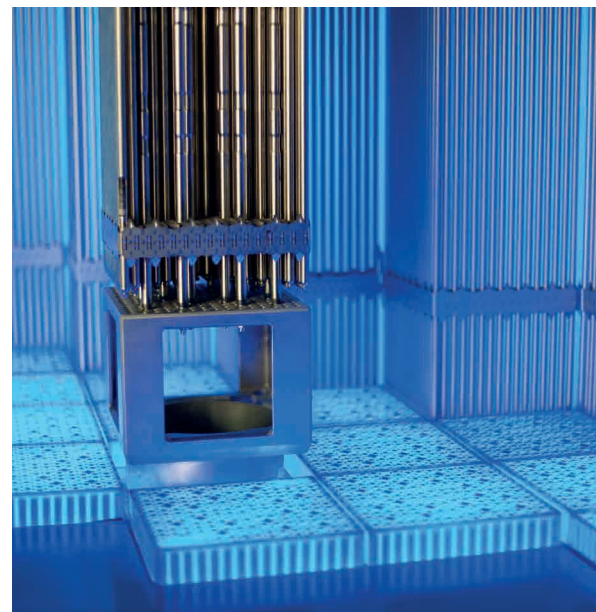




# MASTERS PROGRAMMES IN NUCLEAR EDUCATION

The foundation for your career or further research in a rapidly growing sector



The environmental impact from the use of fossil fuels and the uncertainties in their sources of supply has led to many alternative energy sources being investigated. But of these, only nuclear fission power is at present sufficiently developed to provide an economically viable alternative to fossil fuels.

The University of Birmingham has a long and established track record of research and education in the nuclear sector dating back to the earliest days of the nuclear industry. Today we have extensive links to the UK and global nuclear industry and regulators, including National Nuclear Lab, Japan Atomic Energy Agency, Idaho National Lab, Hitachi, EDF Energy, Horizon Nuclear

Power, CGN, Rolls-Royce, AWE, Atkins, Frazer-Nash, Areva, AMEC Foster Wheeler, Cavendish Nuclear, Sellafield Sites, and the Nuclear Decommissioning Authority. We are pleased to offer two postgraduate nuclear programmes which provide the breadth of learning required for a career in this growing field.

# Physics and Technology of Nuclear Reactors MSc

Providing the breadth and depth you need to enter the nuclear industry.

This programme began in 1956 with the build of the first nuclear reactor in Britain. Since then we have continually updated the areas of study and degree of specialisation to reflect the increasing sophistication of the field. At the same time we have maintained the overall breadth of the course, because we feel this allows new entrants to the field to gain a perspective that will be of continuous help in their future careers.

## Why choose Birmingham?

- Studentships are sponsored by the UK nuclear industry, providing excellent and effective entry routes into careers in this stimulating field for physicists, mathematicians, metallurgists or engineers
- Expand your horizons with visits to a variety of nuclear establishments throughout the academic year visits are made to a variety of nuclear establishments
- Spend one day at a training reactor where the reactor operators are trained

## Course content

This course consists of 180 credits. You will study all of the core modules below which comprise 120 credits and undertake a 60-credit research project.

## Core modules

- Nuclear Instrumentation, Radiation Dosimetry and Protection – 20 credits
  - Covering Particle Detectors, Neutron Radiation Physics, Nuclear Electronics, Radiation Dosimetry, Radiological Protection and Radiation Shielding
- Radiation Transport, Thermal Hydraulics and Reactor Engineering – 20 credits
  - Covering Radiation and Charged Particle Transport, Thermal Hydraulics and Reactor Engineering, Fusion, Statistics, Reactor Physics and Reactor Kinetics

- Reactor Materials, Reactor Systems and NDE – 20 credits
  - Covering Metallurgy, Reactor Systems and Safety Analysis, Nuclear Fuel Cycle, Non-Destructive Testing, Reactor Control and Radio Chemistry
- General Paper – 20 credits
  - Covering Environmental Implications of Nuclear Power, Reactor Materials, Financial Appraisal, Decommissioning and Industrial Lecture Series
- Practical Skills – 40 credits
  - Covering Physics Laboratory, Physics Metallurgy Laboratory, Computing and Numerical Analysis, Reactor Safety Exercise, Seminars and Presentations
- Research Project – 60 credits
  - Covering project work and thesis

## More about the course

In the autumn and spring semesters, you will study all of your taught modules as above. In the summer you will work on your own research project chosen from a wide range of topics in the field. This project may be conducted at the University, but more frequently in recent years we have arranged for projects to be undertaken within industry, giving students an opportunity for direct interaction and enhancing their employment prospects.

## World-class teaching and learning

This programme gives you a chance to learn from world-leading academic staff who are internationally respected for their teaching and research. The lecture courses are supplemented with tutorials, seminars, laboratory work, and visits and talks by speakers from industry organisations.

## FACT FILE

**Start Date:** September/October

**Duration:** 1 year full-time or 2 years part-time

**Entry requirements:** 2:2 Honours degree in a relevant subject (eg, physics, chemistry, materials science, engineering, mathematics or any physical sciences subject)

## CAREERS

### Enhance your professional prospects

Typically, two thirds of our students have jobs or PhDs lined up to walk into upon completion of the course before they have even finished the MSc. Most of the remaining one third will have something within a few months of graduating, and with a total eventual recruitment into the nuclear industry of about 90%.



## LEARN MORE

For full module information and an online application form, please visit our dedicated web pages, or contact the Programme Director with your questions.

Dr Paul Norman

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[www.birmingham.ac.uk/msc-physics-nuclear-reactors](http://www.birmingham.ac.uk/msc-physics-nuclear-reactors)

# Nuclear Decommissioning and Waste Management MSc

Supporting you to capitalise on the recognised skills shortage in this field.

In the UK we currently have 17 nuclear sites at various stages of decommissioning, ranging from first generation Magnox reactors, sites at Sellafield, Springfields and Capenhurst, as well as the fast-reactor research facility at Dounreay. This programme effectively prepares you for a career in the nuclear industry, supporting you to develop the scientific understanding and practical skills to address the challenges in this area.

## Why choose Birmingham?

- Exploit the career opportunities in a growing sector, with demand for high quality graduates increasing with the decommissioning of the current fleet of reactors
- Develop research skills that will also provide a strong foundation for further postgraduate study
- Build relevant skills and knowledge in nuclear sciences, geosciences and materials science to prepare graduates like you for a career in nuclear decommissioning, waste management and remediation

## Course content

This course consists of 180 credits. 120 credits are assessed through the core taught modules and 60 credits are awarded following the successful completion of your research project.

## Core modules

- Nuclear Radiation and Dosimetry – 10 credits
  - Covering Nuclear Radiation and Decay, Radiation Detection, Radiation Dosimetry and Radiation Protection
- Nuclear Fuel Cycle and Radiation Shielding – 10 credits
  - Covering Reactor Systems, Nuclear Fuel Cycle, Radiation Shielding and Introduction to Radiochemistry
- Processing, Storage and Disposal of Nuclear Waste – 20 credits
  - Covering Waste Forms and Classification, Waste Processing and Treatment,

- Encapsulation, Waste Management and Storage, and Geological Storage
- Site Decommissioning and Environmental Management – 20 credits
  - Covering Environmental Impact of Nuclear Power, Site Monitoring and Assessment, Decommissioning, Environmental Remediation and Environmental Modelling
- Policy, Regulation and Management – 20 credits
  - Covering Policy, Public Perception and Accountability, Nuclear Regulation for Waste Management, Programme Management and Contracts, and Project Appraisal and Financing
- Practical and Applied Studies A – 20 credits
  - Covering Radiation Detection and Measurement Lab, Materials and Analysis Lab and Computing and Numerical Analysis
- Practical and Applied Studies B – 20 credits
  - Covering Materials and Analysis Lab, Computing and Numerical Analysis and Case Study Exercise
- Research Project 60 credits
  - Covering project work and thesis

## More about the course

In the autumn and spring semesters, you will study all of your taught modules as above. In the summer semester you will work on your own research project allowing you to further develop your skills and understanding in a specific area of interest to you.

## World-class teaching and learning

This programme covers a wide range of the skills required to work in the nuclear industry and is co-taught with world-leading academic staff from different Schools within the University. Learning is via lectures and practical sessions, supported by field trips and industry seminars. A variety of assessment methods are used, including laboratory exercises, written coursework, case study reports, oral presentations and standard examinations.

## FACT FILE

**Start Date:** September/October

**Duration:** 1 year full-time or 2 years part-time

**Entry requirements:** 2:1 Honours degree in a relevant subject (eg, physics, chemistry, materials science, engineering, mathematics, geoscience or any physical sciences subject)

## CAREERS

### Enhance your professional prospects

This programme is a response to the current skills shortage in this area and trains high quality graduates for the nuclear industry. This is a growing sector and the demand for graduates will increase resulting in an excellent potential for rewarding careers. The research element of the programme also equips our graduates to go on to further study for a PhD.



## LEARN MORE

For full module information and an online application form, please visit our dedicated web pages, or contact the Programme Director with your questions.

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This leaflet was written several months in advance of the start of the academic year. It is intended to provide prospective students with a general picture of the programmes and courses offered by the School. Please note that not all programmes or all courses are offered every year. Also, because our research is constantly exploring new areas and directions of study some courses may be discontinued and new ones offered in their place.

Please note the information in this brochure is correct at time of publication but may be subject to change (June 2019).