TERM 3, 2022

CAREERS WITH STEM™

ENGINEERING

DOUBLE ISSUE
FLIP FOR CAREERS WITH QUANTUM

GRADUATE SOFTWARE ENGINEER

GRADUATE ANDROID DEVELOPER

6 reasons to choose engineering p6

Discover VET pathways p12

Get into green energy careers p18

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(YOU)us

CAN USE YOUR CREATIVITY TO SOLVE TOMORROW'S CHALLENGES

From the pyramids to the industrial revolution, cars, mobile phones, the space station and surgical breakthroughs, engineers' creative approach to solving problems have been critical to innovation, growth and prosperity across the ages.

Study engineering at Macquarie and learn how to create practical solutions to complex problems. Choose from five specialisations to get the skills you need to change lives.

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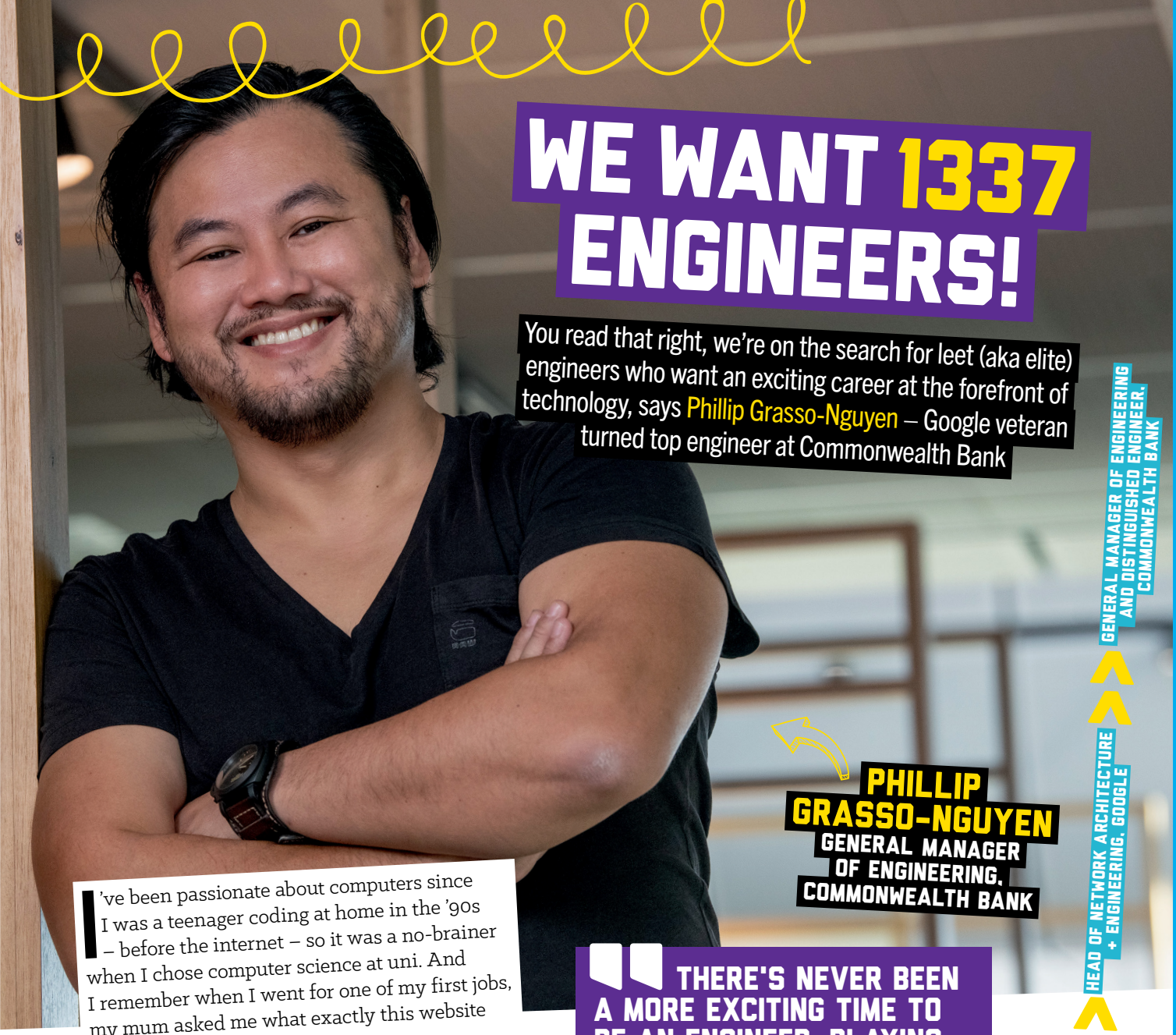


WE WANT 1337 ENGINEERS!

You read that right, we're on the search for leet (aka elite) engineers who want an exciting career at the forefront of technology, says Phillip Grasso-Nguyen – Google veteran turned top engineer at Commonwealth Bank

PHILLIP GRASSO-NGUYEN
GENERAL MANAGER OF ENGINEERING, COMMONWEALTH BANK

GENERAL MANAGER OF ENGINEERING AND DISTINGUISHED ENGINEER, COMMONWEALTH BANK

HEAD OF NETWORK ARCHITECTURE + ENGINEERING, GOOGLE

MASTER OF SCIENCE (COMPUTER SCIENCE), UTS

BACHELOR OF SCIENCE (COMPUTER SCIENCE), UNIVERSITY OF SYDNEY

I've been passionate about computers since I was a teenager coding at home in the '90s – before the internet – so it was a no-brainer when I chose computer science at uni. And I remember when I went for one of my first jobs, my mum asked me what exactly this website was I was going to work for.

It was 2006 and the 'website' was Google.

Over the next 15 years, I helped establish Google's infrastructure teams in Australia to serve its worldwide systems.

'THE CORE OF MODERN BANKING'

You might think I'm talking about the good old days, but I've never been more excited about my career and about working in tech! Similar to how Google isn't just a website anymore, my current employer, Commonwealth Bank, isn't just about money or finance. Cutting-edge technology is the core of modern banking.

It's my job to represent Commonwealth Bank's 7000-plus engineers. I ensure they have what they need to develop software quickly.

Our engineering grads are working at the forefront of tech: using blockchain, DevOps, Kubernetes (Google it!), even playing with robots and using the latest coding languages, like Go. They're learning from some of the best engineers in Australia and having fun making a real difference. For example, you could make a difference to the environment by working on our green products and trading carbon credits.

> "THERE'S NEVER BEEN A MORE EXCITING TIME TO BE AN ENGINEER, PLAYING A ROLE IN AUSTRALIA'S GROWING DIGITAL ECONOMY"

There's never been a more exciting time to be an engineer playing a role in Australia's growing digital economy. I love being in an industry that welcomes everyone for who they are and what they can bring to help make positive change. The more minds, the merrier.

Technology is the future of everything. If you want to shape the future, then take up STEM and be a part of the change we deserve.

Phillip Grasso-Nguyen
General Manager of Engineering and Distinguished Engineer, Commonwealth Bank

CONTENTS

What's inside?

FLIP THE MAGAZINE OVER FOR CAREERS WITH QUANTUM!

STEM + X =

Combine engineering (STEM) with your passion (+ X) to discover the perfect career path for you...

Engineering + ...

WHY ENGINEERING?

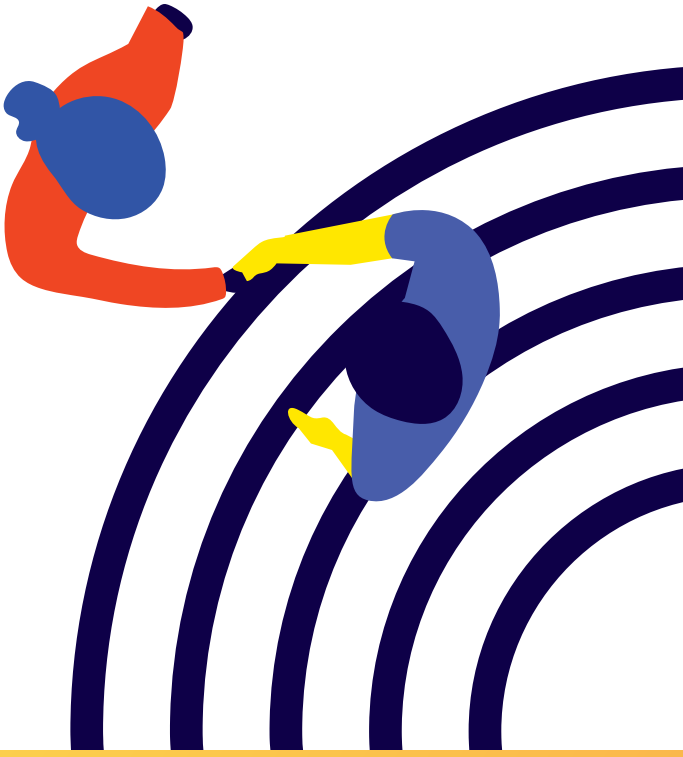
At its core, engineering is about using maths and science to solve problems. From buildings to apps, engineers design and build efficient solutions that we use in our everyday lives and beyond. And with the world currently facing multiple challenges – climate change, war, a pandemic and food insecurity – people with engineering skills are in high demand. In Australia alone, more than 80% of engineering graduates land full-time jobs within four months of graduation. Engineering underpins so many important jobs of our present and future. That's why, in this issue, we're shining a light on amazing engineering feats and the careers behind them.

SHUTTERSTOCK

Australian Government

National Careers Institute

YOUR CAREER. YOUR WAY.



The National Careers Institute empowers Australians to achieve productive, rewarding and fulfilling careers and lifelong learning.

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6 reasons to choose engineering

Wondering why engineering should be on your STEM career radar? Read on

#1 YOU'LL FIND A JOB – AND LOVE IT!

Demand for engineers is so hot right now, you're almost guaranteed a full-time job after graduation.

"Australia has an engineering skills shortage exacerbated by COVID-19," says Dr Bronwyn Evans, CEO of Engineers Australia. "[Plus] an engineering job vacancy rate that has gone up 97 per cent in just 12 months and an economic recovery hinging on major infrastructure projects."

Most engineering students find a full-time job within four months of graduating. Plus engineering hires are heaps happier. A 2021 survey by QILT* found a massive 90% employer satisfaction rate.

#2 THERE'S LOADS OF CHOICE

Whatever your interest, engineering has you covered. Do you geek out over the planets? Consider a career as a space engineer. Obsessed with the ocean? Marine engineering could be the gig for you. Want to save lives? Become a biomedical engineer. Love cool gadgets? Check out electronics engineering.

#3 THE E IN STEM IS FOR EVERYONE

Building the best engineering workforce means improving diversity. Change is happening. Future engineers from diverse backgrounds are in high demand. Australia's Women in STEM Ambassador, Professor Lisa Harvey-Smith, says one of the reasons fewer girls sign up for engineering is that students often don't know what it's all about.

"Ask a Year 9 student if she wants to design a system for rare pygmy possums to safely cross a highway and you will probably get an enthusiastic yes," she told *The Conversation*. "Ask the same student if she wants to be a mechanical engineer and the response may be lukewarm at best."

PROFESSOR LISA HARVEY-SMITH AUSTRALIA'S WOMEN IN STEM AMBASSADOR

SHUTTERSTOCK

> "AUSTRALIA HAS AN ENGINEERING SKILLS SHORTAGE EXACERBATED BY COVID-19"

#4 MAKE YOUR MARK

Think of any complex, high-profile piece of architecture or infrastructure in Australia and there will be dozens of engineers who helped make it happen. We're talking the Sydney Harbour Bridge, The Ghan, the Snowy Hydro Scheme – you name it. By studying engineering, you could be on your way to helping create the next big thing in our future.

#5 SAVE THE PLANET

You could help save the planet as an engineer! From building robotic crabs that pick up cigarette butts on beaches to helping transition our energy system away from fossil fuels, the sky's the limit!

Susan Krumdieck is an adjunct professor and mechanical engineer from New Zealand's University of Canterbury, and she says engineers will be key to conserving our environment for future generations, because no-one knows what needs to be done to save it like engineers do!

#6 EARN BIG BUCKS

A report by the Office of the Chief Scientist found that 40% of engineering graduates in Australia earn $104K or more. Experienced, specialist engineers can earn even more – a late-career marine engineer, for example, can earn up to $205K. – *Heather Gallagher*

YOU GET A JOB! AND YOU GET A JOB! AND YOU GET A JOB...

WHICH ENGINEERS SCORE EMPLOYMENT IN THE FIRST FOUR MONTHS AFTER GRADUATING? THE NUMBERS SPEAK FOR THEMSELVES.

77.7%
CIVIL ENGINEERS

78.1%
ELECTRICAL ENGINEERS

78.5%
COMPUTING ENGINEERS

76.3%
MINING ENGINEERS**

*QILT: QUALITY INDICATORS FOR LEARNING AND TEACHING. **GRAD AUSTRALIA

Choose your own career-venture

Meet three graduates who all chose engineering pathways – and never looked back

Spoilt for choice much? With so many cool next-gen STEM degrees out there, we spoke to three graduates about what made them choose engineering – and how it helped them score great gigs.

SHIVANG NAGAR
DATA ENGINEER, COMMONWEALTH BANK

#1 THE BUSINESS-SAVVY ENGINEER

Shivang and a double degree were a natural fit. After graduating from high school, the maths whiz was keen to choose a pathway that'd teach him both engineering and entrepreneurial skills.

"I wanted to learn software engineering, but also how a business works," he explains.

Eventually settling on a Bachelor of Software Engineering and a Bachelor of Commerce at Monash University, Shivang majored in business analytics, which gave him a glimpse into three awesome aspects of STEM – maths, engineering and data. With his business-savvy mind, Shivang started hunting down graduate gigs while studying.

"I wanted to work for a larger organisation because of the possibility of collaborating with people from around the world," he says.

Shivang secured a graduate engineering role at the Commonwealth Bank – which led to a permanent gig as a data engineer.

> "I WANTED TO LEARN SOFTWARE ENGINEERING, BUT ALSO HOW A BUSINESS WORKS"

WORK WINS

These days, Shivang works in a team of tech-fluent engineers enabling the bank and its partners to share data so they can better serve their customers.

Then there was the project he recently wrapped up that became its own company – CommBank iQ. "During the project, I got the chance to work on both coding tasks and running workshops," he says.

Shivang is securing the coolest future for himself. And his ultimate goal is a role as a thought leader (someone in charge of a company's bigger-picture goals). – *Cassie Steel*

BACHELOR OF SOFTWARE ENGINEERING (HONOURS) / BACHELOR OF COMMERCE (BUSINESS ANALYTICS), MONASH UNIVERSITY >> GRADUATE ENGINEER, COMMONWEALTH BANK >> DATA ENGINEER, COMMONWEALTH BANK

TINA SMIGIELSKI

#2 THE ARTY ENGINEER

AIZEL REDULLA
GRADUATE ANDROID DEVELOPER, COMMONWEALTH BANK

For Aizel, studying something creative was just as important as diving into a straight-up STEM degree – so she sought out a course that flexed both her analytical and creative smarts.

"I have always been passionate about tech, but also about how we interact with it," she says. "We need creative skills in STEM – for problems that seem impossible to solve!"

A Bachelor of IT (UX Design), and Bachelor of Arts (Linguistics) at the University of Queensland satisfied the best of both Aizel's worlds. Even after graduation, she was torn over which field to head into. Aizel's unique DIY degree led her to a graduate position at Commonwealth Bank.

> "WE STILL NEED CREATIVE SKILLS IN STEM – FOR THOSE PROBLEMS THAT SEEM IMPOSSIBLE TO SOLVE!"

THE ART OF ENGINEERING

Aizel's gig as a graduate Android developer has her working on the bank's Business Banking Technology team. She introduces tailored tech features into the Android CommBank app specifically to help small-business owners beyond their banking needs.

"We look at things like how they can grow their business success and handle risks," she says of her first big role. "It's an initiative close to my heart, because I know our small businesses were heavily impacted through the pandemic."

Seeking out a software engineering role that requires equal parts tech skills and creative thinking has been an awesome way for Aizel to engineer her career to suit both her interests.

"I really do feel like I'm living my dream job," she says. And the fact that work flexibility means she can work from home in her pyjamas sometimes? Living. The. Dream. – *Cassie Steel*

LAUREN TROMPP

BACHELOR OF IT (UX DESIGN) / BACHELOR OF ARTS (LINGUISTICS), THE UNIVERSITY OF QUEENSLAND >> HEAD TEACHER, CODE CAMP >> GRADUATE ANDROID DEVELOPER, COMMONWEALTH BANK

#3 THE ASPIRING CEO

At school, Maral was among only a handful of girls who took STEM classes – a fact that always stumped her, considering how important and enjoyable she found them.

"Maths, physics and IT taught me so many practical and logical thinking skills," she says. "I actually remember being the only girl in physics class!"

Aspiring to one day be able to design her own app, Maral knew that software engineering would be her best bet at getting there. She enrolled in a Bachelor of Software Engineering and a Bachelor of Business at the University of Technology Sydney (UTS) – and ended up graduating with Honours.

BANKING ON IT

Growing up surrounded by fast-paced technology, Maral saw limitless opportunities in digital innovation – eventually landing her dream role as a software engineer at Commonwealth Bank.

"It's crazy to think just a laptop and an idea can allow me to build an interactive application that anyone can use all over the world," she says of her cool gig. "Software engineering really has opened up endless opportunities for me!"

Maral spends 9ish to 5ish working with an awesome team of tech-savvy engineers, building new features and improving existing ones on the CommBank mobile app.

She's a huge advocate for diversity in STEM and dreams of one day being CEO of her own multibillion-dollar software company and chilling in a luxe beachside penthouse.

And her advice to STEM grads keen to get started in software engineering?

"Don't give up! It's important not to let failures stop us (they should encourage us)."

Yep, future CEO right there.

– *Cassie Steel*

MARAL NALBANDIAN
GRADUATE SOFTWARE ENGINEER, COMMONWEALTH BANK

BACHELOR OF ENGINEERING (HONOURS) (SOFTWARE ENGINEERING) / BACHELOR OF BUSINESS (ACCOUNTING), UTS
SOFTWARE DEVELOPER, DELOITTE
GRADUATE SOFTWARE ENGINEER, COMMONWEALTH BANK

"SOFTWARE ENGINEERING REALLY HAS OPENED UP ENDLESS OPPORTUNITIES FOR ME"

LAUREN TROMPP

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THE WORLD UNIVERSITY RANKINGS 2022

ECU ranked 151-175 for Engineering (Times Higher Education 2022)

QILT Quality Indicators for Learning and Teaching

Get on the tools

If you enjoy working with your hands, learning on the job and figuring out how stuff works, a career in the trades could be right up your alley

Sometimes seen as uni's little brother or sister, vocational education and training – or VET – is actually huge. In fact, in 2020, a whopping 3.9 million students took a VET course or subject. So what makes the VET system so great?

The VET qualification system is designed so that you can start small and build your skills. In most trades, an apprenticeship is required to become qualified, which includes completing a Certificate III or IV. But the Certificate II provides an introduction – also known as a pre-apprenticeship.

Another option is to study at a TAFE full-time or go through another training provider. You can complete a Certificate II or III fairly quickly and get a head-start in the job market or spend a year or two on a diploma or advanced diploma for more specialised knowledge. These qualifications can also provide a stepping stone to further study at uni. – *Chloe Walker*

EXPRESSIONS OF INTEREST

There are so many opportunities to use engineering skills in the trades – you could be an aircraft mechanic, a metal worker, clockmaker, blacksmith or even a boat builder! Here are a few ideas to get you thinking.

FITTER AND TURNER

Fitters and turners make things out of metal using tools and machines. They work with very precise measurements, so accuracy is essential!

Salary: $50K–$86K

What to study: Certificate III in Engineering (Mechanical Trade)

LOCKSMITH

Locksmiths don't just cut keys and change locks – they also install security systems, repair locking mechanisms and provide security advice. Lots of locksmiths work with security firms, but many run their own businesses.

Salary: $42K–$70K

What to study: Certificate III in Locksmithing (as part of an apprenticeship)

ELECTRICIAN

Electricians are in high demand, with the number of jobs projected to grow more than 10% in the next five years.

Salary: $46K–$99K (domestic) / $68K–$88K (commercial)

What to study: Certificate II in Electrotechnology (Career Start), followed by Certificate III in Electrotechnology Electrician

ENGINEERING DRAFTSPERSON

A draftsperson creates technical drawings for manufacturing and engineering. They use computer-aided design (CAD) skills and may be involved in estimating material costs.

Salary: $43K–$92K*

What to study: The Certificate IV in Engineering Drafting will help you on the way to an entry-level role.

SHUTTERSTOCK / *SOURCE: SALARIES ACCORDING TO PAYSCALE.COM

IMAGE CREDIT: DEPARTMENT OF TRAINING AND WORKFORCE DEVELOPMENT

TAKE FLIGHT

Aircraft maintenance engineer Christian Ferrone's second go at an aviation career is the one that took off

CHRISTIAN FERRONE
AIRCRAFT MAINTENANCE ENGINEER

When Christian found out he was colourblind more than halfway through his flying degree, his lifelong dream of becoming a pilot crash-landed. "I felt pretty disheartened," he says. Christian worked in construction for a few years, but couldn't shake his passion for aviation.

He did a pre-apprenticeship course in aircraft mechanics, and has been flying high ever since. Christian is now working as an aircraft maintenance engineer. His achievements were recognised as the Western Australian Apprentice of the Year and an Australian Apprentice of the Year finalist at the Australian Training Awards in 2021.

It took three years to complete the apprenticeship. Now he is working to add 'licensed' to his job title and complete the full Diploma. That will mean Christian can not only fix planes, but also sign off that they're ready to fly again. "There's a lot to learn at the start – it was overwhelming," he says. "It's really fast-paced but, after a while, things start to click between TAFE and work."

In training, Christian had to complete a logbook of thousands of tasks. Each one had to be done three times. "It's pretty full-on, but towards the end you find you can tick off multiple tasks during a single job. You realise, 'Oh yeah, I can do this,'" he says.

During his apprenticeship, Christian worked on private aircraft, including the WA government's private plane. "Sometimes we'd do heavy maintenance on an aircraft, where you completely rip it apart," he says. "The seats and floors would come out, everything. I'd think, 'How is all this going to go back together?' Then seeing it in the hangar and taking off again is an awesome feeling."

Christian says, in his job, there are no stupid questions. "In this industry, if you don't ask questions, serious things can happen, and there's always something new to learn. You're never bored."

Christian's six-days-on, six-days-off roster gives him plenty of time for volunteering at the restoration team at the Aviation Heritage Museum. "It's a good place to practise skills!" – *Chloe Walker*

"THERE'S ALWAYS SOMETHING NEW TO LEARN. YOU'RE NEVER BORED"

ASSOCIATE DEGREE IN AERONAUTICS, SOUTH METRO TAFE >> SCHEDULER, HOMESTART, A BGC COMPANY >> CERTIFICATE II IN AEROSKILLS (MECHANICAL), SOUTH METRO TAFE

DIPLOMA OF AEROSKILLS (MECHANICAL) AVIATION AUSTRALIA >> APPRENTICE AIRCRAFT MAINTENANCE ENGINEER, EXECUJET >> AIRCRAFT MAINTENANCE ENGINEER, QANTASLINK

Engineering the human body

Biomedical engineers work at the intersection of tech and human biology, using their problem-solving skills to save lives

The idea of a 'designer human', or combining cutting-edge tech like robotics and artificial intelligence (AI) with biology, is a popular sci-fi topic – but now it's also literally a career path you can choose. Love tech and problem-solving? Want to work in healthcare? It's perfect!

Biomedical engineers develop and design medical equipment, devices, computer systems and software that other medical practitioners then use to improve human health and wellbeing.

For this career, STEM subjects biology and engineering are key. Then you'll need a university degree, like an undergrad in science or engineering, and a specific postgrad qualification – or you could combine your interest in healthcare and engineering with a double degree. There are loads of options.

The Australian Government's Job Outlook website states that biomedical engineering is a career path with "strong" future growth. The technology and healthcare sectors are producing super-exciting innovations right now, generating epic career potential. – *Gemma Chilton*

TO-DO LIST

These tasks are just some of the things a biomedical engineer might do on the job:

- ✓ Make surgical equipment and tools for medical practitioners
- ✓ Install and test medical equipment
- ✓ Examine, maintain and repair equipment
- ✓ Quality-assurance checks
- ✓ Electrical safety checks
- ✓ Train medical staff in the use of equipment and give technical advice
- ✓ Design and develop implants for use during operations, such as artificial joints or titanium plates to replace sections of bone in head injuries.

SHUTTERSTOCK / *SOURCE: LABOURMARKETINSIGHTS.GOV.AU

Equity scorecard

Government statistics show that despite about half of all human bodies being female, women currently make up only **15%** of all biomedical engineers! **This sector could do with a serious gender rebalance.**

FIELD DAY

The pathways for a biomedical engineer are super-broad and diverse! You could work in any one of these specialist fields.

Biomechanical engineering
Apply mechanical engineering principles to biological systems to develop, design or repair medical products, such as artificial organs and prosthetic limbs.

Cell and tissue engineering
Create materials and structures to repair or build human tissue.

Clinical engineering
Research, develop and maintain instruments and equipment to help practitioners like doctors and nurses.

Rehabilitation engineering
Develop technological solutions and equipment to aid people with disabilities or recovering from disease or injury.

Medical imaging
Develop and use tech to capture images of the human body – inside and out – to help diagnose disease and injury.

Soft robotics
Combine cutting-edge tech and materials science to develop robots made of 'soft' or malleable materials (which are safer around humans!).

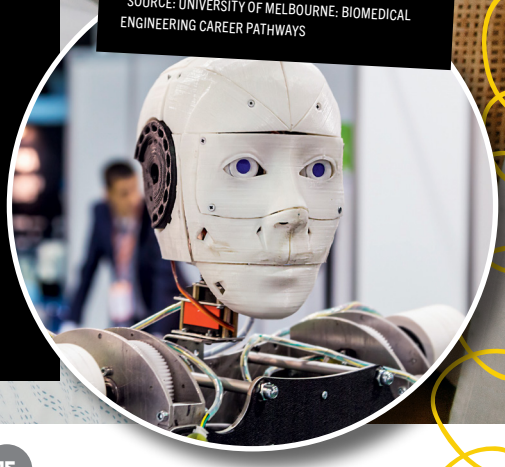
Systems physiology
Apply engineering principles to understand how whole systems within living organisms function and respond to changes in their environment.

WHO'S HIRING?

A hospital is an obvious place where a biomedical engineer might work, but not the only one! Here are some big employers of biomedical engineers in Australia.

- AGILENT TECHNOLOGIES
- BIO21 INSTITUTE
- BIONICS INSTITUTE
- CHEMTRONICS
- COCHLEAR
- COMPUMEDICS
- CSL
- AUSTRALIAN DEFENCE FORCE
- DEVICE TECHNOLOGIES AUSTRALIA
- GLAXOSMITHKLINE
- RESMED
- SANOFI
- THERAPEUTIC GOODS ADMINISTRATION

*SOURCE: UNIVERSITY OF MELBOURNE: BIOMEDICAL ENGINEERING CAREER PATHWAYS



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ENGINEERING + MEDICAL + STUDY

Bachelor of **Medical Sciences/Bachelor of Engineering (Honours)**, Macquarie University

Bachelor of **Biomedicine/ Master of Biomedical Engineering**, University of Melbourne

Bachelor of **Medical Engineering (Honours)**, University of Newcastle

Bachelor of **Engineering (Honours) (Medical)**, QUT

Bachelor of **Engineering (Honours)/Master of Biomedical Engineering**, UNSW

ENGINEERING + MEDICAL + JOBS

Biomedical engineer
$55K–$91K

Medical technologist
$51K–$104K

Prosthetist
$46K–$107K**

*Source: salaries according to payscale.com

The device doctor

CLINICAL ENGINEER ORLANDO HODGSON KEEPS LIFE-SAVING MEDICAL DEVICES HEALTHY

Hospitals are full of technology, from medical-imaging machines and patient monitors to the robots delivering sandwiches in the cafeteria.

"Technology is everywhere you look," says Orlando Hodgson. "And the thing is, someone needs to maintain it."

As a clinical engineer for NSW Health, Orlando's job is to make sure all of the devices that doctors and nurses need to do their jobs are in optimal condition. His workshop looks after machines used by hospitals in northern Sydney. "It can be overwhelming, but it's good because it's a big learning curve," he says.

"I WANT TO BE AT THE FOREFRONT OF MEDICAL TECHNOLOGY. I WANT TO SEE HOW FAR WE CAN GET"

A holistic education

As a kid, Orlando wanted to design aircraft, but Year 10 work experience at an aviation company changed his mind: "I realised there wasn't a big market for aeronautical engineering in Australia. We don't design planes here!"

Instead, he studied mechatronic engineering at Macquarie University.

"I liked that it brings multiple streams together," he says.

A few electives related to biology inspired Orlando to work in medical engineering. His Honours project looked at using 'neurostimulation' (stimulating nerves) to help manage chronic pain and depression. "It's all about problem-solving. How can we engineer a solution to minimise chronic pain?"

Orlando had a range of experiences to start his career. Now, he looks forward to finding out how health tech develops. "I want to be at the forefront of medical technology. I want to see how far we can get. All of these devices have to be top-notch in safety – there's no margin for error," he says. – *Chloe Walker*

ORLANDO HODGSON
CLINICAL ENGINEER

BACHELOR OF ENGINEERING (HONOURS) (MECHATRONIC ENGINEERING), MACQUARIE UNIVERSITY

APPLICATION ENGINEERING INTERN, OMRON ELECTRONICS

GRADUATE ELECTRICAL ENGINEER, ACTRONAIR

CLINICAL ENGINEER, NSW HEALTH

CREATIVE PEOPLE PERSON

ANNA CERNEV LOVES CREATIVITY, PEOPLE AND STEM – AND HOPES TO ONE DAY USE ENGINEERING TO SAVE LIVES

Growing up, Anna always loved science and was also super-creative and a real people person – not exactly the engineer 'stereotype', which is why stereotypes can go straight in the bin!

Instead, Anna understood that STEM can, in fact, be innovative and imaginative, and she could use it to fulfil her other passion – helping people.

"I remember hearing about biomedical engineering when I was in Year 11," she says. "It managed to combine my interest in medicine and science with one of – in my opinion – the most creative disciplines on Earth."

Anna is talking about electrical and electronic engineering, which she's studying at the University of Adelaide, majoring in medical technologies.

Her dream path at the moment is to get into biomedical engineering – "specifically in rehabilitative technology, with a neuroscience focus", she says.

"It is so important to have a diverse range of thinkers in every industry. Engineering is all about being creative and thinking outside of the box." – *Gemma Chilton*

"ENGINEERING IS ALL ABOUT BEING CREATIVE AND THINKING OUTSIDE OF THE BOX"

ENGINEERING+MEDICAL: THE UNIVERSITY OF ADELAIDE

FULL OF ENERGY

Mix engineering with energy and your study and career path will be bright!

So you want to be an engineer and have big plans to make a positive impact on the world. First up, you're amazing! And second, have you thought about renewable energy engineering?

As we look to a future that relies less on fossil fuels for energy, jobs in the renewables space are booming. According to Sunshot (a report about clean energy export opportunities), renewable energy exports could create up to 395,000 new jobs in Australia by 2040! What's even cooler is that a whopping 30,000 of these jobs will be in engineering, information and communications technology (ICT), and consulting services.

Below, we explore lots of cool opportunities in engineering + energy and take a look at some of the challenges you'll need to tackle with your STEM skills. – *Louise Meers*

Hold up! What is renewable energy engineering?

It's all about developing ways to generate energy from different renewable energy sources – think solar, hydro, wind, biomass and geothermal. This area of engineering combines lots of others (including mechanical, electrical, industrial and chemical) and you'll also need to be across cutting-edge tech, like energy capture and storage.

DR MORLEY MUSE
ENGINEER + RENEWABLE ENERGY CONSULTANT

Why get into renewable energy?

Engineer, renewable energy consultant and co-founder of iSTEM Co., Dr Morley Muse says, "Relying only on fossil fuels to meet global demands is dangerous to our climate, due to the harmful effects of global warming and climate change. The use of alternative sustainable fuels is relevant to meet demands. Renewable energy is clean, sustainable and reliable, conserving natural resources and mitigating air pollution. The biggest challenges to renewables are storage and waste heat. Careers in renewable energy are important for sustainability and environmental conservation."

BACHELOR OF ENGINEERING (CHEMICAL AND ENVIRONMENTAL), UNIVERSITY OF NOTTINGHAM >> MASTER OF SCIENCE (SUSTAINABLE POWER TECHNOLOGY), UNIVERSITY OF SOUTH WALES >> PHD (ENVIRONMENTAL/SUSTAINABLE ENGINEERING), VICTORIA UNIVERSITY

AMBASSADOR, CSIRO'S INNOVATION CATALYST GLOBAL >> ENVIRONMENTAL COORDINATOR – METRO TUNNEL PROJECT, LENDLEASE >> CO-FOUNDER, ISTEM CO

SHUTTERSTOCK

ENGINEERING + RENEWABLE ENERGY CAREERS

RENEWABLE ENERGY ENGINEER
Work on ways to produce energy from sustainable sources.

ENVIRONMENTAL ENGINEER
Assess the impact on the environment that renewable energy projects might have.

ELECTRICAL ENGINEER
Design and develop systems for electrical power generation and distribution.

MECHANICAL ENGINEER
Oversee the construction and maintenance of wind turbines, solar panels and hydropower stations.

MATERIALS ENGINEER
Research and test materials to improve their performance, and work out what materials can be used in new and emerging renewables tech.

PROCESS ENGINEER
Look at what equipment is needed for a renewable energy project and how it will be constructed.

CIVIL ENGINEER
Manage the building of renewable-energy facilities (like hydropower stations) and tech (e.g., wind turbines) to make sure they meet safety codes.

SOLAR ENGINEER
Plan and implement solar energy projects like solar panel installations on buildings or development of a solar power plant.

GEOTHERMAL ENGINEER
Explore ways to use natural heat sources inside the earth to produce energy.

Calling all problem-solvers
As Morley says, one of the biggest challenges in renewable energy is storage, so engineers working in this area will need to come up with solutions for things like storing large amounts of solar energy (so it can be used any time) and improving battery tech for electric vehicles (so cars can run more efficiently and for longer).

START YOUR CAREER HERE

ENGINEERING + ENERGY + STUDY

Bachelor of **Engineering (Honours) (Renewable Energy)**, UNSW

Bachelor of **Renewable Energy Engineering (Honours)**, University of Newcastle

Undergraduate Certificate in **Renewable Energy Engineering**, TAFE NSW

ENGINEERING + ENERGY + JOBS

Electrical engineer
$55K–$121K

Environmental engineer
$57K–$104K

Materials engineer
$56K–$110K*

*Source: salaries according to payscale.com

SOLAR STARS

WE SPOKE TO TWO STEM PROS USING THEIR ENGINEERING SKILLS IN SOLAR ENERGY!

#1 ELNAZ HARIRI
SOLAR LEAD

CwS: How did you get into engineering?
EH: In high school, I liked maths and physics. I'd always thought that designing and fabricating stuff seemed cool, so I decided to study mechanical engineering.

CwS: Tell us about your job!
EH: I work at Sun Cable as the solar lead. Sun Cable is developing the world's largest solar energy infrastructure network, making it possible to power whole cities with renewable energy. My role is to design experiments to help inform technology choices.

CwS: What's something people might be surprised to know about working in renewable energy?
EH: No matter what your background, you can actively participate in renewable energy. You must have a passion to learn about the industry and build new skills.

CwS: What career opportunities do you see coming up?
EH: The field is far-reaching and there are a multitude of STEM-related fields within it, like photovoltaics and mechanical, electrical, chemical and software engineering.

> "YOU MUST HAVE A PASSION TO LEARN ABOUT THE INDUSTRY"

BACHELOR OF MECHANICAL ENGINEERING, UNIVERSITY OF ZANJAN, IRAN
MASTER OF RENEWABLE ENERGY ENGINEERING, SHAHID BEHESHTI UNIVERSITY, IRAN
MECHANICAL ENGINEER, IRAN EXHAUST
CO-FOUNDER + PROJECT MANAGER, AVESTA
ENGINEERING LABORATORY MANAGER, CPP WIND ENGINEERING CONSULTANTS
SOLAR LEAD, SUN CABLE

#2 YUNESKA HARRIS
ENGINEERING MANAGER

CwS: What's a typical day at work like for you?
YH: I work for a solar mounting system manufacturer and my team's role is to design the frames that fix the solar panels to the roof. As an engineering manager, my job includes concept design, calculations, talking to clients, meeting deadlines and talking to solar installers to help them solve issues while they are on the roof!

CwS: Favourite thing about your job?
YH: When a client gets their solar panels safely connected. Each installation makes a positive environmental impact.

CwS: And something you're really proud of?
YH: I managed the design of the Melbourne Airport 12 MW solar farm; it's known to be the largest at any airport in the country (so far).

CwS: Tip for students?
YH: The relationships you make with your peers, mentors and teachers are really important. Get involved in programs, clubs or community groups that focus on renewable energy or the environment.

BACHELOR OF CIVIL CONSTRUCTIONS, CIVIL TECHNICIAN, IUT DR FEDERICO RIVERO PALACIOS, VENEZUELA
BACHELOR OF CIVIL ENGINEERING, IUP SANTIAGO MARINO, VENEZUELA
PROJECT COORDINATOR, PANGEA PROJECTS
PROJECT ENGINEER, FRANKI PILES
PROJECT ENGINEER + MANAGER, CLENERGY
ENGINEERING MANAGER, CLENERGY

PROFESSOR STEFAN IGLAUER
PROFESSOR OF ENERGY + RESOURCE ENGINEERING, EDITH COWAN UNIVERSITY

DIRECTOR, CENTRE FOR SUSTAINABLE ENERGY AND RESOURCES, ECU

PROFESSOR AND SENIOR LECTURER, ECU

PHD (MATERIAL SCIENCE), OXFORD BROOKES UNIVERSITY, UK

MASTER OF SCIENCE (CHEMISTRY), UNIVERSITY OF PADERBORN, GERMANY

Energy storage innovator

Professor Stefan Iglauer researches world-leading methods for storing hydrogen and carbon – which could help us shift to cleaner energy production

As the world transitions to more sustainable ways of producing energy, there's still a lot to investigate. Something that could one day be a clean fuel is hydrogen – but we need to work out how to store large volumes of it.

That's where Stefan comes in. Stefan and his team research ways to store elements like hydrogen underground or in geological formations – a method known as geo-storage. As he explains, hydrogen has the potential to be stored as a compressed gas or a liquid. It is sometimes stored in salt caverns deep underground, but we need more places to put it.

He says hydrogen could be stored in different materials, like sandstone, shale or even coal seams. "I've done some calculations and found standard sandstone reservoirs could store about 1-2 million tonnes of hydrogen," Stefan says. "And coal, for example, we found is also probably a very good storage component."

GLOBETROTTING ENGINEER

Although he works in the engineering department now, Stefan started off studying chemistry in his native Germany. Since then, his STEM career has taken him all over the world: from Germany to the UK and the US, where he first became interested in studying petroleum engineering, before finally landing in Australia in 2011.

Today, in his role at Edith Cowan University (ECU), Stefan gets to work at the forefront of research and new technology, which could help fossil fuel companies make vital changes.

"If we want to mitigate climate change and cut greenhouse gas emissions, the oil and gas industries are among the biggest culprits," he says, "but they can also make the biggest difference." – *Kim Thomson*

"IF WE WANT TO CUT GREENHOUSE GAS EMISSIONS, THE OIL AND GAS INDUSTRIES ARE AMONG THE BIGGEST CULPRITS, BUT THEY CAN ALSO MAKE THE BIGGEST DIFFERENCE"

WATER WORKS

It's literally essential for life – which is why STEM experts are needed to ensure our water supplies are safe, sustainable and secure

You might not think much about water until you feel thirsty and fill a glass with H_2O from the tap, but water is a massive deal. Not only do we need ready access to clean, fresh water for our survival, but it's also essential for industries such as agriculture, manufacturing and mining.

Too little of the stuff and crops fail and economies crunch. Too much of the stuff and towns and farms go underwater.

And where there's water being used, there's wastewater to deal with. Handled properly, it can be turned into a valuable resource itself, but poorly managed wastewater can lead to disease and environmental catastrophe.

12% Increase in civil engineers expected in the water sector by 2025

Fresh is best

So who are the clever people designing, building and managing the critical infrastructure keeping fresh water flowing from your tap and down the toilet? That's right: engineers.

Water engineers are behind critical projects like dams and desalination plants, sewerage and stormwater systems, and they are the experts working to prevent or respond to water-related natural disasters like drought and flood.

And with challenges such as climate change, population growth and the ageing of our existing water infrastructure all on the cards, the need for expertise is greater than ever.

Ready to kickstart your career in water engineering? Dive in! – *Gemma Chilton*

SOAKING UP SKILLS

Nope, we don't mean learning to swim – these skills have all been predicted as priority and in demand for all jobs in Australia's water industry.

- STEM
- DIGITAL + TECHNOLOGY
- HEALTH + SAFETY
- OPERATIONAL SKILLS
- COMMUNICATION
- PROBLEM-SOLVING
- PLANNING
- LEADERSHIP

$22.68 billion
The annual revenue of the water sector in Australia

SOURCES INCLUDE: AUSTRALIAN INDUSTRY, SKILLS COMMITTEE AND AUSTRALIAN BUREAU OF STATISTICS., SHUTTERSTOCK

27,700
The number of people employed in Australia's water sector

AUSSIE WATER TWITTER

Fill your feed with these water-related accounts and be part of the conversation!

@STUKHAN
Stuart Khan is Professor of Civil & Environmental Engineering at UNSW, and a prolific tweeter of all things water engineering. #MentorGoals

@AUSTRALIANWATER
Follow Australia's leading member-based water association for industry news and insights.

@MCOOKHISTORY
Margaret Cook isn't an engineer, but she is a "historian interested in disasters, floods, droughts, rivers, water politics and land development" – all relevant if you're interested in a career designing and building water infrastructure.

@SYDNEYWATERNEWS
Sydney Water is Australia's largest water utility, and its news feed features fun stuff like vintage water bills and funny memes.

2746 GL water extracted for agricultural use alone in Australia in 2019-20 (that's more than five Sydney Harbours, in case you were wondering!)

START YOUR CAREER HERE

ENGINEERING + WATER + STUDY

Bachelor of **Engineering (Honours) (Civil)**, The University of Adelaide

Bachelor of **Mechanical Engineering (Honours)**, Monash University

Associate Degree in **Civil and Structural Engineering (Design Drafting)**, TAFE SA

Master of Engineering **(Water, Wastewater and Waste Engineering)**, UNSW Sydney

ENGINEERING + WATER + JOBS

Environmental engineer
$57K–$104K

Hydraulic engineer
$55K–$105K

Marine engineer
$53K–$191K*

Water resources engineer
$67K–$126K

*Source: salaries according to payscale.com

LIQUID LEADER

Erica Deegan is in charge of all things water at City of Launceston

Erica loved maths, science and problem-solving as she went through school in her home state of Tasmania, so she signed up for a degree in environmental engineering – jumping the Bass Strait to enrol at UNSW Sydney.

"I was always interested in water and chose water electives," Erica says. "I love that, as a water engineer, you can see what you're working on in real life."

After graduating, Erica kickstarted her career at UNSW's Water Research Laboratory. Her work with the lab focused on coastal engineering and hazards. A highlight, she says, was the regular trips to the Gold Coast to study sand movement using remote sensing.

Keen to return home, Erica went back to Tasmania, where she spent time in higher education and later at a specialist consulting firm, before landing a job as a water engineer with her current employer, City of Launceston.

Her responsibilities as a water engineer include looking after the city's stormwater network and preparing for and managing flooding emergencies – and she's had her work cut out for her.

> **"I LOVE THAT I CAN SEE THE IMPACT OF MY WORK OUT AND ABOUT"**

"Working as a water engineer here is particularly challenging, as portions of Launceston have a very old and complex combined stormwater and sewerage network," Erica explains. In fact, Launceston, one of Australia's oldest cities, has the last combined drainage system of its kind, of any significant size, still operating in Australia. Also, the city's location at the junction of three rivers makes flooding a real risk – so its water engineers have to be at the top of their game.

Erica loves her job and loves knowing her work makes a difference. "I love that I can see the impact of my work out and about in the city where I live," she says.

Recently, Erica has been promoted to leader of the council's water team; she now manages other water engineers and scientists. Her goal is to nurture her leadership skills in this new role. – *Gemma Chilton*

Go with the flow

IT TOOK SANDUNI GAMAGE A FEW TRIES BEFORE SHE LANDED IN HER DREAM GRADUATE GIG IN WA'S WATER SECTOR

SANDUNI GAMAGE
GRADUATE MECHANICAL ENGINEER

One of the big reasons Sanduni chose to study engineering after school was it offered a lot of potential career choices.

"That meant I had plenty of options in terms of exactly what I wanted to do in the future," she says.

That came in handy when, after scoring her first graduate gig with a mining company, she realised the job wasn't quite the right fit.

"I ended up changing jobs a few more times until I found what I wanted to do and ended up getting an opportunity to work at the Water Corporation," she recalls. "I've been here about a year now and it's been absolutely wonderful."

The Water Corporation supplies water, wastewater and drainage services throughout Western Australia. Sanduni is employed there as a graduate mechanical engineer on a team that's responsible for delivering small water infrastructure projects in the Perth metro area. For example, Sanduni was recently involved in installing a flow meter at a pump station.

"What made this project so interesting was the sheer amount of planning that had to happen, before the actual site work, in order to ensure the water supply to the customers would not get affected," she explains.

A big plus of Sanduni's job is plenty of time away from a desk – she estimates she spends about half her work time on-site.

Sanduni also loves being able to see the impact of her work. "It's great knowing you're playing your part in helping look after this precious resource we often take for granted," she says. "With things such as climate change and population growth, it becomes ever more important to adapt, improve and innovate in how water is sourced and supplied."

Sanduni highly recommends her path to other engineering grads.

"There are lots of opportunities for engineers in the water sector. Whether you study mechanical, electrical, civil, chemical or almost any other type of engineering, there are plenty of things you can do in the water sector." – *Gemma Chilton*

> **"THERE ARE LOTS OF OPPORTUNITIES FOR ENGINEERS IN THE WATER SECTOR"**

BACHELOR OF ENGINEERING (MECHANICAL), CURTIN UNIVERSITY >> GRADUATE MECHANICAL ENGINEER, MINING COMPANY >> GRADUATE MECHANICAL ENGINEER, WOOD >> GRADUATE MECHANICAL ENGINEER, WATER CORPORATION

ENGINEER YOUR FOOD CAREER

Hungry for a healthy, balanced engineering role? A STEM degree or diploma will serve you up a banquet of opportunities in food production

Thought about using your engineering smarts to do something fun, different and delicious? With global demand for fresh and processed foods and ingredients projected to more than double by the year 2050, the opportunities for STEM graduates in Australia's food industry are epic.

And nope, our agribusiness sector isn't just about cooking up new products and recipes. Here in Australia, we provide solutions across the entire agri-food supply chain. Think production, processing, product development, distribution and markets. Careers include gigs in production, processing, packing, alternative protein development, food safety, retail, automation and sustainability.

3D FOOD PRINTING

ON THE MENU

Food engineers in Australia are pushing some serious boundaries – and with obvious sustainability goals in mind, too! Concerns about the environmental impacts of the food sector – particularly the meat and dairy industries – have driven talented professionals skilled up in innovation to tackle next-gen concepts like sustainable proteins (we're talking edible insects) and sustainable supply chains so they can feed us all (a predicted 9.1 billion people worldwide by the year 2050).

Up there with some of the coolest innovations is 3D food printing, where various food-based inks are built up layer-by-layer to fabricate 3D constructs with customised nutrients. This application allows us to feed larger populations where food is scarce.

And then there are equally epic game changers like the use of biofuel – a plant-based renewable fuel that allows chemical engineers to create vegan, protein-rich foods (AKA fake meat) inside a lab. Um, how awesome is STEM?

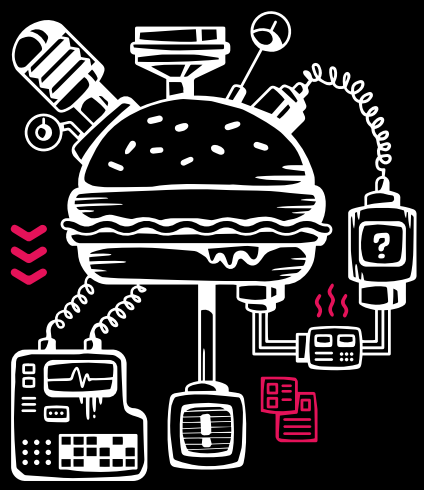
VEGAN SLIDERS

SHUTTERSTOCK

Up there with some of the coolest innovations is 3D food printing, where various food-based inks are built up layer-by-layer to fabricate 3D constructs with customised nutrients. This application allows us to feed larger populations where food is scarce.

Chef's Specials

If you're looking into food roles, make sure you widen your job search to include:



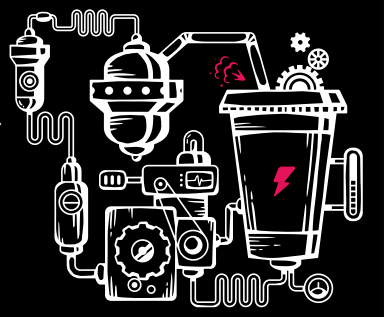
Process engineering
Process engineers are the production pros optimising industrial processes for large-scale manufacturing companies with goals of upping efficiency and reducing costs.

Chemical engineering
These are the chefs of the science world, applying their advanced chemistry knowledge to engineer recipes and new products.

Research roles
Love research as much as engineering and food? There are loads of opportunities for grads to tackle important food-based research topics – from allergies and food security to food safety and global accessibility.

Food tech gigs
Food technologists are fluent in the physics, biology and chemistry of food! They're pros at adjusting ingredients – like the thickeners and flavouring in food products – until they're just right (read: delicious).

Mechatronic engineering
Mechatronic engineers head up the automated processes that literally make our food – robots, smart machines and intelligent control systems.



(Both uni and uni-free pathways available)

TASTE FOR SUCCESS

So when it comes to food engineering roles, who's hiring? Short answer: everyone!

Look out for innovative companies breaking moulds and shaking up the food security space, like AI- and robotics-based farming company Farmwise Labs, plant-based dairy giant The Rebel Kitchen and edible bug retailers Circle Harvest. Then there are the big names, like Nestlé, Uncle Tobys and Arnott's. Plus, research institutions like CSIRO and university labs are always looking for fresh minds.

If your stomach is bigger than your CV, degrees in food science, chemical engineering and even straight-up science (majoring in food) will skill you up, along with VET pathways like food production, tech and processing at TAFE. – *Cassie Steel*

FOOD PYRAMID

GOT A STOMACH FOR HARD WORK AND SKILLING UP? IF YOU WANNA GET INTO FOOD ENGINEERING, MAKE SURE YOU INCORPORATE THE FOLLOWING INTO YOUR CV.

Passion!
A love of food is a huge plus, along with a desire to make a major difference.

Creativity!
Innovation, big ideas and the ability to think outside the box!

STEM smarts!
Chemistry, maths, physics, biology, statistics and advanced engineering skills.

START YOUR CAREER HERE

ENGINEERING + FOOD + STUDY

Bachelor of **Food and Nutrition Science**, The University of Adelaide

Master of **Engineering Science (Food Process Engineering)**, UNSW Sydney

Bachelor of **Science (Food Science and Technology)**, RMIT

Diploma of **Laboratory technology (Food)**, TAFE NSW

ENGINEERING + FOOD + JOBS

Chemical engineer
$55K–$104K

Food technologist
$51K–$90K

Process engineer
$63K–$122K*

*Source: salaries according to payscale.com

NEXT STEPS

Excited about engineering? Take these next steps to kickstart your career today!

What is engineering?

Still kinda confused about what engineers actually, like, do? Don't worry, you're not alone – research has shown that engineering is the least understood of all the STEM fields! Scan the QR code below to watch our handy one-minute explainer that will help set you straight and bust stereotypes all at the same time!

To find courses and compare universities in Australia, check out the Good Universities Guide at gooduniversitiesguide.com.au

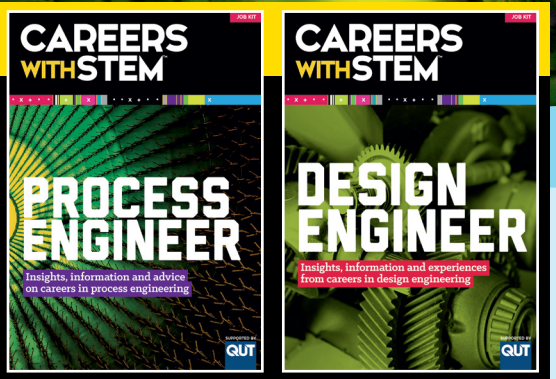
Uni not for you? Read our special edition all about STEM apprenticeships and traineeships at bit.ly/STEM-VET

SHUTTERSTOCK

WHAT'S THAT JOB?

Want to find out more about specific engineering careers? Check out the growing stack of Careers with STEM Job Kits: our eight-page e-mags introducing individual STEM jobs.

Visit CareerswithSTEM.com/job-kits/



Find engineer role models

You can't be what you can't see – which is why STEM role models are important! This is especially true for women and girls, who make up just 11.2% of Australia's working engineers.

Don't worry – we've got you sorted. Did you know you can search career profiles at CareerswithSTEM.com sorting by STEM (e.g. engineers) or by '+X' (i.e. another passion, like fashion, sport or saving the planet!). You can also search specifically for women in STEM and Indigenous people in STEM.

Start scrolling and get inspired about your own future!

FLIP OVER FOR CAREERS WITH QUANTUM!

We acknowledge the Traditional Owners of country throughout Australia and recognise their continuing connection to land, waters and culture. We pay our respects to their Elders past, present and emerging.

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