Power up your career

Study targeted nuclear engineering and advanced manufacturing microcredentials

Flinders University

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

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

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.

Cyber-physical Systems, Robotics and Automation

This microcredential equips participants with the knowledge and skills to understand cyber-physical systems, robotics and automation. Technologies involved include cobots, automated ground vehicles (AGVs) and industrial automation in an assembly line including automatic warehouse, inspection, classification and delivery.

Production Engineering

This microcredential aims to expose participants to key production engineering tools and methodologies that can be integrated into a range of Manufacturing, Production, Jobbing Shop and sustainment scenarios. It provides an insight into various operational tools and techniques focused on the elimination of waste to increase the productive and environmentally sustainable use of resources to maximise value. This microcredential reviews Production Engineering and Lean Thinking concepts and, through industrial case studies and examples, will enable you to assess how these two techniques can work together, evaluating the benefits and limitations.

Cost per subject:

2024 prices

- Individual microcredentials $4,500
- University Certificate in Nuclear Engineering (5 microcredentials) $20,000**

** discount only applicable to Nuclear topics from the University of Rhode Island

Expressions of interest can be submitted here:

When can you take these microcredentials?*

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2024	Nuclear Fuel Cycle and Performance 8 day, Jan 8-18, 2024	ENGR1201 Innovation and Industry 4.0 (12 weeks, 1 hour online/week) ENGR1215 Cyber-physical Systems, Robotics and Automation. (12 weeks, 1 hour/ online/week, 3 day intensive					Introduction to Nuclear Engineering 8 day, July 8-18, 2024	ENGR1201 Innovation and Industry 4.0 (12 weeks, 1 hour online/week) ENGR2402 Production Engineering (12 weeks, 1 hour online/week)				
2025	Nuclear Radiation Damage in Materials 8 day						Nuclear Reactor Design and Safety Analysis 8 day					
2026	Naval Nuclear Propulsion											

** 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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