"Victoria University of Wellington is the ideal place for in-depth technology research. The University’s Computational Media Innovation Centre enables technological research students like me to pursue entrepreneurship in the interactive media industry."

Betty (Hyejin) Kim
Student, Master of Science in Computer Graphics

The state-of-the-art Computational Media Innovation Centre provides postgraduate Computer Graphics students at Victoria University of Wellington access to world-leading researchers as well as local and international industry leaders.
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Cover: Victoria University of Wellington’s state-of-the art Computational Media Innovation Centre (CMIC) provides postgraduate students with access to world-leading researchers and local and international industry leaders. Engineering student Ying Bi experiences augmented reality developed by DreamFlux, part of CMIC’s pioneering research into augmented and virtual reality.

Inside cover: Postgraduate student Betty (Hyejin) Kim is inspired by technology that overcomes the physical limitations of our world and creates, rather than represents, visual space and time.

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.

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WELCOME

Do you want to make the next major breakthrough in technology, create devices that save lives, or help build the next blockbuster film? Are you someone who thrived on the challenge of undergraduate study? Do you want to push yourself to become an expert in your field?

If so, welcome to the Wellington Faculty of Engineering—where we have a range of postgraduate opportunities for you. Victoria University of Wellington is New Zealand’s number-one-ranked research university, and our professors lead world-class research in a number of areas: artificial intelligence, computer graphics, cybersecurity, mechatronics, software engineering, and renewable energy.

Postgraduate research in our Faculty allows you to work with, and learn from, experts in the field who are constantly extending the boundaries of modern engineering knowledge. The Faculty prides itself on its collegiality and support systems for postgraduate students. Our experienced, international staff are passionate about supporting students to follow their natural curiosity into new areas of study and research. We also have close collaborative ties with researchers in other faculties and schools at the University, such as Design, Mathematics and Statistics, Music, Psychology, and Science, all of which foster exciting, high-impact research.

Wellington is a city buzzing with development in the ICT and technology sectors, driving an industry that is constantly changing. The Faculty has established links with leading businesses and sought-after professionals locally and internationally, including Weta Digital, Xero, and Google. Whether academia or industry is your goal, we have the connections to help you get there. Our alumni pursue amazing careers all over the world.

We offer a full range of postgraduate courses across the School of Engineering and Computer Science, the Computational Media and Innovation Centre, the Robinson Research Institute, and the Wellington ICT Graduate School. The courses are either taught or research based, one year or three years in length, industry or academically focused, and for those with prior technology experience, or without. See what we have to offer, and set yourself up for a rewarding, enjoyable future where you can make a real difference.

Professor Dale Carnegie
Dean of Engineering

“The Faculty prides itself on its collegiality and support systems for postgraduate students. Our experienced, international staff are passionate about supporting students to follow their natural curiosity into new areas of study and research.”
Wellington is a thriving capital city. Its unique and compact character makes it a great place to live. Just five minutes from the centre of town, you can be on a sandy beach or in native bush. In between, there are great shops, galleries, museums, festivals, and live shows, and more eateries per person than New York.

**TOP-QUALITY EDUCATION**

New Zealand degrees are recognised by employers and universities all over the world as practical, modern qualifications of high international standing.

Victoria University of Wellington has a unique and proud history as a globally ranked capital city university. It is New Zealand’s top-ranked university for research quality, with a teaching focus on leadership, communication skills, and creative and critical thinking.

By choosing Victoria University of Wellington, you’ll be studying in a place where new and independent thought is encouraged and where creativity thrives.

**NEW ZEALAND’S TECH CAPITAL**

Wellington’s creative and innovative environment is home to a booming digital, film, and gaming industry and a strong start-up culture.

The ICT industry has been growing rapidly throughout New Zealand, but nowhere has this growth been more pronounced than in Wellington. With almost half the city’s workforce in knowledge-intensive industries, producing over a quarter of all New Zealand’s ICT-related GDP, Wellington is the heart of ICT in New Zealand.

**INTERNATIONAL COMMUNITY**

Students come to study here from all over the world—each year, students from more than 100 different countries make up the student population, with more than 120 university partners worldwide. There are many international communities in Wellington—Chinese, Indonesian, Japanese, and Malaysian, among others—that help to make international students feel at home in their new learning environment.

**Wellington has been voted the most liveable city in the world—for two years running—in Deutsche Bank’s list of 50 most liveable global cities.**
If you want to take the next steps in your professional career in the hi-tech industry and research community, you’ll find a warm welcome and a supportive and stimulating environment in the School of Engineering and Computer Science at Victoria University of Wellington.

Our focus on digital technology will provide you with all the skills and experience you will need in the modern workplace and research labs.

LEARN FROM, AND ALONGSIDE, THE BEST
Our highly experienced, international staff have wide networks in research and industry and are actively engaged in internationally recognised, ground-breaking research here at New Zealand’s number-one-ranked university for research.

Not only are our researchers constantly extending the boundaries of modern engineering, computer science, computer graphics, and renewable energy systems, they are passionate about supporting students to follow their curiosity into new areas of study and research.

As New Zealand’s capital city university, we enjoy the benefits of a wonderful landscape and lifestyle, contacts and collaborations with government, national research funders, and world-class industry. We are a School that prides itself on its collegiality and multidisciplinary collaborations with many international and local top-ranked research clusters.

Our research groups provide a collaborative and encouraging support network, and we regularly send our postgraduate research students to top-flight international conferences.

CUTTING-EDGE FACILITIES
Our postgraduate students have access to state-of-the-art equipment and laboratories, situated in both the Alan MacDiarmid and Cotton buildings on the University’s picturesque Kelburn campus, with enviable views over the city and Wellington harbour.

STUDY OPTIONS
We offer a range of postgraduate study options suited to your interests and ambitions—from coursework-based degrees that allow you to learn in a structured environment from knowledgeable and world-leading staff to thesis-based options where you will have the opportunity to join, and contribute to, established research projects, or follow your own interests and forge a new path. Our future-focused postgraduate qualifications see our graduates placed at the forefront of an exciting growth industry.

RESEARCH GROUPS AND CENTRES
We have a number of established research hubs that you can join as a postgraduate student, from smaller informal groups that are working collaboratively to extend the boundaries of our knowledge in key areas to larger industry-linked research centres that offer opportunities for supervision—see the Faculty’s research centres on the following pages.
One of the University’s newest research centres, the Computational Media Innovation Centre (CMIC), was launched in 2018 with the aim of strengthening New Zealand’s capability in interactive media through academic research.

The Centre also incubates potential start-ups and entrepreneurship pipelines, placing it at the forefront of an emerging global digital-media market, and works to develop links with a variety of renowned international entertainment companies and institutes, including gaming, anime, film visual effects, and virtual and augmented reality.

In early 2019, we moved into new premises in downtown Wellington. Our space has been custom designed to support collaboration, innovation, and a high-quality student experience and research experience—including direct connections with industry—as well as attracting top local and international talent to the city.

**ACADEMIC RESEARCH**

Our research expertise spans computational science, including computer graphics, computer vision, virtual and augmented reality, machine learning, and applied mathematics.

Technological innovation is at the heart of what we do—we are committed to advancing new and existing products, pushing the boundaries of what’s currently possible in the realm of interactive media.

**RESEARCH FOR INDUSTRY**

We undertake research in collaboration with our industry partners to support emerging media relating to computer graphics and interactive technologies. Our goal is to create links between academia and industry, advancing digital products on the global market through research findings discovered here in New Zealand.

**POSTGRADUATE STUDY OPPORTUNITIES**

There are opportunities to join the Centre as an Honours, Master’s, or PhD student.

You’ll work in our state-of-the-art facilities, gain practical hands-on experience, and have the chance to work alongside a renowned team of researchers making genuine advances in the field of computational media.

[www.victoria.ac.nz/cmic](http://www.victoria.ac.nz/cmic)
The Robinson Research Institute is recognized worldwide as a pioneer and leader in high-temperature superconductivity (HTS) research. Our research programme also encompasses a wide range of projects in electromagnetic technologies and materials science/engineering, which are typically supported by either government or industry investment.

COLLABORATIVE RESEARCH
Collaboration drives much of our research. We work with world-leading researchers from both academia and industry, combining our science and engineering expertise to solve problems and develop new high-value products. These research partnerships are wide-ranging, from fusion, space technologies, and high-speed rail through to new applications for magnetic sensors and creating better energy-storage devices.

- Superconducting power systems: Our work on ultra-efficient aircraft, wind turbines, flywheels, and transformers is helping to reduce energy waste and create renewable energy solutions.
- Magnet systems: The magnet group develops cryogen-free superconducting magnet systems for magnetic resonance (MRI/NMR) and other applications.
- Magnetic sensors: Magnetic sensors have myriad uses, from infrastructure inspection to traffic management. Our industry-led research is exploring cutting-edge new applications.
- Space technologies: We are developing the next generation of satellite, utilizing HTS technologies.
- Fundamental science: Our materials physics team undertakes fundamental research into novel electronic systems—superconductors, spintronics, and hybrid materials. This underpins and guides several of our industrial research programmes.

- Zero-CO2 metals: Metal production is the world’s largest industrial source of CO2 emissions. Our materials team is developing new chemical processes to eliminate CO2 emissions from the production of industrially essential metals such as iron and vanadium.

POSTGRADUATE STUDY OPPORTUNITIES
We welcome students from universities and technology institutes around the world.

Our Master’s and PhD projects are based around our existing applied and fundamental research programmes. Research projects are tailored to the skills and needs of an individual student and span mechanical, mechatronic, and electrical engineering; physics; and materials science and engineering. As a postgraduate student with us, you’ll be an integral part of our project teams and experience a mix of practical problem-solving and academic learning, working alongside our world-class scientists and engineers.

Students undertake real discovery work and make genuine scientific and engineering advances, which make it possible for industry to develop new products and processes. The unique practical experience we offer students is highly sought after by employers in New Zealand and overseas who are looking for graduates with practical skills in engineering implementation as well as recognised academic qualifications.

Graduates who have studied with us often find their experience in project management sees them advance to leadership positions within industry and the research community.

Master’s and PhD students can apply to study within any of the disciplines pursued at the Robinson Research Institute. Scholarships are available through the Victoria Doctoral Scholarship scheme, and other funded project scholarships may also be available. Check our website for up-to-date details.

Email Dr Chris Bumby or Dr Sergei Obruchkov at rri-postgrad@vuw.ac.nz for more information.
LEARNING FROM NATURE
TO CREATE THE FUTURE

Professor of Computer Science Mengjie Zhang is a leading international AI researcher.
He heads the interdisciplinary Evolutionary Computation Research Group—the largest of its type in Australasia and in the top five in the world in terms of its representation in major journals and conference publications in recent years, is an editor or associate editor of more than 10 major international journals in his field and, in 2016, was appointed chair of the Institute of Electrical and Electronics Engineers (IEEE) Emerging Technologies Technical committee, which identifies and nurtures new directions in technology.
Originally from China, Professor Zhang has witnessed a rapid rise in interest in the application of AI since he arrived in New Zealand in 2000.
AI has “the very cool idea” of mimicking humans’ thinking, ideas, behaviour, and learning ability, he says.
“A long-term dream in computing has been for machines to do things that are useful for humans. This could include robots that mimic human behaviour to do dangerous things, or postal recognition systems that can recognise handwriting people may not be able to.
“Ten years ago, AI was not so useful. Now it can increasingly be applied to the real world, in areas ranging from immunoonalysis (lab tests that use antibodies or antigens to test for specific molecules) to Antarctic research.
“AI is still seen as a hard area to work in, but I tell my students anything new—data mining, big data, data science, cybersecurity, or the internet of things—needs AI techniques.”
Professor Zhang’s primary area of research is evolutionary computation. The term covers a range of problem-solving techniques based on the theories of biological evolution, including genetic algorithms, genetic programming, particle swarm optimisation, different evolution and learning classifier systems, and evolutionary multi-objective optimisation.
Evolutionary computation techniques are used to tackle complex problems that have too many variables for traditional computer algorithms to solve, that people have very little prior knowledge of, that are in dynamic and uncertain environments, or where the approach to solving the problem is difficult to understand.
Professor Zhang is particularly interested in genetic programming, which is inspired by Darwinian natural selection, gene theory, and automatic programming, and particle swarm optimisation, which is inspired by the behaviour of birds flying or fish swimming from one place to another.
Evolutionary scheduling and combinatorial optimisation is another field where the University plays a leading role. This field has a large number of real-world applications, including resource planning and allocation.
“Computer hardware advances and the internet have made it possible to solve things we couldn’t have begun to solve 10 years ago,” says Professor Zhang.
He says a favourite part of his job is collaborating with colleagues and bringing people together.
“Most of the areas I research need a team to do the work. It would be very hard for a single person, and almost impossible to make breakthroughs,” he says. “Competition is good, but collaboration and cooperation are also critical to success.”
Professor Zhang says the group’s success would not have been possible without the excellent technical and administrative support it receives from the School of Engineering and Computer Science, which has helped the University become a recognised hub for AI research—particularly in the fast-growing areas of evolutionary computation, optimisation, and learning.
“This is a great research environment, which is why the University attracts so many excellent PhD students and visiting researchers. New Zealand may be far away from anywhere, but people always want to come here.”

THE IMPORTANCE
OF LANGUAGE

Professor James Noble is leading another security-focused project, which is concerned with developing secure DSL-friendly web programming.
“Common coding practice leaves behind vulnerabilities,” he explains. “Different programming languages solve different problems—no single programming language is right for everything—so developers have to use a multitude of languages to create different functions in an application.”
Dr Potanin says that HTML works well with webpages, JavaScript helps make them responsive, and SQL is good for receiving data from a database, but when developers try to use these languages together, it often leads to bottlenecks and vulnerabilities.
“If differing languages are not implemented well together, applications can be left open to cross-site scripting attacks, SQL injection attacks, and code injection attacks—three of the most severe security threats in web applications today.”
Professor James Noble is leading another security-focused project that aims to create an immune system for software by developing tools that will allow computers to secure themselves from within so they can safely interact with external and even untrusted programs.
“Software guards our secrets, and, as more personal and corporate information moves on to the internet, security breaches can end careers, win elections, and cost hundreds of millions of dollars.”
“Much of the attention to date regarding cybersecurity has been focused on protecting systems from external attacks once they are in use. While important, it is impossible to know in advance what components or entities will seek to interact with a piece of software,” says Professor Noble.
“An alternative approach, and the one we are exploring, is to secure software from within, allowing components to connect and interact only if they have the right permissions.”

C++, Java, Scratch, Python, or Ruby on Rails. Does it matter which programming language you choose? There are several research projects currently underway, looking specifically at programming languages, with research outputs over the past few years gaining both industry and media attention.
Dr Alex Potanin is co-leading one of these, the Wyvern project, which is concerned with developing secure DSL-friendly web programming.

Postgraduate Study 2020
DETECTING OIL SPILLS UNDER SEA ICE

Shrinking ice cover in the polar regions, and the rich deposits of oil and gas under the Arctic Sea, mean these pristine and ecologically fragile environments are being increasingly targeted for oil explorations and extraction by several countries.

The expansion of this activity is also dramatically increasing the risk for an oil spill, as oil pipelines will run under winter sea ice, and any leakage from these is likely to go undetected as the leaked oil pools under the ice.

To address this, Victoria University of Wellington researchers Dr Gideon Gouws, from the School of Engineering, and Dr Malcolm Ingham, a geophysicist from the School of Physical and Chemical Sciences, are working in collaboration with the International Arctic Research Institute at the University of Alaska Fairbanks to develop sensor instrumentation that could serve as an early warning system for oil spills.

“We got involved a few years ago in developing electronic instrumentation for measuring the electrical characteristics of sea ice,” explains Dr Gouws. “By measuring the electrical resistance, you can build up a picture of the internal structure of the ice as it grows and decays over a season.”

We are now applying these techniques to the problem of detecting oil under the ice and measuring the movement of oil into the ice as it warms up.”

Dr Gouws says a challenge in developing this technology is that these experiments cannot be conducted in the field—as it would mean purposely contaminating the environment with oil.

“Instead, we have to perform measurements in the laboratory, using freezers or a coldroom, in both Wellington and Fairbanks. This presents significant challenges, as we must develop techniques to enable the production of realistic sea-ice and oil-spill conditions on a small scale, trying to mimic field conditions in the Arctic.

“The long-term goal of this research is the establishment of a series of autonomous measuring stations in high-risk Arctic areas such as above oil pipelines, with the ability to serve as a sentry to oil-spill responders.

“It will be extremely satisfying if we, and our students, can contribute to make such monitoring a reality and prevent an environmental disaster from occurring.”

The second is alongside the Computational Media Innovation Centre (CMIC), the University’s newest research centre. “I am collaborating with Associate Professor Taehyun Rhee from CMIC on 360 video processing in the aspect of image-based lighting/rendering for creating a more immersive virtual experience.”

While it’s pushing the edges of what we can currently do with computer graphics, it’s also technology that could be used soon to help digital media professionals and amateurs alike.

“As an undergraduate student, Dr Fanglue Zhang was interested in the visual effects he was seeing in photographs and movies and wanted to understand the technology behind them. Now, as a researcher and lecturer in the School of Engineering and Computer Science, he’s building the technology behind the next generation of those effects.

“My current research project is looking at structure-based image and video understanding and editing. This research will allow software to better understand image and video, which in turn will support higher-quality image- and video-based rendering in computer graphics, and the development of algorithms to automatically edit and enhance image and video quality.

“The next step is to keep finding ways to improve these methods to produce faster algorithms and better visual effects—and apply them to more complicated formats, including 360 videos for virtual reality. The challenge in these formats, particularly when working in real-time applications for virtual-reality rendering, is that they need faster 3D information reconstruction of the virtual environment.”

Dr Zhang’s research is contributing to two long-term projects underway in the school, alongside national and international collaborators at the University of Canterbury (New Zealand), Adobe Research (United States), Cardiff University (United Kingdom), and Tsinghua University (China).

The first is the Robotics Spearhead project, part of National Science Challenge 10—Science for Technological Innovation, where he is working to develop deep-learning-based image and video understanding tools to reconstruct the comprehension of the environment surrounding robots.

The second is the Computational Media Innovation Centre (CMIC), the University’s newest research centre. “I am collaborating with Associate Professor Taehyun Rhee from CMIC on 360 video processing in the aspect of image-based lighting/rendering for creating a more immersive virtual experience.”

While it’s pushing the edges of what we can currently do with computer graphics, it’s also technology that could be used soon to help digital media professionals and amateurs alike.

“With the intelligent image and video processing methods, we are able to provide more friendly software for the digital-media sector, allowing them to process image and videos more efficiently and much faster.”

It’s not surprising, then, that industry has been so keen to work with Dr Zhang and his fellow researchers.

“The computer graphics research group at the University is the largest in the southern hemisphere; it also has strong links with industry, especially the movie and game sector, and it has been really willing to work with us on this research.”

It’s not just the chance to drive the innovation that interested him, though. He says another advantage of working in computer graphics is that “everything you research gives you cool visualised results. That is very fulfilling. The people here are doing great stuff in 3D vision and virtual reality. My research and background fit the research here and are complementary to what we plan to do in the next stage.”
RESEARCH SPOTLIGHT

IDENTIFYING RENEWABLE RESOURCES ON INDIGENOUS LAND

Associate Professor Ramesh Rayudu has been working with iwi partners to generate data that could help them develop and effectively use renewable-energy-based resources. The work came after an approach from iwi in Tikorangi Valley, Taupō, Whakatāne/Omaio, and Great Barrier Island, but it could be picked up by iwi across the country.

Associate Professor Rayudu has been working with his colleague Dr Daniel Burmester and three students, Jasper Kueppers, Daniel Satur, and Angus Weich, to develop a ‘black box’. It will have sensors that collect information such as the number of sun hours each day and how much wind the area is exposed to, to determine what renewable resources are available on the site.

Dependent on location, this could be solar power, hydro power, wind turbines, or a combination.

The black box will also measure agriculture data such as soil temperature and moisture, which will help determine what is the best use of that area, such as planting a specific fruit or vegetable that would thrive in that environment.

“The iwi approached us and asked if we could have a look at the possibility of self-sufficiency for their iwi,” Associate Professor Rayudu says. “This project will provide them with solutions and technology.

“Some of the locations didn’t have any data of their land. The iwi at Omaio was getting their data from Tauranga—which is almost 190 kilometres away. We wanted to provide them with localised information that would be beneficial for them,” he says.

Associate Professor Rayudu expects the black box prototype to be ready early next year, after which the first box will be installed.

Once a black box has been successfully developed, the team plans to create multiple black boxes and disseminate them to other iwi across New Zealand in the next five years.

“While the primary interest of this project is in renewable energy and looking at what we can do to be self-sufficient, the black box will also provide intelligent information about cultural land.

“The black box can be used anywhere to identify renewable resources, especially by anyone with agricultural land who wants to find out about the sun hours and what kind of wind speeds and directions the land is exposed to.

“The great thing about it is that you can just install it and the readings are transferred through wireless technology. You can just set it and forget about it,” says Associate Professor Rayudu.
MASTER OF COMMERCE

Study emerging technology, explore concepts that will form the foundations of future innovations, and enhance your career with a Master of Computer Science (MCompSc).

This flexible coursework- and project-based programme will put you at the forefront of innovation in a rapidly developing industry.

You’ll gain specialist knowledge of computer science theories, methods, and strategy and build on your skills in computing architecture, construction, engineering, and design.

Examine networks, software, tools, and packages, and learn more about a range of programming languages and computer-based systems.

DEGREE STRUCTURE

The 180-point MCompSc is divided into two parts and can be completed in one year of full-time study (three trimesters), or in two years part time.

In Part 1, you’ll take an approved combination of courses totalling 120 points. Choose courses from 400-level Computer Science, Cybersecurity, Network Engineering, and Software Engineering.

Part 2 is the research project, which is composed of two courses: COMP 501, a 15-point research essay that demonstrates you have understood the background to the research problem you have chosen to tackle, and COMP 589, a 45-point course in which you design, implement, and evaluate a solution to the problem.

ENTRY REQUIREMENTS

To be accepted into this programme, you will need a Bachelor’s degree or equivalent, with at least a B average, or extensive professional experience, and approval from the head of school.

JUHINI DESAI

Student, Master of Computer Science

Originally from India, Juhini Desai says the practical orientation of the Master of Computer Science, and the potential in the emerging technologies of AI and data mining, are what attracted her to New Zealand to study at Victoria University of Wellington.

“The emerging technologies, which I studied during my programme, are our future. They are making tasks that were impossible to solve with IT possible to solve with IT. I am really excited to gain the expertise and the experience necessary to lead the industry to a new era and to contribute to the future of the corporate IT world.”

Juhini says the opportunity to combine coursework with a project was particularly appealing.

“In the first part of the programme, I’ve had the opportunity to take courses across computer science, network engineering, and software engineering, which equipped me with the hands-on experience needed to be competitive in the job market.”

Now in the second part of her programme, Juhini is undertaking a research project under the supervision of Dr Bing Xue, a leading AI researcher at the University.

“My Master’s research project is looking at multi-label feature selection.

“Traditionally, data is represented by a single label, but in the real world, data is associated with multiple labels simultaneously and it can be represented by many redundant or irrelevant attributes. The aim of my project is to select a small subset of relevant features from a much larger, more complex data set, for the classification of multi-label data. I am using an evolutionary computation technique, particle swarm optimisation, to achieve this goal.”

Dr Bing Xue has been involved in advanced research in the field of AI, machine learning, and big data. “I’ve really enjoyed working under her supervision — she has great knowledge and always gives me constructive feedback, which I believe has helped me to further hone my skills. As a supervisor, she also makes me feel valued and acknowledges the hard work that I put in on these projects, which I really appreciate. Being a project-based programme, the Master of Computer Science has offered me the opportunity to explore more in the area of data mining and machine learning and gain practical experience. This is an area I would like to continue on with in my career — and what I’ve learnt has helped with that.”

After graduating, Juhini plans to stay in New Zealand as part of the New Zealand Government’s work-after-study programme, which offers graduates a three-year work visa on finishing their studies.
MASTER OF ENGINEERING

Go deeper into the world of engineering and conduct research in an area that interests you with the Master of Engineering (ME).

The technological know-how, problem-solving, and creativity you gain from the ME will open up new opportunities for you in your career. You might find work in electronics, robot design, or systems development. Other career options include hardware development, programming, software engineering, systems management, and research.

DEGREE STRUCTURE

The ME is a one-year full-time programme, although you can choose to study it part time.

You can also choose to complete it by doing research leading to a 120-point thesis or by combining research for a 90-point thesis with 30 points of coursework. Whichever pathway you choose, you’ll learn to carry out independent research and further develop your abilities to think critically and creatively and write effectively, graduating with a professional qualification that will be attractive to a range of employers both in New Zealand and overseas.

Your ME may be endorsed with one of three subjects:

- Electronic and Computer Systems Engineering
- Network Engineering
- Software Engineering.

You will be supervised by one of our expert researchers and will work on a research project agreed between you and your supervisor. Your final thesis will be examined by two experts, one of whom will be from outside the University.

ENTRY REQUIREMENTS

To be accepted into this programme, you will need a Bachelor’s degree, with First or Second Class Honours, or extensive professional experience, and approval from the head of school.

JAYDEN NOWITZ

Graduate, Master of Engineering

Master of Engineering graduate Jayden Nowitz says the decision to stay on for postgraduate study, to research phishing scams, was an easy one.

“The staff at the University have been incredibly supportive and foster an environment that allows you to keep exploring the areas of interest to you. The University has really strong connections to industry as well as performing well in research quality, being first in the PBRF rankings*. Finally, I love Wellington as a city. There’s great culture and diversity, and it’s so compact.”

Jayden says technology has always interested him—from tinkering with the latest gadgets to understanding the role it plays in people’s lives.

“What got me interested in cybersecurity was wanting to understand why it is that people and organisations have remained so vulnerable to cyberthreats despite efforts by security researchers and professionals to address them. The field is always changing, so it really keeps you on your toes to figure out how to respond to and address these vulnerabilities as they are discovered. So it can be quite interesting to see how threats have evolved over time.”

For his Master’s research, Jayden sought to understand whether people are more susceptible to these threats when using a mobile phone or tablet, compared with a desktop computer.

“…a lot of research has considered why people are susceptible to phishing, but very few of those studies explored the role of the type of device people were using. Furthermore, most of this research has focused on university students, rather than professional staff.

“To explore this, we conducted a phishing experiment across 141 professional administrative staff in the University, to determine what device they used to handle the phishing campaigns that were sent out.”

After completing his Master’s thesis, Jayden was accepted into the GovTechTalent Graduate Programme, working on cybersecurity in the public sector.

*Performance Based Research Fund Quality Evaluations 2018.
Employers need ICT professionals and engineers who have the skills to work effectively in the New Zealand workplace. These skills include good communication and teamwork and an understanding of the professional environment, alongside strong technical knowledge.

Gain skills in communication, problem-solving, and enterprise to complement your technical knowledge, and fast-track your career in this fast-growing industry with the one-year Master of Engineering Practice (MEP).

**DEGREE STRUCTURE**

The 180-point Master of Engineering Practice combines taught courses with a 12-week (one trimester) research project or paid industry placement to give you practical knowledge and experience.

You’ll have the option to choose courses in your area of interest, including:

- **Electronics:** Electronics encompasses both the hardware and the embedded software that enable the multitude of smart devices and systems in our modern technology. Study this hardware–software interface to contribute to the next generation of sensor devices, communication systems, and signal-processing applications.

- **Mechatronics:** From mobile phones to autonomous robots, the modern world depends upon mechatronic systems. Some of the most exciting breakthroughs in technology are happening in the field of robotics and mechatronics, including automation and artificial intelligence.

- **Networked applications:** Our world is becoming increasingly digital. As more items become part of the internet of things, we need skilled engineers who can design, configure, test, and secure networks. Create distributed networks that connect the world through millions of everyday devices.

- **Renewable energy:** Alternative 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, transmission, and distribution. Be at the forefront of this emerging industry.

- **Software engineering:** Software is the technology driving innovation and change in the world’s biggest industries, including healthcare, transport, and financial services. Give yourself an edge in this fast-growing field.

**ENTRY REQUIREMENTS**

To be accepted into this programme, you will need a Bachelor’s degree or equivalent, with at least a B+ average, and approval from the head of school.

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**SHARAN PRASAD**

Student, Master of Engineering Practice

Sharan Prasad says the unique combination of academic learning and practical experience within the Master of Engineering Practice is what motivated him to enrol.

“*The University has provided me with some excellent opportunities to learn, like interacting with real-world clients as a part of our study, excellent technical courses, and solid infrastructure facilities. I also had the opportunity to tutor for an undergraduate course.*”

Originally from Bangalore, India, Sharan says Wellington is a great place to study and live. “*I am really enjoying my stay here. I love how warm and welcoming the people of this city are.*”

His focus now is on graduating with good grades, and then he would like to stay in Wellington for at least another year to work. “*I feel that there are very good opportunities here that would be great learning experiences for me.*”

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Get the technical skills you need to work as a software developer.

The Master of Software Development (MSwDev) is designed to equip people from non-technical backgrounds with a strong, industry-focused qualification. Gain skills in programming and software development that will enable you to develop software-based solutions for a range of industries.

**DEGREE STRUCTURE**

The Master of Software Development is a full-time, 180-point programme. It is expected that you will complete the full MSwDev within 12 months, through three consecutive trimesters of study, including a 12-week research project or paid industry placement to give you practical knowledge and experience.

**ENTRY REQUIREMENTS**

If you have a Bachelor’s degree in a stream that is not related to computer science, this is the path to your new career. Recent graduates, as well as experienced candidates who want to broaden their career opportunities, are welcome.

To enter the degree directly, you need programming skills at a level equivalent to our COMP 102 course. If you have no programming skills from past studies, then you can take SWEN 131, which runs just before the programme starts.

SWEN 131 will give you the skills you need to design, read, write, and debug small Java programs and work on larger software-development methodologies and tools.

www.wellingtonict.ac.nz/master-of-software-development

**MADELEINE ST-LAURENT-GUÉRIN**

Graduate, Master of Software Development

When Madeleine St-Laurent-Guérin started thinking about postgraduate study, she had two goals in mind: she wanted to gain the skills she needed to make the transition from her previous career into a technology-related field, and she wanted to be industry-ready within a year.

After investigating her options, choosing the Master of Software Development was an easy decision, she says. “One of the University’s student advisers recommended the programme. I had a look at the curriculum and thought that this aligned perfectly with what I was looking to achieve. “During the course, I learnt technical skills, like how to code and architect software to provide solutions that have real-world applications. We used different methodologies to develop software, as well as delivering real software solutions to real clients.”

Madeleine says it wasn’t just about what she learnt in class; she also took full benefit of Wellington’s thriving tech and start-up environment, including guest speakers from industry who spoke to the class, hackathons, and attending events such as Techweek talks and WellyTech.

For her industry placement, Madeleine undertook an entrepreneurship programme with Creative HQ, where she worked alongside two other students to create a minimum viable software product—the foundation of what start-ups do.

“This gave me the chance to apply the skills I had learnt to a project I was passionate about. We explored a software solution to address issues affecting young people in New Zealand. Being part of this meant we were also exposed to a great community and given a chance to gain skills that would not have been possible in a normal corporate environment.

“During the course, I learnt technical skills, like how to code and architect software to provide solutions that have real-world applications. We used different methodologies to develop software, as well as delivering real software solutions to real clients.

*“It also gave me the ability to think differently and to look at a problem from different perspectives. It helped me become more client-focused and able to approach problems in a more creative fashion.”*

Madeleine is now a cloud and innovation analyst at Deloitte, where she works with clients on their cloud-based projects and helps run training programmes within Deloitte aimed at increasing the AWS cloud engineering capacity of its technology consultants.

*“Something I’ve taken from my experience in the Master’s that has helped me in this role is the understanding that software in this day and age is more than just being able to code. All the surrounding aspects, such as teamwork, methodology, client relationships, networking, communication, and project management, are important too—and this is reflected in my current role.”*
DOCTOR OF PHILOSOPHY

The Doctor of Philosophy (PhD) programme is a course of independent study, under the guidance of a research supervisor, in which you undertake a major piece of original research that makes a significant contribution to the knowledge or understanding of a field of study. Coursework is not an integral part of the PhD degree, but some students may be required or encouraged to undertake a limited amount of coursework.

ENTRY REQUIREMENTS

A PhD normally follows a Master’s or Honours degree (with a grade average of at least a B+) or other relevant experience. The minimum time for completion of a PhD is three years of full-time study, and students are expected to complete within four years of full-time study. Most candidates are full time, but part-time enrolment may be possible. In special circumstances, we allow distance enrolment with prior approval.

FINDING A SUPERVISOR

All PhD candidates work under the direct supervision of leading researchers, usually at the University but sometimes at external research institutes. Research degrees require at least one academic supervisor. If you know someone you would like to work with, you should approach them directly to discuss possible research projects. Please note that finding a supervisor before you apply is advisable but not always necessary, and the final allocation of supervisors is done by the admissions committee, according to research interests and available resourcing.

STUDY SUPPORT

The University runs a range of workshops on research skills, which all PhD students are encouraged to attend.

ASSESSMENT

The PhD is assessed on a substantial thesis, by a panel of three examiners, one of whom will be from an overseas university. The assessment includes each examiner writing a full report on the work, followed by an oral examination.

RESEARCH STRENGTHS AND SUPERVISION AREAS

You can study towards your PhD in any subject area that the University offers—or you can forge your own links between subjects with original interdisciplinary research. Research is a big focus of the Faculty’s work, and a diverse range of projects are underway at any time, including investigations into:

- artificial intelligence, machine learning, and evolutionary computation
- big data, data mining, and data analytics
- cloud and grid computing
- computer graphics
- computer vision, image processing, and visualisation
- cybersecurity, network security, and software security
- electronic materials and high-temperature superconductivity
- engineering and computer science education
- human–computer interaction
- instrumentation, electronics, and mechatronics
- magnetic resonance imaging (MRI) systems
- mechatronics and robotics
- programming languages
- renewable energy and smart power systems
- scheduling, combinatorial optimisation, and operations research
- signal and audio processing
- software-defined networks
- wireless communications and networking.

CHELSEA MILLER

PhD candidate, Wellington Faculty of Engineering

Chelsea Miller says it’s the immense challenges and incredible potential of wireless communications that have drawn her to this field for her PhD research.

“Wireless technology is about providing seamless communication between people. Not that long ago, we could only transmit voice through a location-specific wired connection—now we can video chat with our friends while walking around town. Seeing that massive change in such a short space of time really makes you think about what could be possible.

“However, the other side is that the more ambitious your wireless technology is, the more capacity your system must provide. That’s the constant challenge. It really is a field that will never run out of puzzles or problems to solve, and that excites me.”

For her thesis, Chelsea is investigating multi-user MIMO (multiple-input multiple-output) systems, which are seen as a key technology required to facilitate the significantly higher data rates required in the next generation of cellular systems. “So far, the way light rays propagate in a wireless system has only been approximated using very simplified channel models. These are looking to be unsuitable for future systems.

“The model I’m using in my research provides a much more reasonable representation of electromagnetic transmissions, but it’s significantly more mathematically complex than previous models.”

Her interest in MIMO technology was sparked during her undergraduate studies, and recently she had a chance to share her passion for MIMO technology, and ground-breaking research, at the prestigious IEEE International Conference on Communications, held in Shanghai.

She says she was thrilled when she heard her paper had been accepted. “This is the first time I’ve had my name on an academic publication—to have it published in an IEEE flagship conference is just surreal.”

Chelsea completed her undergraduate degree in Engineering at the University and cites the “positive, challenging, and supportive academic environment in the School of Engineering and Computer Science” for why she chose to undertake her PhD here.

“The staff are so approachable, compassionate, and helpful. I also just love Wellington as a whole, and I really feel I am growing as a person, and professionally, during my time here.”

The staff are so approachable, compassionate, and helpful. I also just love Wellington as a whole, and I really feel I am growing as a person, and professionally, during my time here.
Our strong research culture is reflected in our scholarships, which are available for PhD and Master’s by thesis candidates in all disciplines. Graduate awards are open to graduates of any university enrolling in Honours or coursework Master’s programmes. Scholarships are available for both domestic and international students.

In addition to the Victoria University of Wellington scholarships outlined here, there may be specific project funding available through the Wellington Faculty of Engineering. Contact the Faculty office or talk to your prospective supervisor to find out about these.

**PhD FUNDING**
The University awards scholarships to applicants applying to the PhD programme on the basis of academic merit, research ability, and, if relevant, a publication record. Approximately 120 new PhD scholarships are offered each year, in three rounds.

Victoria Doctoral Scholarships currently provide an annual stipend of $23,500 plus tuition fees for up to three years. Closing dates for PhD admission and scholarships are 1 March, 1 July, and 1 November each year.

**Victoria Master’s by Thesis Scholarships** are awarded to candidates on the basis of academic merit and the suitability of the research topic. They provide a stipend of $15,000 and domestic tuition fees for one year. Applicants must be undertaking a thesis of at least 90 points. The closing date is 1 November each year.

Victoria Graduate Awards are open to students who will be enrolled full time in an Honours or Master’s degree taken via coursework or a combination of coursework and a thesis or research project of fewer than 90 points. The closing date is 1 November each year.

Victoria University of Wellington is New Zealand’s most internationalised university, with students from 114 countries, more than 140 university partners worldwide, joint teaching in a number of countries, a campus in Viet Nam, and about 50 percent of staff from overseas. Our international research and teaching are strengthened by our diversity.

The first point of contact for information and advice for international students is Victoria International. Staff handle admissions and enrolment and provide award-winning student support so students get the very best out of their time here. We welcome all international students on arrival and organise an orientation programme to help students establish themselves at the University and in the city.

We understand that living and studying in a foreign country may have highs and lows, and Victoria International’s student advisers are here to listen to, and support, you. Academic advisers are available in the faculties, but prospective PhD candidates should contact the Faculty of Graduate Research in the first instance.