

MSc Advanced Nuclear Engineering

This document provides a definitive record of the main features of the programme and the learning outcomes that a typical student may reasonably be expected to achieve and demonstrate if s/he takes full advantage of the learning opportunities provided. This programme specification is intended as a reference point for prospective students, current students, external examiners and academic and support staff involved in delivering the programme and enabling student development and achievement.

Programme Information

Award(s)	MSc		
Programme Title	Advanced Nuclear Engineering		
Programme Code	J5UP		
Awarding Institution	Imperial College London		
Teaching Institution	Imperial College London		
Faculty	Faculty of Engineering		
Department	Department of Materials		
Associateship	N/A		
Mode and Period of Study	1 academic year, full-time		
Cohort Entry Points	Annually in October		
Relevant QAA Benchmark Statement(s) and/or other external reference points	Master's Degrees in Engineering		
Total Credits	ECTS:	90	CATS: 180
FHEQ Level	Level 7		
EHEA Level	2 nd cycle		
External Accreditor(s)	None		
Specification Details			
Student cohorts covered by specification	2016/17 entry		
Person responsible for the specification	Dr Ben Britton (Course Director)		
Date of introduction of programme	October 2010		
Date of programme specification/revision	September 2016		

Description of Programme Contents

This course empowers the next generation of talented engineers to enter and support growth and development of the global nuclear industry. We provide our students with the core skills required by a wide range of roles within the nuclear sector and enable them to provide creative solutions which are grounded with a firm technical understanding.

The course covers all major aspect of the nuclear industry, from the design and build of nuclear power stations and their operations through to decommissioning and final disposal. Within the course, we enable our students to be horizon scanners and discuss the next generation of fission and fusion concepts, as well as the role of nuclear power in the wider global energy landscape.

The course is multidisciplinary drawing from expertise across departments within the Faculty of Engineering, including experts from the Reactor Centre staff at the Silwood Park Campus who operate the CONSORT test reactor.

Learning Outcomes

The Imperial Graduate Attributes are a set of core competencies which we expect students to achieve through completion of any Imperial College degree programme. The Graduate Attributes are available at: www.imperial.ac.uk/students/academic-support/graduate-attributes

Knowledge and Understanding of:

- An introduction to nuclear power in the global landscape
- Underpinning core nuclear engineering – including reactor physics, nuclear chemical engineering and the fuel cycle, nuclear materials, nuclear thermal hydraulics, safety, waste management and decommissioning, and modelling approaches used in the nuclear industry
- Nuclear engineering in the wider industrial, policy, and technical context (e.g. future reactor designs)

Intellectual Skills:

- Perform analysis and, thereby, solve problems in specific areas shown above.
- Integrate theory and practice in dealing with problems which involve several of the subject areas shown above.
- Carry out a synthesis/design of a process when faced with a conflicting set of objectives which are, to some extent, mutually exclusive.
- Demonstrate the skills necessary to plan, conduct and report a programme of original research or, alternatively, a project of direct and immediate industrial relevance.

Practical Skills:

- Plan and execute safely a series of experiments.
- Use laboratory methods to generate data.
- Analyse experimental results and determine their accuracy, precision and validity.
- Prepare technical reports.
- Give technical presentations.
- Use effectively, a wide range of computational tools and packages of a general nature.
- Use effectively, a wide range of computational tools and packages relating specifically to the relevant engineering discipline being studied and to determine the range of their validity.
- Make use of knowledge from a number of diverse areas to synthesise a feasible solution to a complex problem or design.

Professional Skills Development:

- Communicate effectively through oral presentations and written reports.
- Use information and communications technology.
- Develop management skills: group coordination, decision processes, objective criteria, problem definition, project design and evaluation needs.
- Work as a team and/or independently as appropriate.
- Be adequately prepared to enter a chosen sector of industry as a professional.
- Become aware of the environmental, economic and social impact of the specific engineering discipline being studied.
- Integrate and evaluate information from a variety of sources.
- Learn effectively for the purpose of continuing professional development.

Entry Requirements

Academic Requirement	2.1 Honours degree in an engineering or science discipline (materials; mechanical, civil or chemical engineering; physics or chemistry).
Non-academic Requirements	None
English Language Requirement	IELTS 6.5 with a minimum of 6.0 in each element or equivalent.

The programme's competency standards document can be found at:
<http://www.imperial.ac.uk/materials/postgraduate/pgt/msc-nuclear/>

Learning & Teaching Strategy

Scheduled Learning & Teaching Methods	<ul style="list-style-type: none"> • Lectures • Tutorials • Journal clubs • Modelling laboratories
E-learning & Blended Learning Methods	<ul style="list-style-type: none"> • N/A
Project and Placement Learning Methods	<ul style="list-style-type: none"> • Research project

Assessment Strategy

Assessment Methods	<ul style="list-style-type: none"> • Examination • Coursework • Research Project (Literature Review, Thesis and Final Presentation)
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Academic Feedback Policy

Students can expect to receive feedback within two weeks.

Re-sit Policy

The College's Policy on Re-sits is available at: www.imperial.ac.uk/registry/exams/resit

Mitigating Circumstances Policy

The College's Policy on Mitigating Circumstances is available at: www.imperial.ac.uk/registry/exams

Assessment Structure

Marking Scheme

Final Degree Classifications

Pass - the Pass Mark for all postgraduate taught course modules is 50%. Students must pass all elements in order to be awarded a degree.

Merit - in order to be awarded a result of merit, a candidate must obtain an aggregate mark of 60% or greater. Where appropriate, a Board of Examiners may award a result of merit where a candidate has achieved an aggregate mark of 60% or greater across the programme as a whole AND has obtained a mark of 60% or greater in each element with the exception of one element AND has obtained a mark of 50% or greater in this latter element.

Distinction - in order to be awarded a result of distinction, a candidate must obtain an aggregate mark of 70% or greater. Where appropriate, a Board of Examiners may award a result of distinction where a candidate has achieved an aggregate mark of 70% or greater across the programme as a whole AND has obtained a mark of 70% or greater in each element with the exception of one element AND has obtained a mark of 60% or greater in this latter element.

Module Weightings

Module	% Module Weighting
Introduction to Nuclear Energy (6 ECTS)	6%
At least 6 x comprehensive modules from elective group (A)	6% each
4 x short modules from elective group (B)	3% each
Journal Club	5%
Research Project	42%

Indicative Module List											
Code	Title	Core/ Elective	L&T Hours	Ind. Study Hours	Place- ment Hours	Total Hours	% Written Exam	% Course- work	% Practical	FHEQ Level	ECTS
MSE 9NINE	Introduction to Nuclear Energy	CORE	20	130	0	150	50%	50%	0%	7	6.00
MSE 9NMNE	Modelling for Nuclear Engineers	ELECTIVE (A)	30	120	0	150	0%	100%	0%	7	6.00
CE4-30	Nuclear Chemical Engineering	ELECTIVE (A)	30	120	0	150	80%	20%	0%	7	6.00
MSE 414	Nuclear Materials for Reactor Systems	ELECTIVE (A)	24	126	0	150	100%	0%	0%	7	6.00
MSE 9NNSM	Nuclear Safety Management	ELECTIVE (A)	24	126	0	150	75%	25%	0%	7	6.00
ME4-MNUTH	Nuclear Thermal Hydraulics	ELECTIVE (A)	30	120	0	150	100%	0%	0%	7	6.00
MSE 419	Nuclear Waste Management and Decommissioning	ELECTIVE (A)	24	126	0	150	100%	0%	0%	7	6.00
ME4-MNURP	Nuclear Reactor Physics	ELECTIVE (A)	32	118	0	150	100%	0%	0%	7	6.00
MSE 9NC2	Fast Reactors and Nuclear Hydrogen Production	ELECTIVE (B)	9	66	0	75	0%	100%	0%	7	3.00
MSE 9NC4	Nuclear Engineer in Industry	ELECTIVE (B)	12	63	0	75	0%	100%	0%	7	3.00
MSE 9NC3	Nuclear Fusion	ELECTIVE (B)	12	63	0	75	0%	100%	0%	7	3.00
MSE 9NC5	Nuclear Energy Policy	ELECTIVE (B)	12	63	0	75	0%	100%	0%	7	3.00
MSE 9NC1	Radiation Protection	ELECTIVE (B)	12	63	0	75	100%	0%	0%	7	3.00

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Code	Title	Core/ Elective	L&T Hours	Ind. Study Hours	Place- ment Hours	Total Hours	% Written Exam	% Course- work	% Practical	FHEQ Level	ECTS
MSE 9JC	Journal Club	CORE	14	111	0	125	0%	0%	100%	7	5.00
MSE 9NIRP	Research Project	CORE	0	750	0	750	0%	100%	0%	7	31.00

Supporting Information

The Programme Handbook is available at:

<http://www.imperial.ac.uk/materials/postgraduate/pgt/msc-nuclear/>

The Module Handbook is available at:

<http://www.imperial.ac.uk/materials/postgraduate/pgt/msc-nuclear/>

The College's entry requirements for postgraduate programmes can be found at:

www.imperial.ac.uk/study/pg/apply/requirements

The College's Quality & Enhancement Framework is available at:

www.imperial.ac.uk/registry/proceduresandregulations/qualityassurance

The College's Academic and Examination Regulations can be found at:

<http://www3.imperial.ac.uk/registry/proceduresandregulations/regulations>

Imperial College is an independent corporation whose legal status derives from a Royal Charter granted under Letters Patent in 1907. In 2007 a Supplemental Charter and Statutes was granted by HM Queen Elizabeth II. This Supplemental Charter, which came into force on the date of the College's Centenary, 8th July 2007, established the College as a University with the name and style of "The Imperial College of Science, Technology and Medicine".

<http://www.imperial.ac.uk/admin-services/secretariat/college-governance/charters-statutes-ordinances-and-regulations/>

Imperial College London is regulated by the Higher Education Funding Council for England (HEFCE)

<http://www.hefce.ac.uk/reg/of/>