AUT

A FUTURE IN **MECHATRONICS ENGINEERING**

WHAT IS MECHATRONICS ENGINEERING?

Mechatronics is central to the myriad of smart products we take for granted in our daily lives, whether it's our car's cruise control feature, advanced flight control systems, washing machines or multifunctional precision machines.

Mechatronics engineering refers to the combination of 'mecha' from mechanisms and 'tronics' from electronics, combining mechanical, electrical, electronic and control engineering. This integrated interdisciplinary approach to engineering is in the design of cars, robots, machine tools, washing machines, cameras and many other machines and systems.

Mechatronics encompasses sensors and measurement systems, drive and actuation systems, and microprocessors systems. Mechatronic systems are used in space technology, transportation, optical telecommunications, automobiles, automated manufacturing plants or automated harvesting plants, wireless network enabled devices, micro electro-mechanical systems, automatic diagnostic systems, biomedical devices, surgical devices, robots, and artificial organs.

As a mechatronics engineer you could be involved in activities like:

- Producing equipment and robots in pick-and-place operations for agriculture, farming, and related industries
- Designing innovative medical devices that save lives or contribute to rehabilitation
- Developing drones, cars, ships, planes, and robots
- Designing control systems for aviation, space, defence, and transport

Even within one company your options are diverse. At Fisher & Paykel, for example, mechatronics engineering graduates may work in appliances, automatization systems or designing medical devices.

Are you curious about how things work and the world around you? Do you love challenges and solving complex problems? Are you strong at maths, physics and/or programming and a creative, innovative, practical person? If so, mechatronics engineering could be the career for you.

OUTLOOK AND TRENDS

Artificial intelligence (AI) rapidly advancing – Artificial intelligence (AI), robotics and other forms of 'smart automation' are advancing at a rapid pace. They have the potential to bring great benefits to the economy by boosting productivity and creating new and better products and services. A recent PwC study estimated that these technologies could contribute up to 14% to global NZ GDP by 2030, equivalent to around $15 trillion at today's values.

Strong investment by NZ – Competing in a globalised market requires the adaptation of modern technology to yield flexible, multifunctional products that are better, cheaper, and more intelligent than those currently on the shelf. New Zealand is investing heavily in systems to modernise our infrastructure, prepare for climate change and help grow the economy.

High demand areas – Globally, there is high demand for mechatronic professionals in cybersecurity, automatisation, telecommunications, computer science, automotive engineering, biomedical engineering, robotics, artificial intelligence, consumer products and packaging. Between 2020-2025 the robotics and mechatronics market is estimated to grow 15% in Europe, 11% in Asia-Pacific and 6% in US.

NZ shortage of mechatronic engineers – Mechatronics engineering is on Immigration NZ's long-term shortage list. Employment for engineering professionals (all fields of engineering) will increase over 3% through to 2023, then is projected to keep rising over 2.3% per year to 2028, according to the Ministry of Business, Innovation and Employment Occupational Outlook and Immigration NZ's Medium to Long-Term employment projections.

Engineering professionals are one of the highly skilled occupations that are projected to account for around 58% of total employment growth up to 2028.

Sources: Ministry of Business, Innovation and Employment, Immigration New Zealand, Europe Agricultural Robots and Mechatronics Market – Growth, Trends and Forecast (2020-2025).

WORK SETTINGS

Mechatronics engineering is a broad discipline, providing opportunities in a wide range of sectors such as automation, power/energy, telecommunications, propulsion systems, healthcare, and aviation. The majority of employers are private companies or consultancies.

Specific industries employing mechatronic engineers include:

- Automation for agriculture
- Manufacturing
- Transport
- Medical
- Control systems
- Robotics
- Space and aeronautics
- Telecommunications, security, and programming

CAREER DIRECTIONS

Most engineering professionals start out as graduate engineers, working with more senior engineers to gain experience and an understanding of the job. With experience, engineers may become part of, or gain responsibility for, larger and more complex projects. They may also take leadership and supervisory roles.

Automation engineer – Improves the efficiency of various manufacturing and computer systems by automating certain parts of the systems to work on their own. Plans and changes existing technology so it needs less human interaction and monitors the performance of the changes. Sometimes, an automation engineer may design entirely new technology to automate a system.

Roboticist – Designs, builds, programs, and experiments with robots. A highly interdisciplinary field, roboticists often acquire expertise from a diverse number of disciplines including computer science, mechanical engineering, electrical engineering, human-computer interaction and interaction design.

Data logging engineer – Manages, optimises, oversees and monitors data retrieval, storage and distribution. Responsible for finding trends in data sets and developing algorithms to help make raw data more useful. Keeps an eye out for trends or inconsistencies that will impact established goals.

Control system engineer – Designs, develops and implements solutions that control dynamic systems (constantly changing systems) by bringing stability to produce the desired outcome. With car anti-lock braking systems, for example, a control system engineer would design, develop and implement the systems that control the behaviour of the car's brakes in different speeds, road surface conditions, brake temperatures, etc.

Instrumentation engineer – Plans, installs, monitors and maintains control systems and machinery within manufacturing environments. Works with control processes that use sensors to provide feedback. May also design and develop customer products that utilise such processes, such as blood glucose meters or smoke detectors.

Development engineer/Product development engineer – Designs, creates and tests new products for companies. Works in teams developing products or hired to independently create devices or merchandise. Product and industries vary substantially, eg from mechanical toys to medical devices.

Sources: MBIE, Career Explore, Indeed, SEEK

SKILLS AND KNOWLEDGE

- Project management and planning
- Team management and leadership
- Simulation and modelling abilities
- Communication skills, writing, graphic and oral
- Analytical, logical, and quantitative thinking
- Creative and innovative
- Problem solvers and adaptable

PERSONAL QUALITIES

- Intellectual, introspective, and inquisitive
- Curious, methodical, rational, analytical and logical
- Independent, stable, persistent, genuine, practical

SALARY GUIDELINES

Can vary depending on size of organisation and location.

	Salary depending on experience (per year)
Mechatronics engineering graduate (0–3 years)	$62,000 (average)
Mid-career (4–9 years)	$76,000 (average)
Senior (10yrs+)	$94,000
Team leader	$101,000 (average)
Technical manager	$140,000 (average)

Sources: Engineering New Zealand, Occupation Outlook MBIE NZ, Jobted, payscale.com

Salary range is indicative of the New Zealand job market at the time of publication (mid-2021) and should only be used as a guideline.

PROFESSIONAL REGISTRATION

Engineering New Zealand is the NZ professional body and registration authority. A 4 year Bachelor of Engineering (BE) degree, plus 5–6 years' work experience leads to registration as a Chartered Professional Engineer (CPEng registration). This is internationally recognised.

Many engineers also become Engineering New Zealand members, for professional and career support.

THE AUT ADVANTAGE

AUT mechatronics engineering students study a complete integration of electrical, mechanical and control systems, offering a concurrent approach to engineering design. This integrated and interdisciplinary approach to engineering design is increasingly adopted worldwide. AUT graduates enter the employment market with knowledge and skills that have been tested in practical situations and work environments.
All mechatronics engineering students must complete a 300-hour final year project – often for industry.
In addition, they undertake 800 hours of practical work experience, gaining real industrial and work environment experience.

FURTHER STUDY OPTIONS

Further study in mechatronics engineering is available at postgraduate level, including the Postgraduate Certificate in Engineering, Postgraduate Diploma in Engineering, Master of Engineering, Master of Philosophy and Doctor of Philosophy. Research areas include robotics, biomechatronic and bionics, medical devices design and medical technology, production and manufacturing processes, advanced control systems, and telecommunication systems.

Saad Hassan

Bachelor of Engineering (Honours) in Mechatronics Engineering

Graduate Automation Engineer for Industrial Controls South Canterbury (ICSC)

"I started with ICSC in 2020. Unlike a traditional graduate program, ICSC throws you in the deep end. From day one, I enjoyed working on medium ($100k) to large ($1m) sized projects in a team environment.

I always wanted a dynamic work environment where I am challenged daily to learn new things. My technical role offers me desk time, as well as work on-site, making every day exciting.

As an automation engineer, I am heavily involved in project planning, designing process logic, programming PLC (microcontroller and input/output devices), and developing HMI (Human Machine Interface) and SCADA (Supervisory Control and Data Acquisition) systems using a variety of packaged computer software.

Nothing gives me more excitement than seeing my code work in real life. I have enjoyed controlling conveyors, robotic arms, pumps, valves, and many more operational technology devices depending on the client's need. Fault finding code, improving the user interface, and creating a robust control system is another aspect of my daily work.

I also visit clients' sites and work with them to commission the project. I get to work with electrical and process engineers, operators, and electricians from many industries including food and beverages, manufacturing facilities, water supply, and building services. In short, I'm dealing with people and computer programming.

During my degree I networked with industry professionals and found the world is headed into the Fourth Industrial Revolution; the automation of traditional manufacturing and industrial processes using Operational Technology (OT) and Internet of Things (IoT). So I aligned my career options with that."

EMPLOYER COMMENT

"With automation graduates and interns we look for a strong engineering fundamental background, and an interest in computer programming. We want someone interested in knowing a process, who likes to pull things apart and discover how things work.

Mechatronics engineering is a preferable pathway into automation because graduates understanding of electronics, mechanical and software helps them understand and work with people from those fields.

Saad researched the company and automation role thoroughly. He showed great passion and interest in automation, and his academic projects and previous work experience in an automation related field made him stand out.

I advise graduates to research the company and location. Reflect your personality and recreational interests in your application because it gives an understanding of how you would fit in a team.

If you are passionate about working for the company, send your CV and cover letter even if no job is advertised. It's not only about grades and achievements – passion is important too.

Having work experience is a bonus."

Lindsay Brazendale
ICSC Senior Automation Engineer

USEFUL WEBSITES

Engineering New Zealand
www.engineeringnz.org

ABB
www.new.abb.com

Compac
www.compacsort.com

Fisher & Paykel
www.fisherpaykel.com/nz/

Fisher & Paykel Health
www.fphcare.com/nz/

Rocket Lab
www.rocketlabusa.com

NZ Robotics, Automation & Sensing
www.nzras.org.nz

FURTHER INFORMATION

For the most up-to-date information on mechatronics engineering study, visit our website :
www.aut.ac.nz/mechatronics
For other Future Career Sheets visit:
www.aut.ac.nz/careersheets

EMPLOYABILITY & CAREERS

For employability and career support, AUT students can book an appointment through
https://elab.aut.ac.nz/
@AUTEmployabilityandCareers

FUTURE STUDENTS

Contact the Future Student Advisory team for more information: www.aut.ac.nz/enquire
futurestudents@aut.ac.nz
@AUTFutureStudents

CURRENT AUT STUDENTS

Contact the Student Hub Advisors team for more information: 0800 AUT UNI (0800 288 864)
www.aut.ac.nz/enquire
studenthub@aut.ac.nz

CITY CAMPUS

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The information contained in this career sheet is correct at time of printing, September 2021.