constantly challenged and can do work that I love.”
The Bachelor of Science (BSc) comprises three-year programmes in Computer Graphics (CGRA), Computer Science (COMP), Electronic and Computer Systems (ELCO), and Renewable Energy (RESY), enabling careers in artificial intelligence, communications, computer graphics, games development, computer systems, mechatronics, distributed systems, electronics, logic, computation, software engineering, and sustainable energy. These programmes can also lead to postgraduate Honours and Master’s degrees and PhDs.
Humans are visual creatures: most of our information about the world comes through our eyes. Computer graphics is the dominant way computers communicate with people. Computer games and movie visual effects are the most obvious applications, but your smart phone, tablet, or desktop computer would be much less useful without its graphical user interface. Live-action TV and movies are all put through digital post-production, where computer graphics is used to tweak, enhance, and alter the content. Even the weather forecast on TV is presented using 3D computer graphics.

Computer graphics is a large, sophisticated field. We use vast amounts of computing power to create animated movies that are practically indistinguishable from reality. We build artificial worlds that we can interact with in real time, for both entertainment and simulation. We can visualise enormous quantities of scientific or medical data and make quick, accurate judgements because a visual representation is such a good fit to our natural abilities.

Victoria University of Wellington’s Computer Graphics programme is unique in Australasia. It was developed in collaboration with the thriving Wellington graphics industry in movie visual effects (for example, at Weta Digital) and computer games (such as local mobile game company PikPok). It builds on the University’s substantial expertise in Engineering, Computer Science, Design, and Mathematics. It aims to produce people who can build the next generation of computer graphics tools for use by artists, designers, scientists, and medics.

You will learn the principles and practice of computer graphics, taught by our team of world-class experts. This includes how we programme computers to do 2D and 3D modelling, rendering, lighting, texturing, ray tracing, and animation. Supporting the core material are courses from the Computer Science major, in which you learn the key concepts of algorithm design. You will also spend time at the School of Design learning, alongside future designers, how the computer tools are used in practice. At the other end of our spectrum of courses, you will learn the mathematics needed to allow you to build new computer tools to create visual effects as yet undreamed of.
First-year programme

The Computer Graphics major has four streams in the first-year programme, each with two courses.

**COMPUTER GRAPHICS**
- ANFX 101 Animation and Visual Effects I
- CGRA 151 Introduction to Computer Graphics

**COMPUTER PROGRAMMING**
- COMP 102 Introduction to Computer Program Design or COMP 112 Introduction to Computer Science*
- COMP 103 Introduction to Data Structures and Algorithms

**FUNDAMENTAL MATHEMATICS**
- ENGR 121 Engineering Mathematics Foundations or MATH 151 Algebra*
- ENGR 123 Engineering Mathematics with Logic and Statistics or MATH 161 Discrete Mathematics and Logic*

**OPTIONS**
- Two courses of your own choice +

* Alternative course. COMP 112 is for those with substantial prior programming experience. MATH 151 and MATH 161 are for those who plan to go on to take mathematics courses in later years.

+ The two optional courses can be taken from the University’s range of first-year courses. We offer guidance about what would be appropriate. If you want to consider optional courses in the School of Design in later years, you should consider taking DSDN 101 Design Visualisation. ENGR 122 Engineering Mathematics with Calculus is a required course for the Computer Graphics major that can be taken in either the first or second year. If you have no other strong options, we suggest you take it in your first year. Those with appropriate NCEA credits who want to take advanced Mathematics courses in later years should consider MATH 141 Calculus IA and MATH 142 Calculus IB. If you want to keep your options open to taking either a BSc in Computer Graphics or a BE(Hons) in Software Engineering, you should register for BE(Hons), taking ANFX 101 Animation and Visual Effects I and CGRA 151 Introduction to Computer Graphics as your options; you can make a decision about which degree to take at the end of your first year.
Computer Graphics student Jack Purvis has combined his passions for computer graphics and music to create a fully interactive tool for DJs and artists, in which a digital smoke simulation reacts to music in real time.

Jack’s Honours project looked at the challenge of simulating smoke using computer graphics techniques, and how the effect can be influenced by a dynamic input such as music to create an appealing visualisation.

“I had built music visualisers in the past, but I wanted a deeper understanding of how audio processing works,” explains Jack. “I designed a program that reads audio from an input device, allowing a livestream of music to be visualised.”

Jack also wanted to learn more about the computer graphics techniques that enable smoke simulation. Fluid dynamics and its associated mathematics can be used to simulate the physical properties of real-world fluids. As smoke is often used as a practical effect in live performances, it served as a good candidate for application in a music visualisation.

Properties of music such as the volume level, beats, and frequency information can be used to influence the smoke effect to produce a visualisation.

“Implementing the smoke simulation showed that I can use my passion and motivate myself to solve a complex engineering problem,” says Jack. “People really enjoyed watching the visualisation, so I received a lot of positive feedback on the final output.”

Jack’s supervisor, Professor Neil Dodgson, helped him design the project and supported him along the way with tips on mathematics, as well as presentation and technical writing skills.

Jack also credits his university courses with providing him with the skills to complete the project, not least the ability to self-manage and implement a large project independently.

“Through the Computer Graphics programme, I learnt how to solve complex problems by breaking them down into smaller, logical steps and I was able to apply design thinking to create an appealing visual effect that engages the audience.

“The University has many leading researchers who are exploring exciting new technologies. If you are passionate about a certain topic, you can propose your own project idea. A project that is tailored to your own interests is highly motivating and can lead to a really successful Honours year.”
It is an exciting time to be a computer scientist. We are living in the midst of a revolution powered by computers that pervades virtually all aspects of society, from the clever speech recognition algorithm on your phone to any of the myriad complex software systems that we depend on every day. New creations continue to arise that would have been impossible without the science of computing. An education in computer science prepares you to go on to innovate in extraordinary ways—whether directly in the technology itself or beyond it in wider society.

The BSc in Computer Science is a flexible three-year degree that can include your selection of courses from Cybersecurity, Software Engineering, and other areas of Computer Science such as artificial intelligence, computer graphics, and the design of programming languages. It starts with courses in which you will learn the fundamental skills of computer programming and understanding algorithms. In later courses, you will build on these skills while learning new concepts and techniques for applying computing to many different tasks and problems. The BSc allows you to focus entirely on Computer Science or to combine Computer Science with other disciplines at the University, giving you a broad interdisciplinary foundation for working in jobs that apply computing to new areas.

If you choose to study Computer Science, you can optionally elect to complete one of two specialisations—Artificial Intelligence or Cybersecurity—by choosing specific courses within the major.

Although the BSc in Computer Science shares many of its courses with the BE(Hons), it differs from Engineering because it gives considerably more freedom in the choice of courses and substantial flexibility to explore subjects beyond Computer Science. For example, a BSc in Computer Science can include up to half its credits from other fields in the sciences, or up to a quarter of its credits from subjects in commerce or the humanities. It can be combined with another subject to make a double major.

A typical first-year programme in the BSc would be to take COMP 102 Introduction to Computer Program Design or COMP 112 Introduction to Computer Science, a Mathematics course such as ENGR 121 Engineering Mathematics Foundations or STAT 193 Statistics in Practice in the first trimester, followed by COMP 103 Introduction to Data Structures and Algorithms in the second trimester with ENGR 123 Engineering Mathematics with Logic and Statistics or MATH 161 Discrete Mathematics and Logic. You complement these four courses with further courses from a selection of choices across the University to make up a full first-year workload.

Students who major in Computer Science benefit from the University's strong programme, excellent staff, and extensive range of equipment. Our graduates in Computer Science are actively sought by local and international employers and are valued for their clear thinking as well as their technical skills. The BSc is an entry into a range of jobs across gaming, graphics, artificial intelligence, machine learning, networking, software development, and other applications of computing.

The BSc is also the basis for postgraduate study such as a Bachelor of Science with Honours, a Master's, or a PhD. These research degrees lead to novel ways of using computers to solve problems facing the world.
For his Master’s research, Computer Science student Ben Selwyn-Smith has explored the potential of using interactive touch tables rather than traditional mouse and keyboard versions to teach programming.

Ben, who cites a keen interest in education, found that the benefits of the new approach include the ability for multiple users to code at the same time, something that was previously impossible.

For his research, Ben used a visual, block-based programming language called Tabletop Grace—an extension from an existing mouse and keyboard block language, Tiled Grace.

Block-based languages, including one called Scratch, have previously been used to teach children how to code as they provide an easy way to create games and animations with no syntax errors.

“The main motivation was to combine block-based programming with pair programming, where two people can code at the same time and also with interactive touch tables,” explains Ben. “Research has shown that each of these is individually worthwhile, but combinations of all three did not exist.”

Previously, pair programming with block languages was typically done either with two individuals sharing one single-user device, or two devices with remote collaboration. Using an interactive touch table allowed users to collaborate from the same location.

“This project is great in that I got to combine software development and design with research, including experience in conducting that research, formal presentations, and software demonstrations. I now feel much more prepared for future endeavours—if I decide to pursue a career in programming or research, I have a good grounding in both.”

Ben also enjoyed working with his two supervisors from the School of Engineering and Computer Science, Dr Craig Anslow, with his extensive knowledge of interactive touch tables, and Dr Michael Homer, the creator of Tiled Grace, the block-based language that formed the basis of Ben’s new software, Tabletop Grace.

“Getting to work alongside my supervisors was great, as well as being a collaborator on a paper that was accepted by the Blocks and Beyond 2017 Workshop,” says Ben.

“Tabletop Grace was considered to be as usable as Tiled Grace, so the transition to touch tables was successful. Also, 70 percent of participants in my user study said they preferred working on the tabletop, as it was less frustrating and more enjoyable, intuitive, and novel.”
The BSc in Electronic and Computer Systems (ELCO) gives you a great deal of flexibility to delve into intersecting fields of inquiry and the cutting-edge research that exists in many fields of emerging technology.

You will be able to combine technical Electronic and Computer Systems (ECEN) courses from the BE(Hons) with subjects drawn from other fields in science and beyond. The programme caters for students with interests ranging from the practical side of electronics to more fundamental areas of signal processing, control, and communications. You could combine ECEN’s electronics subjects with Physics to embark on a career in semiconductor devices, or you could combine Chemistry and Control Engineering for a career in chemical or pharmaceutical manufacturing. You could also combine Statistics with Communication or Signal Processing to design next-generation telecommunications systems or sonar devices. You could even combine Digital Electronics with Computer Science and specialise in the design of next-generation microprocessor chips.

The first-year programme consists of foundation courses in Mathematics, Physics, and Computer Programming:

- ENGR 121 Engineering Mathematics Foundations and ENGR 122 Engineering Mathematics with Calculus (or MATH 142 Calculus 1B and MATH 151 Algebra)
- ENGR 141 Engineering Science and ENGR 142 Engineering Physics for Electronic and Computer Systems (or PHYS 114 Physics 1A and PHYS 115 Physics 1B)
- COMP 102 Introduction to Computer Programming Design (or COMP 112 Introduction to Computer Science).

If you are interested in advanced Mathematics courses in later years, you can substitute MATH 142 Calculus 1B and MATH 151 Algebra for ENGR 121 Engineering Mathematics Foundations and ENGR 122 Engineering Mathematics with Calculus. Similarly, if you are interested in advanced Physics courses in later years, you can substitute PHYS 114 Physics 1A and PHYS 115 Physics 1B for ENGR 141 Engineering Science and ENGR 142 Engineering Physics for Electronic and Computer Systems.

The mathematics and physics concepts introduced in the first year will enable you to attain the fundamental tools of electronic engineering.

The above courses can be taken alongside any other course in the BSc schedule. Depending on your interest, these include courses in Chemistry, Computer Science, Mathematics, and Physics.

In your final year of the programme, you will be able to focus more on practical electronics or on fundamentals of signal processing, communications, and control.
Captivated by computers and electronics, and with a desire to understand how everyday devices work, Joel Robertson found an outlet for his curiosity in engineering.

“As a musician, I use a lot of electronics and software in music production and performance. I find the technology behind it fascinating, and understanding how my tools work allows me to get the most out of them.”

The degree has a strong focus on team projects, which Joel said were beneficial to his personal development. “I’ve learnt to work better with others, to manage and prioritise my workload, and to be a team leader. On the flipside, I’ve also learnt to be more self-sufficient during my study.

“I enjoy applying problem-solving skills in engineering to create new devices and expand my understanding of physics and mathematics. All of my courses have been packed with interesting and useful knowledge, including lots of practical learning. I’ve worked as a tutor for first-year students, and the Summer of Tech programme, sponsored by the University, helped me get a summer job as a software developer after my second year of study.”

Working towards a Bachelor of Engineering with Honours, majoring in Electronic and Computer Systems, Joel has found that electronics engineering encompasses both hardware and software design, making it an extremely versatile area of study. “There are so many good job opportunities worldwide, with good starting salaries and great possibilities for career progression.”

Joel is hoping to move overseas sometime in the next couple of years. “I’d really like to work for an audio-electronics company. The best opportunities for that are in Europe and North America.

“At some point, I’d like to be self-employed as an electronics designer, and spend some time working on my own projects. I have a lot of ideas I think would be worth developing. I’d also like to work in management, as the human connection aspect of engineering is really important to me.”
New energy technologies are rapidly becoming affordable, and it is well accepted that these will be immensely disruptive to our traditional mode of centralised energy generation and its transmission and distribution. Additionally, most of the world’s population is becoming aware of the severe climate (and other) impacts of many traditional energy sources. What society requires are the skills and knowledge appropriate to develop the future of renewable and sustainable energy systems.

Expertise in renewable energy systems can be found not only in the energy generation, transmission, and distribution industries, but also in various governmental bodies, not-for-profit organisations, energy retailers, and Māori and Pacific community-based entities. Your programme will therefore be broad, covering a range of engineering, sustainability, and scientific principles. During the first year of study in Renewable Energy Systems (RESY), you will learn engineering and sustainability science fundamentals while developing sound foundations in Computer Science, Mathematics, Physics, and Renewable Energy.

During the later years of the programme, you will further develop your analytical skills as you study various topics within the field such as renewable energy generation, conversion and storage technologies, energy–economic analysis, sustainability modelling techniques, and policy development. As the programme progresses, you will be able to concentrate on areas of the curriculum that particularly interest you.

The programme uses an interdisciplinary approach by working with research and teaching expertise from many areas in the University and engaging with partners across society in transdisciplinary ways. The BSc in RESY then gives you a great deal of flexibility to delve into intersecting fields of inquiry and the cutting-edge research that exists in many fields of emerging technology systems.

There are many careers available to graduates of the RESY programme. Whatever field you decide to pursue, your studies will provide you with the tools for a career of solving real-world problems.

<table>
<thead>
<tr>
<th>All first-year RESY students should take these 100-level Part One courses</th>
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<tbody>
<tr>
<td><strong>Trimester 1</strong></td>
</tr>
<tr>
<td>ENGR 121 Engineering Mathematics Foundations</td>
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<tr>
<td>ENGR 141 Engineering Science (Physics and Chemistry)</td>
</tr>
</tbody>
</table>

You can then choose four courses at 100 level from any other major that will complement your RESY major.
ADMISSION

There are various ways you can gain admission to Victoria University of Wellington. Details of admission and enrolment requirements are online.

ℹ️ www.victoria.ac.nz/apply

CAREERS

Employers look for enthusiasm and passion as well as good grades. They hire graduates who are able to explain why they chose their particular course of study and why they enjoyed it. The right attitude to life, study, and work is what gives graduates the competitive edge when applying for jobs.

Careers and Employment

The Careers and Employment team can help you explore study and work options, apply for jobs and internships, and establish a career path by providing advice and resources for ongoing career development. All current students can participate in the Victoria Plus service and leadership programme and our Alumni as Mentors programme connects final-year students with alumni who are experienced mentors in their workforce.

Visit the Careers and Employment office for:

- convenient 15-minute sessions for CV and interview tips, advice, and getting quick questions answered
- individual appointments to help with career planning, job exploration, goals, and decision-making
- resources to help you clarify your preferred skills and interest areas and identify suitable employment options.
CareerHub

CareerHub is for enrolled students and graduates and keeps you up to date with everything you need to know to get your career on track. With CareerHub you can:

■ search for a range of jobs, from internships, part-time work, and summer work to graduate recruitment positions
■ be the first to hear about careers expos, employer information sessions, and seminars
■ find online resources, including those to assist with CV and interview preparation
■ use our easy booking system for career advice appointments, workshops, and events.

www.victoria.ac.nz/careerhub

Resources

Explore our web resources at www.victoria.ac.nz/careers-resources including:

■ Career View series—information about what career opportunities are available to graduates in specific subject areas.
■ What can I do with my degree/subject?
■ Graduate employment destinations.

CAREERS AND EMPLOYMENT
Room HU120, Hunter Building, Kelburn Campus

➥ 04 463 5393
✉ careers-service@vuw.ac.nz
📍 www.victoria.ac.nz/careers
Victoria University of Wellington strives to create an environment that values diversity. We work alongside approximately 1,500 students with impairments each year and should be your first point of contact. If you are Deaf, have an impairment, mental distress, injury, medical condition, or specific learning disability that affects your learning, participation, or enjoyment at university, tailored assistance is available.

We can help you with individualised coaching and planning, accessible arrangements for courses and exams, liaising with academic staff to help them understand your needs, adaptive technology, and note-taking assistance for lectures. We also provide access to ergonomic equipment, quiet spaces to rest and study, mobility parking, and accessible transport between campuses.

Contact Disability Services as early as possible prior to commencing study.

**DISABILITY SERVICES**

Level 1, Robert Stout Building, Kelburn Campus

＜ 04 463 6070

✉ disability@vuw.ac.nz

🌐 www.victoria.ac.nz/disability
PUBLICATIONS

Publications can be downloaded from our website or requested in hardcopy by contacting Student Recruitment and Orientation (0800 VICTORIA (842 867)).

- Your Introduction to Victoria University of Wellington (February) gives a brief overview to the University’s degrees and student life.
- Guide to Undergraduate Study (July) includes all information students need about first-year courses, degrees, student life, and how to apply to enrol.
- Guide for Parents (May) answers questions parents have about sending their children to university.
- Accommodation Guide (May) gives information about each hall of residence and how to apply, as well as details about other accommodation options.

www.victoria.ac.nz/publications

SCHOLARSHIPS

Victoria University of Wellington is committed to providing scholarships that recognise and encourage high achievement, leadership, and diversity, and help remove the barriers to university study that exist for students facing hardship or disadvantage. In recent years, our scholarships for school leavers have grown significantly, to the point where we now support around one in five first-year students with a university-funded scholarship.

We also support a large number of postgraduate scholarships for Honours, Master’s, and Doctoral students.

You can search online for scholarships you may be eligible for, check if you are eligible to apply, and find up-to-date information and application forms.

www.victoria.ac.nz/scholarships
WHO TO CONTACT

Faculty Student and Academic Services Office

Visit the office for help with anything from enrolment to graduation. Get help with choosing your degree, planning your courses, or changing your degree programme. This office should be your first point of contact for any enquiries you have about your studies.

Room CO114, Level 1, Cotton Building, Kelburn Campus

04 463 5101

engineering-faculty@vuw.ac.nz

www.victoria.ac.nz/engineering

Careers and Employment

Find out what you need to know to get a job, what career options are open to you, and what your ideal future might look like.

www.victoria.ac.nz/careers

Disability Services

If you have a temporary or ongoing impairment, we can assist you with coaching and advice, liaison with academic staff, adaptive equipment, technology and training, sign language interpreting, note-taking assistance, mobility parking, ergonomic furniture, and access to rest and study rooms.

www.victoria.ac.nz/disability

Enrolment Office

If you are a prospective student, you can get information, advice, and support with enrolment.

If you are a current student, you can get information on how to re-enrol.

www.victoria.ac.nz/apply

www.victoria.ac.nz/re-enrol

Information Technology Services

Information Technology Services supports the use of technology for learning, research, and administration across all campuses. It also provides access to student-focused applications, shared computer suites, personal laptop clinics, and Office 365, the student email and collaboration service.

www.victoria.ac.nz/its

Marae

Te Herenga Waka, the University marae on our Kelburn campus, is a multipurpose teaching, learning, research, and engagement hub for all staff and students. Resources, support, and activities include Te Whanake Mauri Tū Computer Suite, lunches in the wharekai from Monday to Friday, and whānau housing.

www.victoria.ac.nz/marae

Student Counselling and Student Health

Student Counselling has professional, confidential counselling available at all campuses for any issue that is impacting on your personal or academic success.

Student Health offers confidential healthcare consultations at the Kelburn and Pipitea campuses. Register with us to receive free routine healthcare. Our doctors and nurses provide primary medical care as well as health education and promotion. We also offer acute healthcare, telephone triage, chronic condition and accident management, and health and wellbeing support. Make an appointment for contraception, sexual health checks, travel consultations, minor operations (such as mole removal and toenail resections), and preventative healthcare (such as immunisations).

www.victoria.ac.nz/counselling

www.victoria.ac.nz/student-health
Student Finance
Get information and advice related to fees, payments, student levies, and StudyLink.

Student finance advisers will give you information on all money matters, including StudyLink entitlements. The advisers also manage the Hardship Fund.

www.victoria.ac.nz/fees

www.victoria.ac.nz/financial-advice

Student Learning / Te Taiako
Student Learning staff can work with you on academic writing, study, and maths support for all levels of your study. You are welcome to attend workshops, one-to-one appointments, and access helpful resources.

www.victoria.ac.nz/student-learning

Student Recruitment and Orientation
If you are a prospective or new student, go online or contact us for course advice and to get your admission questions answered.

www.victoria.ac.nz/study

Vic Books and Café
One hundred percent student owned, Vic Books is at the Kelburn and Pipitea campuses. Buy your textbooks (new and used) and student notes online or in store, as well as general books, stationery, Victoria University of Wellington-branded memorabilia, gifts and gift cards, and Coffee Supreme.

www.vicbooks.co.nz

Victoria Accommodation
Contact us for advice on our halls of residence, renting, and other accommodation options. We can assist with processing applications and offers for halls of residence.

www.victoria.ac.nz/accommodation

Victoria Kids
Victoria Kids has been providing excellent early childhood education for families for more than 30 years and offers a range of booking options to suit your needs.

www.victoriakids.co.nz

Victoria Recreation
You can enhance your university experience by getting involved in clubs, sports, and fitness.

www.victoria.ac.nz/recreation

Victoria University of Wellington Students’ Association
Victoria University of Wellington Students’ Association (VUWSA) provides advice, advocacy, events, and support for all students.

www.vuwsa.org.nz