

engineeringchoices

What is engineering?

Engineers are people who use their knowledge of maths, science and technology to solve real-world problems and find new opportunities to improve the world around us.

We see their influence in every aspect of our lives. When we send a text message, drive along a road, buy food, build a house, watch television or flush a toilet, we're using products and services that engineers have designed.

Why work in engineering?

Engineers enjoy variety in their day-to-day work, tackle interesting challenges, use problem-solving skills to find creative solutions, work in teams, are paid well and often get opportunities to travel. You can help your community and enjoy a creative, rewarding role at the same time.

There is already a shortage of engineers in a number of industries, and many engineers are approaching retirement age. This means there will be plenty of jobs available for young people with the right qualifications.

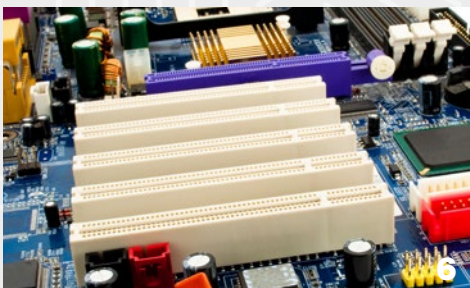
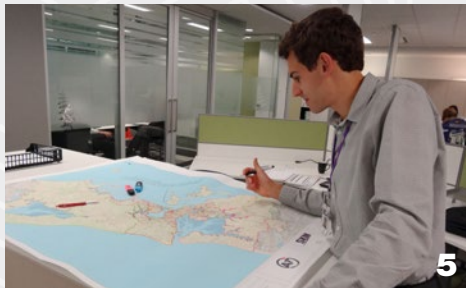
What sorts of jobs do engineers do?

Are you interested in environmental issues, earthquake-proof buildings, high performance sports, computers, medical care, motorbikes, growing or manufacturing food – or something else? You can follow your interest into a rewarding job in engineering.

Engineering is often sorted into five broad fields – chemical & process, civil, digital (computer systems/software), electrical & electronic, and mechanical – and there are a number of disciplines within these fields. This brochure describes many of these disciplines, which may have different names in other parts of the world.

It's a hugely varied profession with an increasing number of new areas. There's crossover between different fields, for example, robotics engineers use electrical, mechanical and digital engineering skills.

Engineering in action: 1. Renewable energy generation; 2. Dairy processing; 3. Structural engineering for major projects; 4. Enabling construction of creative designs; 5. Transport engineering; 6. Electronics; 7. Large-scale power generation; 8. Engineering trades workshop.



Some specialist areas in engineering

Bio-engineering

Bio-engineers use engineering to solve biological and medical problems, for example, designing artificial joints.

Chemical engineering

Chemical engineers design and develop ways to transform raw materials into useful products, such as cosmetics, medicines, processed food/drinks, petrol, plastics and aluminium. They also improve existing systems, and help develop and supervise large processing plants such as dairy factories and water treatment facilities.

- **Process engineers** design, develop and maintain chemical processes used

in oil refineries, paper mills and other manufacturing plants.

- **Food engineers** develop and supervise efficient systems for the safe manufacture of food products.

Civil engineering

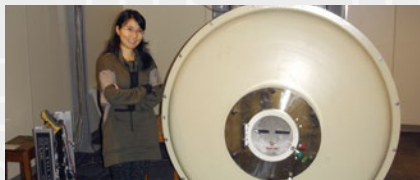
Civil engineers are involved in the analysis, design, construction and maintenance of roads, bridges, buildings, dams, harbours, airports, railways, etc.

- **Environmental and natural resources engineers** assess the impact of engineering projects on the environment, design sustainable processes and develop systems to treat waste products.

- **Fire engineers** use knowledge of the effects of fire on materials, structures and the environment to design safer buildings.
- **Geotechnical engineers** assess ground strength and stability, and design foundations and earthworks that can withstand earthquakes.
- **Structural engineers** design structures such as dams, bridges, buildings, factories and hospitals for strength and stability.
- **Transportation engineers** analyse, design and construct road, water, rail and air transport systems.

Other types of civil engineering focus on forestry, water resources and mining.

Introducing people who work in engineering



Researcher Vicky Wang (Auckland Bioengineering Institute) develops computer-based methods to improve the diagnosis of heart disease.

Pathway: Western Springs College, Year 13: Chemistry, Maths, Physics, Statistics; University of Auckland: Bachelor of Engineering (Honours) in Biomedical Engineering, PhD



Civil Engineer Miriam Karalus (URS) helps design and build motorways.

Pathway: Sacred Heart Girls' College, Hamilton, Year 13: Calculus, Chemistry, History, Music, Physics; University of Auckland: Bachelor of Engineering (Honours), Master of Engineering Studies; both in Civil Engineering



Geotechnical Engineer Moru Jia (URS) tests ground conditions for building projects in post-earthquake Christchurch.

Pathway: Auckland Girls' Grammar, Year 13: Biology, Chemistry, English, Geography, Physics, Statistics; University of Auckland: Bachelor of Engineering in Geotechnical Engineering



Technologist Ian Laing (Fonterra) fixes problems and works out ways to improve the way the dairy processing plant runs.

Pathway: Secondary school overseas, Year 13: Accounting, Economics, Maths, Physics; University of Waikato: Bachelor of Engineering (Honours) in Materials and Process Engineering



Fire Engineer Garth Hay (Beca) designs buildings to protect people from fire and smoke.

Pathway: New Plymouth Boys' High School, Year 13: Calculus, Chemistry, Economics, English, Management, History, Japanese; University of Canterbury: Bachelor of Engineering (Honours) in Civil Engineering; Master of Engineering in Fire Engineering



Civil Engineer Kimberly Jupp (McConnell Dowell Constructors) helps rebuild infrastructure (pipes, roads and bridges) in Christchurch.

Pathway: New Plymouth Girls' High, Year 13: Art, Art History, English, Statistics; University of Canterbury: Bachelor of Arts (Honours) in Geography; CPIT: NZ Diploma in Engineering (Civil) (*in progress*)



Process Engineer Dinah Vaiaoga-loasa (Holcim NZ) helps improve processes for making cement.

Pathway: Auckland Girls' Grammar, Year 13: Biology, Calculus, Chemistry, English, Physics; University of Auckland: Bachelor of Engineering (Honours) in Chemicals and Materials Engineering



Structural Engineer Sarah Neill (Beca) helps ensure new or renovated buildings are strong and stable.

Pathway: St Kentigern College, Year 12/13: Art, Calculus, Chemistry, English, Physics, Statistics; University of Auckland: Bachelor of Engineering (Honours) in Civil Engineering



Engineer Greg Richardson (Harrison Grierson Consultants) does computer-assisted and some general engineering.

Pathway: Pakuranga College, Year 13: Calculus, Geography, Graphics, Physics, Statistics; Manukau Institute of Technology: NZ Diploma in Engineering (Civil); Unitec: Bachelor of Engineering Technology

Digital engineering

Digital engineering includes the design, development, installation and maintenance of computers and computer networks and software. These engineers may also work on the computer systems that are embedded in mobile devices and household appliances, such as washing machines.

- **Computer and computer systems engineers** use knowledge of electronic hardware and software design to solve engineering problems.
- **Software engineers** apply an engineering approach to the design, development and maintenance of computer software.

Electrical & electronic engineering

Electrical engineering involves developing systems or equipment that create, supply or use electricity.

- **Electrical engineers** work in areas such as power generation, transmission and distribution, control systems and instrumentation.
- **Electronic engineers** develop circuits for a range of products, including telecommunications networks and computer systems.

Mechanical engineering

Mechanical engineers design, manufacture and maintain mechanical products and systems. They may work on small appliances or large industrial machines; bicycles, ships or aeroplanes; robots or automated systems; air conditioning and refrigeration or power generation and distribution.

- **Mechatronics engineers** combine mechanical and electrical engineering, and are often involved in instrumentation and automation systems.
- **Product development engineers** design and develop new products.



Transportation Engineer Nic Grgec (Sinclair Knight Merz) plans traffic infrastructure, including roads, footpaths, cycleways and car parks.

Pathway: AGC Senior College, Year 13: English, Geography, Maths, Physics; University of Auckland: Bachelor of Engineering (Hons) in Civil Engineering



Automation Engineer Steve Charles (Pan Pac Forest Products) builds and maintains automated control systems, such as for machines that cut tree trunks into wood chips.

Pathway: John Paul College, Year 13: Calculus, Chemistry, Economics, Physics, Statistics; Massey University: Bachelor of Engineering in Industrial Automation



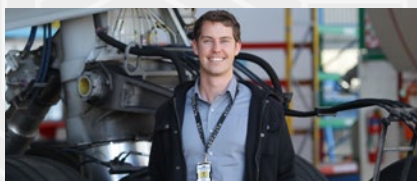
Software Engineer Sreeram Sreedharan (Atlantis Healthcare) develops software to support medical treatment.

Pathway: St Peter's College, Auckland, Year 13: Biology, Calculus, Chemistry, Physics, Statistics; University of Auckland: Bachelor of Engineering in Software Engineering



Electrical Engineer Ashley Stewart (Unison) helps ensure electricity flows to customers in the Hawke's Bay, Taupo and Rotorua

Pathway: St Peter's School, Cambridge, Year 13: Calculus, Chemistry, English, French, Physics, Statistics; University of Canterbury: Bachelor of Engineering (Honours) in Electrical Engineering



Avionics Engineer Steve Ward (Altitude Aerospace Interiors) designs electrical systems, such as in-flight entertainment for aircraft.

Pathway: Freyberg High School, Year 13: Biology, Chemistry, PE, Physics, Statistics; University of Auckland: Bachelor of Engineering (Honours) in Electrical and Electronic Engineering



Mechanical engineer Teokotai Ruland-Marsters (Te Arawa/Takitumu (AWT Water Ltd) designs water and wastewater treatment plants.

Pathway: Mount Albert Grammar School, Year 13: Calculus, Chemistry, Maori, Physics, Statistics; University of Auckland: Bachelor of Engineering (Honours) in Mechanical Engineering



Automation Engineer Nidal Eltayeb (RCR Energy Systems) designs automation systems, such as for a steam boiler in a milk powder plant.

Pathway: Freyberg High School, Year 13: Calculus, Chemistry, English, Physics, Statistics; Massey University: Bachelor of Engineering (Honours) in Mechatronics



Product Development Engineer Olivia Winn (Fisher & Paykel Appliances) designs parts for appliances such as the DishDrawer dishwasher.

Pathway: St Peter's School, Cambridge, Year 13: Calculus, Chemistry, English, Japanese, Music, Physics; University of Canterbury: Bachelor of Engineering (Honours) in Mechanical Engineering



Software Developer/Engineer Scott Bamford (Allied Telesis) programs the internet equipment his company produces.

Pathway: Marlborough Boys' College, Year 13: Chemistry, Digital Technologies, English, Maths, Physics; University of Canterbury: Bachelor of Engineering (Honours) in Computer Engineering

How do I get into engineering?

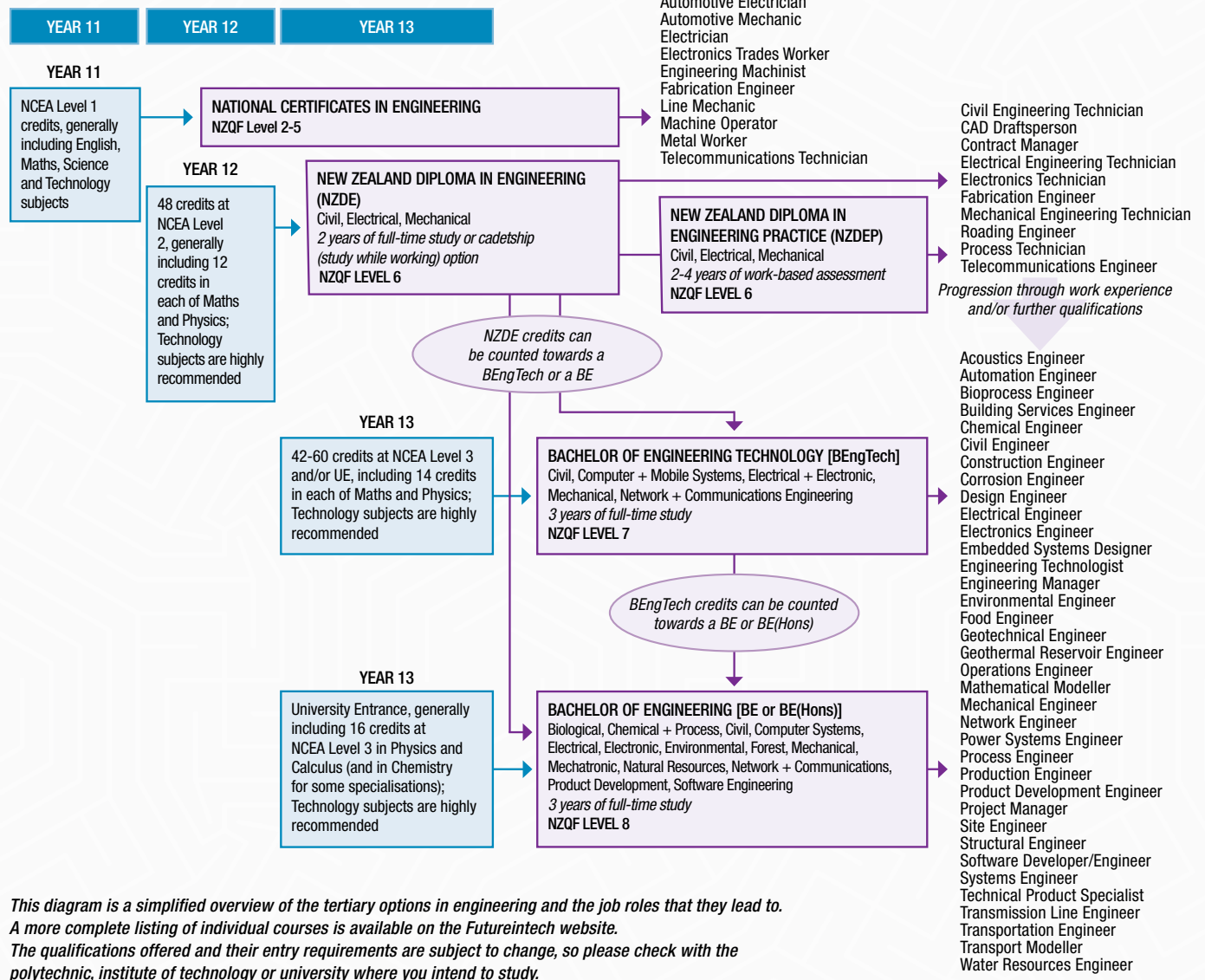
Your pathway into engineering starts at secondary school with a good background in Maths, Science and Technology subjects. Entry into diplomas and degrees in engineering generally require credits in Maths – especially Calculus – and Physics. Chemistry is also needed if you want to study Chemical, Materials or Process Engineering. But there's no need to worry if you don't have the required school achievements – many polytechnics, institutes of technology and universities offer bridging courses. Alternatively,

you can start with a certificate or diploma, which can be credited towards a degree later. You may also be able to find a cadetship, where you can study part-time while working in the engineering industry.

The New Zealand Diploma in Engineering, Bachelor of Engineering Technology and Bachelor of Engineering degrees have all been accredited to international standards, so your qualifications will be recognised overseas.

Qualification pathways into engineering

Recommended Year 12-13 subjects: Maths (especially Calculus), Science (especially Physics and Chemistry), English and Materials/Design Technology



Find out more

Visit the Futureintech website for:

- Stories about people who work as engineers
- Information on what subjects to take at school
- Our Course Finder, which lists engineering courses and where you can study
- Ask Someone – an online Q&A page where you can ask engineers about what they studied and what they do in their job.



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