



**WOMEN IN SPACE**  
AOTEAROA NEW ZEALAND

# Pathways to Space Event Series 2022



## **Information for Attendees:**

Study and Training Courses in New Zealand  
towards a Career in the Space Sector



Tēnā koutou katoa,

Women in Space Aotearoa New Zealand (WISANZ) aims to support and enable women and gender minorities working in the New Zealand space sector, and those who want to join the space sector. As the WISANZ committee, we are so excited to bring the Pathways to Space Event Series to life to inspire the next generation to pursue careers in space.

Women make up less than 20% of the global space sector and under 30% of all science, technology, engineering and mathematics (STEM) researchers globally<sup>1</sup>. WISANZ is committed to improving diverse representation in the space sector in New Zealand. Space careers can not only be incredibly fulfilling, but also offer the opportunity for high income and good career progression.

WISANZ members working in the space sector strongly believe that providing visibility of and access to female and gender diverse mentors in space could be a game changer to increasing the number of young women and gender minorities entering the New Zealand space sector – because “if you can see it, you can be it”.

### **“If you can see it, you can be it”**

For the first time ever in Aotearoa, high school and tertiary students interested in space careers will be able to hear from women role models across space career fields in New Zealand – and have a chance to ask them questions about their jobs and the pathways they took to get there.

With support from the New Zealand Space Agency<sup>2</sup>, we have created this booklet as a reference for students attending Pathways events, to provide information on different training and study courses available in New Zealand that can help them work towards jobs across different fields in the space sector. These courses and training programmes are correct at time of printing, and links can be found to each institution’s webpage from the New Zealand Space Agency ‘Careers in Space’ webpage: <https://www.mbie.govt.nz/science-and-technology/space/careers-in-space/>

We hope the aspiring young space wāhine who attend WISANZ’s Pathways events leave feeling as inspired and excited about working in space as we do, and with information to help them pursue their space career dreams.

Ngā mihi nui,

**The WISANZ Committee**

1. United Nations Office of Outer Space Affairs <https://space4women.unoosa.org/about>

2. The New Zealand Space Agency is part of the Ministry of Business, Innovation and Employment

## At High School

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A lot of space careers across different fields have a strong science or engineering basis, and so studying science and maths at high school can provide a lot of options for you to follow different space career pathways. Space presents a lot of challenges that needs creative, innovative thinkers to work together to solve. Taking subjects at high school that help you to develop problem solving skills or work as a team on projects, including hands-on designing or building things to solve problems, will be a good basis for starting a career in the space sector.

While space jobs that have foundations in science, technology, engineering and mathematics (STEM) make up the majority of the jobs in the New Zealand space sector, they aren't the only roles that contribute to the success of a space company or a space research team.

There are jobs in the space sector that are focused on being able to write or communicate really well, or to manage or interact with people. Studying English and other subjects where you solve problems or work together in teams can be helpful to work towards these types of jobs.

Having a STEM-based space job doesn't mean you can't be creative as well. Some of our WISANZ members are successful in STEM space careers but also write books, paint or are part of drama clubs. A number of STEM-based space jobs require really good people skills and the ability to be able to write well. Art, English and other creative subjects at high school can help you be an even more successful space team member, even if the majority of your job requires technical skills.

- ★ Science (physics, chemistry, biology)
- ★ Mathematics
- ★ Graphic design or art
- ★ Software , computer science, robotics
- ★ English
- ★ Electronics



## After High School

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Many space careers require a degree or some form of trade training to get you started. Over the following pages, we've set out suggested job types or families in the New Zealand space sector, and then listed degrees or trade training or apprenticeship options that could help you achieve a job in that field.

Once you start studying or training, you will be able to decide what to specialise in to get into the type of work you really want to do. When you imagine your future space career, what type of job would be interesting for you?

- ★ **ROCKETS, SPACEPLANES AND SATELLITES**
- ★ **CELESTIAL BODIES, PLANETS AND STARS**
- ★ **PLANT LIFE IN SPACE**
- ★ **SPACE MEDICINE AND BIOMEDICAL RESEARCH**
- ★ **COMMUNICATIONS, MARKETING AND BUSINESS OPERATIONS**
- ★ **SPACE LAW, SECURITY AND INTERNATIONAL RELATIONS**
- ★ **INTERDISCIPLINARY STUDIES**

This booklet will share information on how to study or train in the fields listed above in New Zealand so read on to find out more!

## ROCKETS, SPACEPLANES AND SATELLITES

*Help build or operate the spacecraft that fly to space or orbit around planets and stars!*

### Building or designing rocket engines and satellite thrusters

Do you want to design or build rocket engines, engine components, or work with machines like 3D printers or computer controlled mills or lathes to make parts of rocket engines, or test rocket engines on the ground?

Trade training or apprenticeships can be a good basis for a number of hands-on jobs building or testing rocket engines or satellite thrusters, such as

- ★ NZ Diploma in Engineering (Mechanical)
- ★ NZ Certificate in Engineering Fabrication (Mechanical)
- ★ Aircraft Maintenance Engineering (Certificate or Diploma)
- ★ New Zealand Certificate in Mechanical Engineering (Level 3, pre-apprenticeship) – Unitec

Degree qualifications can be a good basis for design or testing performance improvement for rocket engines or satellite thrusters, such as:

- ★ Bachelor of Engineering with Honours/Masters of Engineering in:
  - ★ Mechanical Engineering – Auckland University of Technology, University of Auckland or University of Canterbury (with a Minor in Aerospace Engineering available for undergraduate study)
  - ★ Mechatronics Engineering— Auckland University of Technology, University of Auckland, University of Canterbury, Massey University

*For embedded systems, automation control, graphical user interfaces:*

- ★ Electrical and Electronic Engineering – Auckland University of Technology, University of Auckland and University of Canterbury
- ★ Engineering Science – University of Auckland
- ★ Computer Science and Software Engineering – University of Canterbury
- ★ Software Engineering – Auckland University of Technology, University of Auckland
- ★ Bachelor of Engineering Technology— Auckland University of Technology
- ★ Post Graduate Certificate/Diploma in Aerospace Engineering – University of Auckland
- ★ Master of Aerospace Engineering – University of Auckland
- ★ Bachelor of Engineering with Honours – Victoria University of Wellington



## Software, data and analysis

Do you want to study data from rocket or spaceplane launches/flights and analyse or design systems and software that make better, faster, or safer space rockets or spaceplanes?

### Relevant Qualifications:

- ★ Bachelor of Engineering with Honours in:
  - ★ Mechatronics Engineering— Auckland University of Technology, University of Auckland, University of Canterbury, Massey University
  - ★ Software Engineering — Auckland University of Technology, University of Auckland
  - ★ Electrical and Electronic Engineering — Auckland University of Technology, University of Auckland and University of Canterbury
  - ★ Engineering Science – University of Auckland
  - ★ Computer Science and Software Engineering – University of Canterbury
- ★ Post Graduate Certificate/Diploma in Aerospace Engineering – University of Auckland
- ★ Master of Aerospace Engineering – University of Auckland
- ★ Bachelor of Engineering with Honours – Victoria University of Wellington
- ★ Bachelor of Engineering Technology (Electrical) Level 7 – Unitec
- ★ Postgraduate Diploma in Computing – Unitec
- ★ Master of Computing – Unitec
- ★ Bachelor of Information Sciences – Massey University

## Rocket and spaceplane structures

Do you want to build or design rocket bodies or spaceplane structures, or analyse and improve their aerodynamics?

Trade training or apprenticeships can be a good basis for a number of hands-on jobs building or testing rocket bodies, spaceplane airframes or satellite structures, such as

- ★ New Zealand Certificate in Mechanical Engineering Level 3 – Unitec
- ★ NZ Diploma in Engineering (Mechanical or Electrical)
- ★ NZ Certificate in Engineering Fabrication (Mechanical or Electrical)
- ★ NZ Certificate in Composites
- ★ Aircraft Maintenance Engineering (Certificate or Diploma)

Degree qualifications can be a good basis for designing rocket bodies, spaceplane airframes or satellite structures, such as:

- ★ Bachelor of Engineering with Honours/Masters of Engineering in:
  - ★ Mechanical Engineering – Auckland University of Technology, University of Auckland or University of Canterbury (with a Minor in Aerospace Engineering available for undergraduate study)
  - ★ Mechatronics Engineering— Auckland University of Technology, University of Auckland, University of Canterbury, Massey University
- ★ Bachelor of Engineering Technology— Auckland University of Technology
- ★ Post Graduate Certificate/Diploma in Aerospace Engineering – University of Auckland
- ★ Master of Aerospace Engineering – University of Auckland

### Guidance, Navigation & Control, Avionics and Electrical Systems

Do you want to design or build the avionics systems for spaceplanes and satellites, or the systems that power them?

Trade training or apprenticeships can be a good basis for a number of hands-on jobs building or testing avionics and electrical systems, such as:

- ★ NZ Diploma in Engineering (Electrical)
- ★ NZ Certificate in Engineering Fabrication (Electrical)
- ★ Aircraft Maintenance Engineering – Avionics (Certificate or Diploma).

Degree qualifications can be a good basis for designing guidance, navigation and control systems, or avionics and electrical systems for rockets, satellites and spaceplanes, such as:

- ★ Bachelor of Engineering with Honours/Masters of Engineering in:
  - ★ Electrical and Electronic Engineering – Auckland University of Technology, University of Auckland and University of Canterbury
  - ★ Mechatronics Engineering— Auckland University of Technology, University of Auckland, University of Canterbury, Massey University
  - ★ Engineering Science – University of Auckland
  - ★ Computer Science and Software Engineering – University of Canterbury
  - ★ Software Engineering – Auckland University of Technology, University of Auckland
- ★ Bachelor of Engineering Technology— Auckland University of Technology
- ★ Post Graduate Certificate/Diploma in Aerospace Engineering – University of Auckland
- ★ Master of Aerospace Engineering – University of Auckland



## Remote sensing from space and communications

Do you want to design or build systems for satellites that sense or study Earth or space or let people on Earth communicate – with other parts of Earth or other parts of space? (like telescopes, radar, radios or lasers).

Degree qualifications can be a good basis for designing remote sensing systems and communications or radio frequency sensing systems, such as:

- ★ Bachelor of Engineering with Honours/Masters of Engineering in:
  - ★ Mechatronics Engineering— Auckland University of Technology, University of Auckland, University of Canterbury, Massey University
  - ★ Electrical and Electronic Engineering — Auckland University of Technology, University of Auckland and University of Canterbury
  - ★ Engineering Science – University of Auckland
  - ★ Computer Science and Software Engineering – University of Canterbury
  - ★ Software Engineering — Auckland University of Technology, University of Auckland
- ★ Bachelor of Engineering Technology— Auckland University of Technology
- ★ Bachelor of Applied Technology (Electrotechnology) Level 7 – Unitec
- ★ Bachelor of Science
- ★ A Bachelor of Astronomy may help you understand how radio telescopes work.



## CELESTIAL BODIES, PLANETS AND STARS

*Expand our collective knowledge about the universe and everything in it!*

Do you want to study the origins of planets, stars and the universe? Or the way that celestial bodies affect each other, how spacecraft are affected by gravity in space? Or the movement of celestial bodies like asteroids and how we could protect Earth from them?

Degree qualifications can be a good basis, with a number of specialist subject areas able to be selected within broader degrees:

- ★ Bachelor of Science in Astronomy or Astrophysics – University of Canterbury, University of Auckland, Victoria University
- ★ Bachelor of Science in (Astronomy, Astrophysics) – Victoria University of Wellington
- ★ Bachelor of Science at Auckland University of Technology.
- ★ Bachelor of Science with Space Science major – Victoria University of Wellington

### The origins of planets:

Study Bachelor of Science with major in astronomy, physics, chemistry, molecular biology, microbiology, ecology, planetary science, space science (Victoria University of Wellington only), geography or geology, at a number of New Zealand universities. Some specialist courses you can elect within these majors to specialise in planetary science include :

- ★ Astrobiology Astro 200G Astrobiology – University of Auckland
- ★ Microbes and their environments (BIOL234) – Victoria University of Wellington
- ★ Environmental Sciences Applied Conservation – Auckland University of Technology
- ★ Geospatial Science, Geoscience – Auckland University of Technology
- ★ Microbiology, Molecular Genetics and Biomedical Science under the BSc, MSc, PhD programmes – Auckland University of Technology.

### Planetary defence:

Study Bachelor of Science with major in astronomy, astrophysics, geology or physics with elected specialist courses like:

- ★ Astrosciences – University of Auckland
- ★ Space Sciences major – Victoria University of Wellington



## PLANT LIFE IN SPACE

*Help create the first gardens in space or on another planet!*

Do you want to study how plants grow in space, or figure out different ways to grow food in space or on the Moon or other planets?

Degree qualifications can be a good basis, with a number of specialist subject areas able to be selected within broader degrees:

- ★ Study a Bachelor of Science in biology, horticulture or agriculture, including microbiology – Lincoln University, Massey or Auckland University of Technology
- ★ Molecular genetics – Auckland University of Technology
- ★ Astrobiology Astro 200G Astrobiology – University of Auckland
- ★ Microbes and their environments (BIOL234) – Victoria University of Wellington

## SPACE MEDICINE AND BIOMEDICAL RESEARCH

*Understand how the human body performs in the space environment.*

Do you want to study the effects of space on the human body or how humans perform in space, or use space to help research ways that medicine or treatments and drugs can be improved or made in space to improve our health or lives on Earth?

Degree qualifications can be a good basis, with a number of specialist subject areas able to be selected within broader degrees:

Study medicine, biomedical science, health science, molecular biology, cell biology, life sciences, pathology, anatomy and physiology, genetics, radiobiology, medical laboratory science

- ★ Bachelor of Health Science or Science (Biomedical)– University of Otago, University of Auckland
- ★ Biomedical Science and Medical Laboratory Science – Auckland University of Technology
- ★ Bachelor of Health Science – Massey University

Sport and exercise programmes can include physiology, biomechanics, nutrition and cognitive science. Astronauts need these aspects in a very similar way to professional athletes.

- ★ Major in sport and exercise – Auckland University of Technology
- ★ The AUT Sport Performance Research Institute New Zealand has an active research programme in collaboration with colleagues at NASA.

## SPACE LAW, SECURITY AND INTERNATIONAL RELATIONS

*Contribute to building a safe and cooperative space environment for all.*

Space is open to everyone and every country to explore and use, and can provide significant benefits to everyone on Earth. There are also complex situations where companies or governments using space need to work together or where there can be risk to the space environment degrading if we don't all look after it. There are lots of roles where the government or companies need guidance to develop policies or understand legal implications from activities in space. Space policy, space law and space diplomacy are all areas that will need more and more specialists in New Zealand in the future.

Degree qualifications in law, political science, international security or international relations from a number of New Zealand universities can be a good basis for learning about space policy or space law, followed by working with government departments or in legal firms with specialist space roles. Some specialist legal courses that can help include:

- ★ International Law (LAWPUBL 402) – University of Auckland
- ★ Advanced International Law (LAWPUBL 403) – University of Auckland
- ★ Critical Issues in Space Law (LEGAL444 2021) – University of Waikato

## COMMUNICATIONS, MARKETING AND BUSINESS OPERATIONS

*Help grow companies working within the space sector.*

Do you want to help tell the story of space companies or space research to the public, help space businesses thrive or help people join the space sector and have thriving careers?

There are a number of ways to gain qualifications and experience in fields that space companies and space researchers need to help them succeed. You can become a Communications, Marketing, Business or HR specialist through qualifications or on-job training in any sector and then transfer those to the space sector. Look for courses available at universities or training institutions that align with the type of job you'd like to do that will enable a space company or space researchers, such as:

- ★ Bachelor of Communications
- ★ Bachelor of Commerce, including specialist courses in Human Resources Management, Business Management, Supply Chain Management, and Marketing



## CROSS DISCIPLINARY SPACE QUALIFICATION

*For those who want to learn about everything!*

Victoria University of Wellington Bachelor of Science with a major in Space Science will be available from 2023. Space Science looks at all parts of the space industry—from the technical innovations needed to go into space, to the ethical and legal issues that develop as we push out of Earth's orbit.

Students will learn about the basic scientific nature of the space environment and the technical aspects of getting into space. Delve into the history of astronomy and space exploration, and find out about the importance of the night sky in Māori and Pasifika culture.

At the end of your degree you'll have an in depth understanding of the space sector and strong mathematical and computing skills—helping to open employment pathways in both the growing space sector and other technical sectors.

### Online Resources and Disclaimer

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All courses detailed in the booklet are correct at time of printing, however the list we have presented is neither exhaustive nor definitive for training and study that can assist achieving space jobs in New Zealand. WISANZ recommend visiting the websites of, or contacting, New Zealand universities or training institutes to learn the most up to date courses available.

The New Zealand Space Agency 'Careers in Space' webpage sets out the majority of the information included in this booklet, with online links to training institutions or universities.

Visit: <https://www.mbie.govt.nz/science-and-technology/space/careers-in-space/>

### Acknowledgements

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WISANZ want to thank the New Zealand Space Agency for permitting the use of information contained on their 'Careers in Space' webpage within this information booklet.

## Notes

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