AUT

A FUTURE IN **MARITIME ENGINEERING**

WHAT IS MARITIME ENGINEERING?

From very early in the history of human endeavour, we have travelled the seas and gathered and harvested resources from the oceans. The diverse challenges and demands facing maritime activities today require increasingly sophisticated maritime engineering and technology.

Marine structures, vessels and ocean systems present numerous design and manufacturing challenges. Not only do they need to be built for a marine environment, they are large and complex – yet only a small number of each design is built.

Naval architecture, ocean engineering, and marine and offshore engineering, are the sectors that design, build and maintain marine craft, operational systems, underwater and floating structures and associated machinery. These include ships, pleasure craft, luxury yachts, oil rigs, offshore wind energy platforms, undersea pipelines, ports and harbours, underwater remote operated vehicles and more.

- **Naval architecture** – Engineering design of all forms of waterborne craft, from underwater vehicles, submarines, naval ships, tugs and ferries, to yachts, powerboats, racing boats and super yachts.

  Naval architects are employed by designers, consultants, shipbuilding companies and government bodies. They work as contractors or supervisors to oversee new builds and refits/conversions.

- **Ocean Engineering** – Design, installation and maintenance of all fixed and floating offshore, coastal and subsea structures. Traditionally based around oil and gas, there is a growing demand in renewable energy installations, aquaculture, underwater vehicles, port and harbour design, and development of techniques and technologies for exploration and protection of our oceans.

- **Marine and Offshore Engineering** – Design, manufacture, deployment and commissioning of machinery and operational systems associated with the marine and offshore industries, from engines and propulsion to fresh and grey water, HVAC (heating, ventilation and air conditioning) and electric and electronic systems on board.

However, these domains are not fixed and opportunities open up across all three, whatever your maritime qualification.

If you have a head for maths and science, enjoy solving problems, love the ocean and want to travel, a career in maritime engineering could be just the ticket for you.

OUTLOOK AND TRENDS

Maritime engineering is fast growing and dynamic, with employment opportunities that continue to increase as people turn to the oceans for resources such as food, transportation and energy. Government, industry and academia need experts and researchers able to develop new processes and systems to explore and travel the ocean, achieving economic and social goals, while minimising impact on the environment.

Offshore engineering developments
Globally there is demand for traditional oil and gas engineering, with new offshore oil and gas exploration in areas such as Brazil and the Arctic presenting challenges in the form of ultra-deep water and severe physical conditions.

However, there is also increasing demand for offshore renewable energy (fixed and floating offshore wind turbines, tidal and wave energy devices) and for the specialised equipment needed for scientific ocean exploration.

But economic ocean activity is also posing a threat to the ecological health of the world's oceans. This will be one of the biggest challenges for decades to come and ocean engineers will be at the forefront of all technical developments.

Offshore aquaculture
Strong demand in New Zealand for offshore aquaculture installations (remote offshore fish farming etc) is expected over the next decade, along with innovations in localised offshore renewable energy generation. AUT, with NZ industry partners and the Australian Maritime College, is part of the Blue Economy Cooperative Research Centre investigating innovative sustainable seafood and renewable energy for marine nations in the South Pacific region. This is providing opportunities for NZ industries to access first class research and become leaders in seafood technology and aquaculture.

Global shipbuilding developments
The shipbuilding market is growing with the increase of seaborne trade, economic growth and rising energy consumption. Within the last decade, China has massively invested capability in all areas of maritime engineering. Chinese production lines are delivering large numbers of quality, fast ships, while European shipbuilding production is now mostly centred on specialised ships.

Although New Zealand's commercial ship construction industry is small compared to other bigger countries, numerous workboats, ferries, patrol type vessels, tugboats, barges and recreational vessels are built every year. Innovative new technologies are being created in NZ that should lead the design of sustainable marine transport for the future.

Shifts in growth
New Zealand's shipbuilding industry, especially super-yachts, has undergone major changes during the last decade because of increasing competition from the northern hemisphere. However, an innovative shift in New Zealand to refitting and maintaining super and mega yachts, rather than doing new builds, is creating a growing reputation for high quality design.

The America's Cup is bringing work for naval architects and boat builders.

Greener shipping fleets
New regulations require fleets to be 'green ships' as demand increases for new, eco-friendly ships and shipping services. This means new ships are built to more rigorous environmental standards and older ships are upgraded. This impacts on ship design and marine and offshore systems.

WORK SETTINGS

Graduates work in diverse roles around the world. Some roles are primarily office based and computer-facing. Many roles involve travel and spending substantial time onsite in shipyards, factories, oil rigs, ports or on board the ships and structures themselves.

Employers include designers, consultants, shipbuilding yards, shipping and transport companies, energy companies, government agencies, research organisations, universities, the Royal NZ Navy and other navies. Marine consultancy companies also offer career opportunities with commercial vessel owners to supplement their own operational engineering teams.

CAREER EXAMPLES

Naval Architect
Designs ships and boats, related components and specialist equipment. Plans the whole build process of a vessel, managing everything from concept through to delivery of the final product. Acts as a consultant – providing clients with engineering solutions, technical and commercial guidance and project management. Carries out risk analysis of ships and marine structures.

Ocean Engineer
Develops, designs, and analyses systems that operate in marine environments and/or harness the ocean's resources. Prepares system layouts, detailed drawings, and diagrams. Determines the effects of waves, currents, and the saltwater environment on marine vehicles, structures, instruments, and equipment. Includes designing and conducting tests and inspecting marine machinery and equipment.

Marine Engineer Officer – Royal New Zealand Navy (RNZN)
Expert on ship structure, propulsion, power generation, hydraulic and habitability systems. Manages equipment procurement and upgrades, system performance analysis and maintenance planning. Makes decisions in the ship's response to fire-fighting and damage control. Performs duties in support of the fleet at a naval base.

Subsea Engineer – offshore drilling company
Operates and maintains all subsea-related equipment. Supervises the installation and monitoring of BOP (blowout preventer) operations. Carries out regular BOP tests and drilling. Provides expertise on technology, cost estimation and risk, installation and support services.

SKILLS AND KNOWLEDGE

- Ability to problem-solve, diagnose mechanical faults and create practical solutions
- Skills in analysis of hydrodynamics, stability, powering, mooring and longitudinal strength
- Good communicator, able to lead, collaborate and communicate effectively in a multi-disciplinary environment
- Confident in adapting and applying engineering principles to new or different situations, projects and tasks
- Skilled in developing products using computer modelling and design software
- Knowledge of structural engineering, boat and marine structure building methods, performance of materials, marine standards and safety regulations.

PERSONAL QUALITIES

- Creative and able to see the potential to use marine environments effectively and sustainably
- Highly organised, logical thinker, accurate with an eye for detail
- Responsible, adaptable, practical and methodical
- Confident decision-maker who can remain calm in emergencies
- Thrives in a challenging work environment

SALARY GUIDE

Naval architecture, ocean engineering, and marine and offshore engineering are highly globalised maritime engineering sectors. The salary guideline below is for these roles in New Zealand. Overseas salaries may vary considerably from those below.

	On average per year
Naval Architect Ocean Engineer Marine and Offshore Engineer (MOE)	$60,000-$78,000 Graduate $85,000-$110,000 3-6 years' experience $150,000+ 6+ years' experience

Sources: RINA, Careers NZ

Salary range is indicative of the NZ job market at the time of publication (mid-2023) and should only be used as a guide.

PROFESSIONAL REGISTRATION

Professional registration is not always required, however IPENZ, IMarEST or Royal Institution of Naval Architects membership leads to Chartered Engineer recognition (beneficial if working abroad or for large companies where senior positions require a C.Eng). Professional registration is normally achieved after 4-5 years of work experience.

THE AUT ADVANTAGE

AUT's Bachelor of Engineering (Honours) – with maritime majors – is the only New Zealand tertiary maritime degree. It's offered in partnership with the Australian Maritime College (AMC) in Tasmania. The first two years are completed at AUT in Auckland, the final two years at AMC.

FURTHER STUDY OPTIONS

At AUT, postgraduate study is available in maritime engineering through a Master of Engineering, Master of Engineering Project Management or Master of Science.

At AMC, postgraduate master's maritime specialisations are offered through applied science, engineering and an MBA in Maritime and Logistics Management.

RENEE FULLER

Naval Architect, Marine Industrial Design (MID)

Bachelor of Engineering (Honours) in Maritime Engineering

"Since joining the Marine Industrial Design (MID) team in October 2022 as a naval architect, I've been immersed in a range of exciting challenges. My main area of work involves stability analysis, 3D modelling, structural design and general naval architectural duties. I also support our company's naval activity for the Royal New Zealand Navy (RNZN).

My time is spent mostly behind a desk, however the advantage of working at the Devonport Naval Base are the opportunities to go down to the ships and see things first hand.

In my six years as a naval architect, I have worked on new and existing vessels. I've been involved in the entire lifecycle of projects, from brainstorming the initial concept to developing intricate construction drawings, designing the structure, overseeing construction until the launch as a fully operational vessel, and conducting sea trials.

What truly sets this role apart is the endlessly evolving puzzle-problem solving that is a huge part of the job. Each vessel is a unique masterpiece, requiring a tailor-made solution to match its operational demands and customer aspirations. If you can dream it, we can make it seaworthy!

The next stage in my career that I am currently working towards is to gain my chartered engineering accreditation through RINA (Royal Institute of Naval Architects) NZ."

EMPLOYER COMMENT

"Renee was already known to MID through her work volunteering for the NZ division of the Royal Institute of Naval Architects so we were very happy to bring her onboard.

We look for skills and experience that allow someone to get started, then grow into more senior roles through training and mentorship.

These skills include understanding basic principles of naval architecture – stability (analysis for compliance), structural design (metal and composite), powering, some basic system knowledge (piping, electrical, ventilation) and rule sets.

Training can be provided in specific software tools, but a general understanding of how to model in 3D, draw in 2D, generate a hull surface, and undertake a structural FEA analysis is beneficial.

Understanding developing technologies and trends such as CFD, hybrid/clean power systems, renewable and sustainable technologies are also important.

Renee has been self-motivated to gain these skills and experience which means she can deliver projects in collaboration with the team, work to an output standard and start to take on further responsibilities."

Jason Smith

Principal Naval Architect/MID Manager

USEFUL WEBSITES

Maritime New Zealand
maritimenz.govt.nz

International Maritime Organization
imo.org

Institute of Marine Engineering, Science and Technology
imarest.org

The Royal Institute of Naval Architects (RINA) New Zealand division
rina.org.nz

NIWA (National Institute of Water and Atmospheric Research)
niwa.co.nz

Australian Maritime College (AMC) / University of Tasmania
amc.edu.au

FURTHER INFORMATION

For the most up-to-date maritime engineering information, visit aut.ac.nz/maritime

For other Future Career Sheets visit 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: aut.ac.nz/enquire
futurestudents@aut.ac.nz
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CURRENT AUT STUDENTS
Contact the Student Hub Advisors team for more information: 0800 AUT UNI (0800 288 864)
aut.ac.nz/enquire | studenthub@aut.ac.nz

CITY CAMPUS
55 Wellesley Street East, Auckland Central

AUSTRALIAN MARITIME COLLEGE (AMC) / UNIVERSITY OF TASMANIA
Years 3 and 4 of maritime degree

Connect with us now:

The information contained in this career sheet is correct at time of printing, mid 2023.