A FUTURE IN
SOFTWARE ENGINEERING

AUT

WHAT IS SOFTWARE ENGINEERING?

Software plays a central role in almost every aspect of our daily life.

It drives apps on your phone, online shopping, social media, emails, office and business software, operating systems and embedded software that run our complex traffic networks, factories and smart buildings.

Software engineering can be a creative and stimulating discipline. Technologically minded people find a great challenge in developing complex algorithms for speed, ease of use, security and other objectives. Sociable people enjoy how software is developed in teams. People also find it very satisfying to see how the software they develop works, how others use it and how it can improve other people's lives.

Programming is at the core of software engineering, along with systematic and quantifiable approaches to the developing, operating and maintaining of software to meet specified quality, scale and economy.

Most software engineering work involves a mix of maintaining existing software and developing new software. This requires frequent communication with other programmers, managers, clients and users.

Software is used in a wide range of areas and contexts, opening up diverse opportunities to learn of other sectors. For example, learning about:

- The organisation of a hospital when developing software there
- Arts, design, and media production when developing software for media processing
- Music production, signal processing, or computer architecture and embedded systems when developing software for audio devices.

Are you interested in programming and software engineering? Are you creative and innovative? Are you curious about how to make things work more efficiently? Are you a collaborative worker (software is developed in teams)? Do you enjoy solving maths and physics problems? If so, a career in software engineering may be the path for you.

OUTLOOK AND TRENDS

High demand – Software engineers are in high demand. According to the Statistics NZ Census and MBIE projections, the growth rate for the broader category "business and systems analysts, and programmers" is between 2.4% and 4.4% annually until 2028.

Software engineering is also on Immigration New Zealand's long-term skills-shortage list, along with related occupations such as developer programmer, software tester, analyst programmer, software and applications programmers.

Growth in cloud services – Software engineering has been boosted by the global trend to move business processes into the cloud. During the current pandemic it has played a large role in helping people stay productive and connected. More cloud software has been developed, often for companies that hadn't considered it before.

Innovation of business processes through software – There is high demand for new software technologies to innovate business processes. Artificial intelligence has become crucial for decision making and data analysis. New uses of embedded software are being found in smart devices and tools.

Blockchain technology is increasingly being used to secure business transactions. Low code/no code programming facilitates creating quick software prototypes and simple applications.

Research in software engineering – The discovery of new application areas and developments in computing power is inspiring significant research, particularly in the foundations of software engineering, ie computer programming, data science, programming languages, and mathematics. Research in automation and industrialisation is currently on the rise with specialised research topics in tools/hardware, production planning and control manufacturing.

WORK SETTINGS

The majority of employers are private companies and consultancies. Many of them specialise in software products that require expertise in certain technologies, domain specific knowledge, or professional standards. These can include:

- Office software to facilitate the business operation of a client, for example data management
- Web design and online shops
- Control software to operate machines or factory
- Software embedded in electronic devices (eg digital camera)
- Software following a professional standard (eg in telecommunication)
- Software for an application (eg face recognition, video surveillance, signal processing)
- Development of computer games, mobile apps

The work environment is typically a computer workspace onsite within the company. However, since COVID-19, many software engineers will be working at least part-time from home.

The majority of software engineers work standard business hours, although a significant minority work 50 hours or more per week. Evening or weekend work may sometimes be required as project deadlines approach.

CAREER DIRECTIONS

Roles are wide-ranging. In a generalist or all-rounder role, such as software developer/engineer, you'd undertake a range of activities including:

- Analysing how an organisation, system or process works to identify realistic software needs and requirements
- Writing or modifying program code to meet a specification
- Testing, diagnosing and error correction, according to established protocols
- Planning and documenting software development activities
- Advising on purchases and upgrades

SPECIALIST ROLES

It is also common to specialise in certain technologies, such as test engineer, security analyst or site reliability engineer.

Or you can specialise in one area of the software development process, eg:

- Software engineer in quality assurance
- Security engineer
- Web programmer
- Graphic designer
- Games programmer

Many software engineers move towards strategic or management-oriented roles in their later career, such as product manager, project manager, scrum master, as well as senior managerial roles.

SPECIFIC ROLE EXAMPLES

Software engineer/developer (front-end, back-end, full stack) – Applies systematic software development processes to produce software to client requirements, taking into account budget limitations and deadlines. Deals with software modelling, requirements analysis, software design, software validation, project management, software quality assurance and software security.

Front-end engineers program the user interface. Back-end engineers are responsible for calculations and data modelling. Full-stack engineers do both.

Programmer – Writes and tests program code to implement software designs made by software engineers. Turns the program designs created by software developers and engineers into instructions that a computer can follow. Tests software for performance, reliability and security.

Systems administrator – Focuses on software configuration and maintenance, rather than coding and software development. Determines an organisation's system needs and installs network hardware and software. Makes needed upgrades and repairs to networks, ensures systems are operating correctly, maintains network and computer system security.

Web developer, web programmer – Develops websites, online portals, or internet shops. Includes understanding of business processes, usability and corporate designs.

PROFESSIONAL REGISTRATION

The four most relevant professional software engineering organisations in New Zealand are Association for Computing Machinery (ACM), Institute of Electrical and Electronics Engineers (IEEE), Engineering New Zealand, and IT Professionals NZ (ITP).

Professional registration is not required for software engineering roles, but many engineers join for the industry and academic connections, professional development and advocacy of a professional body.

SKILLS AND KNOWLEDGE

General skills

- Communication, problem solving skills and team skills
- Planning and organisational skills
- Ability to obtain and process information
- Confident decision–maker who remains calm in stressful situations and meets deadlines

Technical knowledge

- Mathematical, engineering and computing fundamentals
- Programming languages, algorithms and data structures
- Construction tools and technologies
- Software and process models
- Software validation and quality assurance
- Software security
- Engineering management

PERSONAL QUALITIES

- Creative, innovative and curious about how things work
- Open minded, enjoy learning how to make things work more efficiently
- Methodical, patient, logical thinker with an eye for detail

SALARY GUIDE

Job title	Salary (per year)
Graduate software engineer	$50,000–$67,000 (median: $55,000)
Software engineer/ developer	$85,000–$110,000 (median: $99,500)
Senior software engineer/developer	$118,000–$145,500 (median: $129,000)

Job title	Salary (per year)
Application support	$68,000–$98,000 (median: $83,500)
Developer (full–stack/back–end)	$77,500–$138,000 (median: $99,000)

Job title	Salary (per year)
Project manager	$100,000–$126,000 (median: $115,000)
Senior project manager	$120,000–$143,000 (median: $130,000)

Sources: AbsoluteIT, Tech Digital Report, Glassdoor

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

THE AUT ADVANTAGE

AUT graduates enter the employment market well equipped with knowledge and skills that have been tested in practical situations and working environments such as industrial projects and internships.

FURTHER STUDY OPTIONS

Further study in software engineering is available at postgraduate level, including the Postgraduate Certificate in Engineering, Postgraduate Diploma in Engineering, Master of Engineering, Master of Construction Management, Master of Engineering Project Management, Master of Philosophy and Doctor of Philosophy.

Research areas include computer programming, data handling, programming languages, mathematics, automation and industrialisation.

MICHELLE EXTROSS
Quality Assurance Engineer at Kiwibank
Bachelor of Engineering (Honours) in Software Engineering

"I've been with Kiwibank for 20 months. I began as a test analyst graduate in the summer of 2019, and I'm now a quality assurance engineer.

Our team uses the agile software process model, working in two-week sprints. Each sprint starts with a planning session where, as a tester, I'll give my perspective on requirements and acceptance criteria and identify potential risks.

A typical day begins with a 15-minute stand-up, sharing our previous day's progress, plans for today, and any blockers. I then form a test session and execute the tests.

I often reach out for an added perspective, such as from a technical analyst to better understand requirements, a developer to discuss solution design, a fellow tester on test approach or the business for user acceptance testing. If I find a defect, I'll gather as much information as I can before raising it with my team.

Once I've executed my tests manually, I evaluate to see what to automate. Once I've made my changes to the test suite, I put through a pull request and it is peer reviewed by a fellow test engineer and developer before my changes are merged with master branch. We then execute the new automated tests against the application through the pipeline."

What she enjoys most
"I get bored easily, so I enjoy the way the role challenges me. The test automation aspect really appeals to my engineering side – the learning scope is truly vast. It's fun to launch your test suite and watch your code build and execute the tests for you, but at a superhuman speed. Feels pretty powerful!"

Advice to new graduates
"If you try, you have some chance of winning. But you miss 100% of the shots if you don't take a chance. If you feel you don't know something, it doesn't mean you will never know it. That's the beauty of a human mind. We can always learn!"

EMPLOYER
Kiwibank Test Practice Lead, Vikash Chhaganlal (VC)

"Michelle not only embraces our values, she also demonstrates how we work together to solve challenging problems through engineering solutions.

Job search can be daunting for graduates. There are so many options in terms of organisations, industry, graduate programs etc. I would recommend outlining areas that matter most to you (what excites you and will bring the best out of you) and where you need additional support (internships etc). Then research roles and companies and take time to connect and speak to people about their experiences.

Experience matters (hobby programming etc), but there is also high demand for strong communication, problem solving and teamwork skills."

USEFUL WEBSITES

Engineering New Zealand
www.engineeringnz.org

Association for Computing Machinery (ACM)
https://www.acm.org/

Institute of Electrical and Electronics Engineers (IEEE)
https://www.ieee.org/

Engineering New Zealand
https://www.engineeringnz.org/

IT Professionals NZ (ITP)
https://itp.nz/

FURTHER INFORMATION

For the most up-to-date information on software engineering study, visit our website
www.aut.ac.nz/software-engineering

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/
f @AUTEmployabilityandCareers

FUTURE STUDENTS
Contact the Future Student Advisory team for more information: www.aut.ac.nz/enquire
futurestudents@aut.ac.nz
f @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
55 Wellesley Street East, Auckland Central

CONNECT WITH US NOW
f @autuni   @AUTuni
▶ AUTUniversity   @autuni

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