Power up your career

Study targeted nuclear engineering and advanced manufacturing microcredentials
Flinders is proud to be offering a unique suite of targeted nuclear and advanced manufacturing microcredentials that will give participants exciting new opportunities to prepare for future industries, including shifting our submarines from diesel to nuclear power.

Nuclear programs at Flinders University are offered through a tri-nation academic partnership between Flinders University (Australia), the University of Rhode Island (United States) and the University of Manchester (United Kingdom), meaning that participants will have in person access to experts across three nations. This results in co-badged qualifications and the option to complete 5 microcredentials to receive a University Certificate in Nuclear Engineering from the University of Rhode Island.

Why study a nuclear course?

In September 2021 Australia, the US and the UK created a trilateral partnership which has earmarked significant investment into building and maintaining nuclear-powered submarines.

With an estimated 8,000 jobs to be created around the industry, completing a nuclear course will have a huge impact on your employability and future career, with Flinders University's close relationship with BAE and the ASC putting our graduates in pole position to make the most of these amazing opportunities.

Coupled with our strength in Advanced Manufacturing, graduates from Flinders will be able to help drive forward all aspects of this growing industry in Australia - from digital component design and industrial 3D printing processes, to monitoring safety levels, modelling outputs, keeping workers safe, and even using VR to experiment with how all the chemical, physical and material parts interact.

What’s on offer?

These microcredentials have been developed based on best practice from a global nuclear submarine manufacturer using the following framework that identifies key roles needed in a nuclear context. Our Flinders courses have been specially designed to ensure that these key capabilities align with our microcredentials to meet the needs of specific nuclear roles and enable you to work in a nuclear context.

Microcredentials: Engineering

Introduction to Nuclear Reactor Engineering

This nuclear introductory microcredential will provide participants with a comprehensive understanding of the design of fission and fusion nuclear power reactors. The microcredential will provide descriptions of type III fission nuclear reactors and will examine the neutronics in these systems, including neutron/matter interactions, radioactive decay, and neutron multiplication. It will also cover neutron diffusion and moderation treated by group diffusion methods for different reactor geometries.

Nuclear Reactor Design and Safety Analysis

This microcredential will provide a fundamental understanding of nuclear reactor neutronics kinetics, including neutron/matter interactions, radioactive decay, and neutron multiplication. It will also provide analyses of neutron diffusion and moderation treated by group diffusion methods for different reactor geometries.

Prerequisite knowledge: Differential equations and thermodynamics.

Nuclear Radiation Damage in Materials

This microcredential focuses on how fuels and basic materials in nuclear reactor systems are affected by nuclear radiation. It will review fundamentals in crystallography and microstructure defects as well as the basics of diffusion theory. Fission reactors components, the associated fission process, and resulting fission neutrons and heavy charged particles will be detailed. These will all be tied together to develop theories of fission neutrons and their interactions with matter to produce damage in the form of atom displacements and their cascades. Models to account for displaced atoms applying concepts of binary collisions are detailed. Radiation damage effects including the change of material properties under irradiation, void swelling, irradiation creep, embrittlement and loss of ductility will be detailed. This microcredential consists of a series of lectures, selected readings and problem sets involving numerical simulation of neutron damage, and collaborative short research projects.

Prerequisite: Completion of Introduction to Nuclear Reactor Engineering

Microcredentials available

<table>
<thead>
<tr>
<th>Compliance, INA &amp; Safety Cases</th>
<th>Functional Workforce Planning and Nuclear Baseline Governance</th>
<th>Naval Reactor Plant (NRP) &amp; PWR (deep technical)</th>
<th>Radiological (health physics, radiological, chemistry)</th>
<th>Manufacture, Build, Fuelling, Test and Commissioning</th>
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<tbody>
<tr>
<td>• Nuclear Reactor Design and Safety Analysis</td>
<td>• Reactor Operations</td>
<td>• Nuclear Radiation Damage in Materials • Naval Nuclear Power and Propulsion</td>
<td>• Introduction to Nuclear Engineering</td>
<td>• Nuclear Fuel Cycle and Performance • Industry 4.0 and Innovation • Cyber-physical Systems, Robotics and Automation • Production Engineering</td>
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</table>
Naval Nuclear Power and Propulsion

This microcredential aims to equip participants with a knowledge of the role of nuclear power in modern navies. It examines the historical evolution from diesel engines to nuclear reactors, highlighting a timeline construction of naval nuclear milestones and records set by nuclear submarines. It enables participants to apply reactor design concepts and compare naval and civilian reactors. It explores engineering considerations, safety and sustainability. Current trends and technologies are explored including jet pump propulsion and all electrical systems with a simulation of modern propulsion systems.

Prerequisite: Completion of Introduction to Nuclear Reactor Engineering and Nuclear Reactor Design and Safety Analysis.

Nuclear Fuel Cycle and Performance

This microcredential details analysis and design of stages of the nuclear fuel cycle including mining, milling, conversion, enrichment, fuel fabrication, fuel burn-up, spent fuel interim storage, reprocessing, safety and aspects of high-level waste. Participants will be able to describe all the steps in military and civilian nuclear fuel cycles and be able to perform basic analysis of known fuel cycles. Participants will also be able to describe how fuel cycle facilities operate and the materials used and produced by those facilities.

Microcredentials: Advanced Manufacturing

Innovation and Industry 4.0

Innovation is needed to successfully introduce Industry 4.0 in the workplace. This microcredential introduces participants to innovative thinking, the process of innovation and the interplay with Industry 4.0. The microcredential focuses on understanding human and institutional factors in the introduction of new technologies such as Industry 4.0, innovation, change management, trust in technology, Industry 4.0 for supply chain competitiveness and the process of innovation in an organisation.

When can you take these microcredentials?*

<table>
<thead>
<tr>
<th>Year</th>
<th>Jan</th>
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<tr>
<td>2024</td>
<td>Nuclear Fuel Cycle and Performance 8 day, Jan 8-18, 2024</td>
<td>ENGR1201 Innovation and Industry 4.0 (12 weeks, 1 hour online/week)</td>
<td>ENGR1215 Cyber-physical Systems, Robotics and Automation. (12 weeks, 1 hour/online/week, 3 day intensive)</td>
<td>Introduction to Nuclear Engineering 8 day, July 8-18, 2024</td>
<td>ENGR1201 Innovation and Industry 4.0 (12 weeks, 1 hour online/week)</td>
<td>ENGR2402 Production Engineering (12 weeks, 1 hour online/week)</td>
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<td>2026</td>
<td>Naval Nuclear Propulsion</td>
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* For latest scheduling see Flinders.edu.au/nuclear

All nuclear microcredentials are intensive 8 day face to face programs with visiting Professors from University of Rhode Island delivered at Tonsley Innovation Hub, South Australia. Advanced manufacturing microcredentials are delivered online with some short 3 day face to face intensives.
Coming soon in 2024 – Postgraduate offerings

Stack courses and/or Graduate Certificates toward a Master in Nuclear Science and Technology through a tri-nation partnership involving Flinders University, the University of Rhode Island and the University of Manchester and the Nuclear Technology Education Consortium (NTEC).

Graduate Certificates will be available in Safety, Compliance and Governance, Naval Reactor Plant, Radiological and Manufacturing, Testing and Commissioning.

Graduate Certificate (4 subjects) 6-12 months

- Compliance
- Workforce & Governance
- Naval Reactor Plant
- Radiological
- Manufacture

Graduate Diploma
(Grad Cert plus additional 4 subjects)
12-24 months

Masters (Grad Dip plus dissertation) 12-24 months

Contact us

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Every effort has been made to ensure the information is accurate at the time of publication: November 2023. Flinders University reserves the right to alter any course or topic contained herein without prior notice. Alterations are reflected in the course information available on the University’s website. CRICOS No. 00114A