Imperial College London

Programme Specification 2022-23

Programme Information		
Programme Title	Programme Code	HECoS Code
Mechanical Engineering with Nuclear Engineering and a Year in Industry	H3G2	For Registry Use Only

Award	Length of Study	Mode of Study	Entry Point(s)	Total Credits	
				ECTS	CATS
MEng	5 Years	Full Time	N/A	300	600

This programme is not available for entry. All students must apply to and join the Mechanical Engineering MEng and transfer from within.

Specific requirements for transferring to this programme are outlined in the Progression and Classification section at the end of this document.

Ownership			
Awarding Institution	Imperial College London	Faculty	Faculty of Engineering
Teaching Institution	Imperial College London	Department	Mechanical Engineering
Associateship	City and Guilds Institute	Main Location(s) of Study	South Kensington Campus
External Reference			
Relevant QAA Benchmark Statement(s) and/or other external reference points		Honours Degree in Engineering	
FHEQ Level		Level 7 - Honours	
EHEA Level		2nd Cycle	
External Accreditor(s) (if applicable)			
External Accreditor:	Institute of Mechanical Engineers		
Accreditation received:	2016	Accreditation renewal:	2022
Collaborative Provision			
Collaborative partner	Collaboration type	Agreement effective date	Agreement expiry date
N/A	N/A	N/A	N/A
Specification Details			
Programme Lead		Dr Michael J Bluck	
Student cohorts covered by specification		2022-23 entry	

Date of introduction of programme	September 19
Date of programme specification/revision	March 22

Programme Overview

The MEng Mechanical Engineering with Nuclear Engineering programme seeks to educate and enthuse future engineers, resulting in graduate students with technical expertise matched with professionalism and creativity, with a specialism in nuclear. The programme consists of technical, practical and professional skills modules in multiples of 5 ECTS. The year in industry provides you with the opportunity to apply the skills, knowledge and attributes you have developed during the first two years of the programme in a nuclear industrial setting.

In the first year you will develop a basic understanding across a range of technical modules in three technical themes; solid mechanics, thermofluids and mechatronics. The realisation of the engineering product and the understanding and practice of design is introduced in the Design and Manufacture module. Mathematics and computing is a vital language in engineering and your skills are developed in support of the technical themes. An engineer must operate in a commercial environment and the professional skills module develops and equips you with the necessary understanding and experience through practice.

The second year is a continuation of the first, further developing your expertise across the three technical disciplines, design and manufacture, supporting mathematics and computing and professional skills. These two core years establish a strong technical and professional base for subsequent years.

The year in industry will normally take place in year three and typically lasts from September to August. This means that some of the placement will fall outside of normal term time. You will be able to demonstrate employability skills by applying for and securing a placement and working effectively as a full-time employee within your job role. Personal tutors will provide monitoring and support through the year, including site visits.

The fourth and fifth years enable you to tailor the programme to your own ambitions and establish mastery in the nuclear theme. In year 4, you will take core modules in Introduction to Nuclear Engineering and Nuclear Chemical Engineering. You will also broaden and deepen your understanding through a wide range of additional technical and commercial electives. In year 4, the group Design, Make and Test project brings together your technical skills and develops creativity and innovation in a team-working environment, requiring you to produce reports, posters and presentations. Also in year 4, the Literature Research Project (LRP) (a component of the Professional Skills module) develops your critical analysis and report writing skills. In year 5, the core component includes Nuclear Reactor Physics, Nuclear Thermal Hydraulics and Nuclear Materials I and the individual project. You will broaden and deepen your understanding through a wide range of additional electives and establish a deep understanding of one selected advanced industrial application (Advanced Applications (AA) module). Also in year 5, the individual project is an opportunity for you to develop and demonstrate a deep understanding in a key research area with sole responsibility through close supervision by academic staff who are experts in their fields.

As a graduate of this programme you will be equipped with the skills to find solutions to real-life problems with conflicting requirements. The employment trajectories of our graduates are very diverse. Many find work in consultancy, tackling an ever-changing variety of tasks. The technical and management skills of the discipline are equally valued in the commercial world, where they work together to sharpen the competitive edge. Some of our graduates elect to remain in academia to contribute to research and the education of future generations.
The degree programme is accredited by the Institution of Mechanical Engineers as the basis for Chartered Engineer status.

Learning Outcomes

On completion of year 1 (equivalent to a CertHE) you will be able to:

1. Explain the underpinning mathematics, basic mechanics, mechatronics and thermofluids associated with a career in mechanical engineering.
2. Consider how appropriate codes of practice, industry standards, quality issues and lifelong learning are applicable to a general mechanical engineering career.
3. Apply design processes and methodologies.
4. Evaluate the characteristics of engineering materials, equipment and processes and basic mechanical workshop practices.

On completion of year 2 (equivalent to a DipHE), in addition to the ILOs above you will be able to:

6. Explain advanced mathematics and knowledge of the fundamentals of mechanical, mechatronics and thermofluids associated with a career in mechanical engineering.
7. Describe, develop and use mathematical and computer models for the analysis of engineering systems.
8. Recommend and select management techniques appropriate for a career in engineering and an understanding of the commercial and economic context of the engineering business.
9. Apply advanced design processes and methodologies in a team working environment involving consideration of applicable health & safety, diversity, inclusion, cultural, societal issues.
10. Report technical ideas, results and data in a clear professional manner.

On completion of year 3, in addition to the ILOs above you will be able to:

- Demonstrate employability skills by applying for and securing a placement, working effectively within their job role.

On completion of year 4 (equivalent to a BEng), in addition to the ILOs above you will be able to:

11. Research and critically evaluate concepts and evidence; apply diagnostic and creative skills and exercise significant judgement and accept accountability for determining and achieving personal and/or group outcomes.
12. Design, manufacture and test engineering devices, using creative processes, design processes, methodologies and team working.
13. Illustrate the intellectual property issues and of environmental, legal, security and ethical issues within the modern professional industrial world.
14. Construct physical and mathematical models in range of engineering subjects and evaluate and apply the analytical techniques used within at least one major engineering discipline.

On completion of year 5 (equivalent to a MEng), in addition to the ILOs above you will be able to:

15. Synthesize fundamental engineering concepts and evaluate and apply them to a complex and specialised area of engineering of industrial importance.
16. Select state-of-the-art methods in a range of engineering subjects, analyse complex data, and simulate and model relevant scenarios.
17. Conduct research, or advanced technical activity, accepting accountability for related decision making
18. Synthesize the underlying fundamental concepts and processes in nuclear engineering and its industrial implementation.

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

Entry Requirements	
Academic Requirement	A Levels (3 subjects) A* Maths, A* Physics, A in another subject (Further Maths useful but not essential). A Levels (4 subjects) A* Maths, A Physics, A in two other subjects (Further Maths useful but not essential). IB 40 overall, 6 Maths (HL), 6 Physics (HL), 6 other (HL) For further information on entry requirements, please go to https://www.imperial.ac.uk/study/ug/apply/requirements/ugacademic/
Non-academic Requirements	N/A
English Language Requirement	Standard requirement Please check for other Accepted English Qualifications
Admissions Test/Interview	Where possible, shortlisted applicants are invited for interview.

The programme's competency standards documents can be found at: https://bb.imperial.ac.uk/webapps/blackboard/content/listContent.jsp?course_id=_6309_1&content_id=_540708_1

Learning & Teaching Approach

Teaching
You will be taught through a combination of, lectures, tutorials, team-based learning, laboratory demonstrations, experiments, practical classes, guest lectures and presentations. Lectures make use of recording and a number of interactive technologies including experimental demonstrations. Tutorials will enable you to discuss and develop your understanding of topics covered in lectures whilst in smaller groups of around 16 students. Team-based learning is used in creative and design-oriented study and laboratory demonstrations and experiments support your theoretical knowledge developed in lectures and tutorials.

Independent learning
You are expected to spend significant time on independent study outside of face to face contact time. This will typically include accessing and interacting with resources online, reading journal articles and books, undertaking research in the library, reviewing lecture notes and watching lecture recordings, working on individual and group projects, working on coursework assignments, solving tutorial questions and revising for exams.

Where appropriate, and specifically for practical and laboratory-based modules, use is made of flipped teaching, meaning that you will need to actively engage with on-line materials ahead of attending timetabled sessions. This independent learning is followed by sessions where you will work in small groups to apply that knowledge in practice, thereby further consolidating and enhancing understanding of the topics studied.

Research projects and literature reviews
You are given numerous opportunities to consider specific problems of interest to you. In the Literature Review Project, Design, Make and Test project and Final Year Project you can select from a very broad range of projects, including technical, commercial, economic and socio-political topics. You can also self-propose a topic, subject to agreement with the supervisor. A substantive part of the project/your study can be self-proposed across the programme.

Overall Workload
The overall workload consists of face-to-face sessions, independent and team-based learning. While actual contact hours may vary according to the optional modules students choose to study, the following gives an indication of how much time you will need to allocate to different activities at each level of the programme. At Imperial, each ECTS credit taken equates to an expected total study time of 25 hours. Therefore, the expected total study time is normally 1500 hours per year.

Typically, in the first two years (levels 4 and 5) you will spend around 20% of the time on lectures, seminars and other scheduled activity (around 300 hours) and around 80% of the time on independent study (around 1200 hours).
In the fourth and fifth years (level 6 and 7), you will spend less time in lectures, seminars or other scheduled activity (around 60 hours). Instead, the rest of the time will be split evenly between independent study and project work (approximately 600 hours on each).

Assessment Strategy

Assessment Methods

You can expect a variety of different types of assessment methods:

Written assessment
- Examinations
- Progress tests
- Online assignments, quizzes and tests
- Report writing
- Peer assessment

Practical assessment
- Laboratory/workshop practicals
- Programming tests
- CAD & simulation tool tests

Oral assessment
- Oral presentations

- Poster presentations
- Group presentations
- Design exhibitions

The programme allows you to test understanding of the subject informally before you complete the formal summative assessments that count towards your final mark. These summative assessments allow you to demonstrate that you have met the intended learning outcomes for each module and contribute towards your achievement of the programme learning outcomes, detailed above. There is formal summative assessment during and/or at the end of each module. Examinations are intended to assess understanding rather than recall. Group assessments may incorporate peer marking. The year in industry is assessed through four reports submitted during the year.

Balance of assessment
The percentages below are based on a typical pathway through the course and have been rounded to the nearest whole number.

	Year 1	Year 2	Year 3	Year 4	Year 5
Coursework	20%	20%	100%	40%	45%
Practical	5%	5%	n/a	5%	5%
Examination	75%	75%	n/a	55%	50%

Academic Feedback Policy

Feedback is provided through a number of formats, including:
- Oral (e.g. face to face during or after face-to-face sessions, video)
- Personal (e.g. discussion with staff)
- Interactive (e.g. Team Based Learning, peer-to-peer, online quizzes)
- Written (e.g. solutions, model answers, comments on work which can be used as feedforward)

You will receive feedback on intermediate, developmental assessments such as project plan and progress reports and on coursework assessments. Feedback on examination performance is available upon request from the module leader and overall class performance feedback on a question-by-question basis is also provided. Feedback is intended to help you learn and you are encouraged to discuss it with your module tutor. Feedback will be provided on coursework and practical assessments within 2 weeks of submission.

The College's Policy on Academic Feedback and guidance on issuing provisional marks to students is available at:
www.imperial.ac.uk/about/governance/academic-governance/academic-policy/exams-and-assessment/

Re-sit Policy

The College's Policy on Re-sits is available at: www.imperial.ac.uk/student-records-and-data/for-current-students/undergraduate-and-taught-postgraduate/exams-assessments-and-regulations/

Mitigating Circumstances Policy

The College's Policy on Mitigating Circumstances is available at: www.imperial.ac.uk/student-records-and-data/for-current-students/undergraduate-and-taught-postgraduate/exams-assessments-and-regulations/

Additional Programme Costs

This section should outline any additional costs relevant to this programme which are not included in students' tuition fees.

Students will need to consider the costs involved with placements. For students studying or working abroad as part of their programme, costs will vary with destination. Information on the types of costs which may be incurred can be found in the Placements Abroad Handbook which is available at https://www.imperial.ac.uk/placements/information-for-imperial-college-students/

Important notice: The Programme Specifications are the result of a large curriculum and pedagogy reform implemented by the Department and supported by the Learning and Teaching Strategy of Imperial College London. The modules, structure and assessments presented in this Programme Specification are correct at time of publication but might change as a result of student and staff feedback and the introduction of new or innovative approaches to teaching and learning. You will be consulted and notified in a timely manner of any changes to this document.

Programme Structure[1]					
Year 1 – FHEQ Level 4 **Students study all core modules.**					
Code	Module Title	Core/ Elective	Group *	Term	Credits
MECH40008	Mathematics and Computing 1	Core	N/A	1,2	15
MECH40001	Professional Engineering Skills 1	Core	N/A	1,2	5
MECH40005	Stress Analysis 1	Core	N/A	1,2,3	5
MECH40009	Mechanics	Core	N/A	1,2,3	5
MECH40006	Materials 1	Core	N/A	1,2,3	5
MECH40002	Fluid Mechanics 1	Core	N/A	1,2,3	5
MECH40003	Thermodynamics 1	Core	N/A	1,2,3	5
MECH40004	Mechatronics 1	Core	N/A	1,2,3	5
MECH40007	Design and Manufacture 1	Core	N/A	1,2,3	10
				Credit Total	60

Year 2 - FHEQ Level 5 **Students study all core modules.**					
Code	Module Title	Core/ Elective	Group	Term	Credits
MECH50003	Mathematics and Computing 2	Core	N/A	1,2	10
MECH50007	Professional Engineering Skills 2	Core	N/A	1,2	5
MECH50002	Stress Analysis 2	Core	N/A	1,2,3	5
MECH50008	Dynamics	Core	N/A	1,2,3	5
MECH50005	Materials 2	Core	N/A	1,2,3	5
MECH50010	Fluid Mechanics 2	Core	N/A	1,2,3	5
MECH50006	Thermodynamics 2	Core	N/A	1,2,3	5
MECH50001	Heat Transfer	Core	N/A	1,2,3	5
MECH50004	Mechatronics 2	Core	N/A	1,2,3	5
MECH50009	Design and Manufacture 2	Core	N/A	1,2,3	10

[1] **Core** modules are those which serve a fundamental role within the curriculum, and for which achievement of the credits for that module is essential for the achievement of the target award. Core modules must therefore be taken and passed in order to achieve that named award. **Compulsory** modules are those which are designated as necessary to be taken as part of the programme syllabus. Compulsory modules can be compensated. **Elective** modules are those which are in the same subject area as the field of study and are offered to students in order to offer an element of choice in the curriculum and from which students are able to select. Elective modules can be compensated.

				Credit Total	60
Year 3 - Students spend a year in industry.					
Code	Module Title	Core/ Elective	Group	Term	Credits
MECH60023	Year in industry	Core	N/A	1,2,3	60
				Credit Total	60

Year 4 - FHEQ Level 6 **Students must study all core and and one compulsory iExplore module (F). Students must study both modules in at least one of groups A-C, and one additional module from groups A-E. Note that a range of electives are available in a given year and students will be given advance notice of which options are available to them ahead of making module choices.**					
Code	Module Title	Core/ Elective	Group	Term	Credits
MECH60015	Professional Engineering Skills 3	Core	N/A	1,2	10
MECH60003	Design, Make and Test Project	Core	N/A	1,2,3	20
MECH60004	Introduction to Nuclear Energy A	Core	N/A	1	5
CENG60013	Nuclear Chemical Engineering	Core	N/A	2	5
	I-Explore (Level 5/6)	Compulsory	F	1 &/or 2	5
MECH60014	Stress Analysis 3A	Elective	A	1,2	5
MECH60002	Fracture Mechanics A	Elective	A	1,2	5
MECH60011	Thermodynamics 3A	Elective	B	1,2	5
MECH60006	Fluid Mechanics 3A	Elective	B	1.2	5
MECH60018	Mechatronics 3A	Elective	C	1,2	5
MECH60001	Machine Dynamics and Vibrations A	Elective	C	1,2	5
MECH60009	Embedded C for Microcontrollers A	Elective	D	1,2	5
MECH60013	Structure, Properties and Application of Polymers A	Elective	D	1,2	5
MECH60021	Computational Continuum Mechanics A	Elective	D	1	5
MECH60007	Finite Element Analysis and Applications A	Elective	D	1,2	5
MECH60005	Manufacturing Technology and Management A	Elective	D	1,2	5
MECH60019	Tribology A	Elective	D	1,2	5
MECH60016	Mathematics A	Elective	D	1,2	5
MECH60017	Statistics A	Elective	D	1,2	5
MECH60024	Automotive Design with Motorsport	Elective	D	1	5

MECH60025	Equality, Diversity and Inclusion in Engineering A	Elective	D	1	5
	BPES Modules	Elective	E	1 &/or 2	5
				Credit Total	60

Year 5 - FHEQ Level 7
Students study all core modules. Students must study exactly one module from group A and two modules from groups B-C. No level 7 module (variant B) may be studied for credit where the corresponding level 6 module (variant A) has already been studied for credit. Note that a range of electives will be available in a given year and students will be given advance notice of which options are available to them ahead of making module choices.

Code	Module Title	Core/ Elective	Group	Term	Credits
MECH70007	Individual Project	Core	N/A	1,2,3	25
MECH70002	Nuclear Reactor Physics	Core	N/A	2	5
MECH70001	Nuclear Thermal Hydraulics	Core	N/A	1	5
MATE70019	Nuclear Materials	Core	N/A	1	5
MECH70021	Aircraft Engine Technology	Elective	A	1,2	10
MECH70006	Metal Processing Technology	Elective	A	1,2	10
MECH70003	Future Clean Transport Technology	Elective	A	1,2	10
MECH70008	Mechanical Transmissions Technology	Elective	A	1,2	10
MECH70022	Advanced Control	Elective	B	1,2	5
MECH70019	Advanced Stress Analysis	Elective	B	1,2	5
MECH70016	Applied Vibration Engineering	Elective	B	1,2	5
MECH70020	Combustion Safety and Fire Dynamics	Elective	B	1,2	5
MECH70015	Computational Fluid Dynamics	Elective	B	1,2	5
MECH70017	Composite Materials	Elective	B	1,2	5
MECH70009	Interfacing and Data Processing	Elective	B	1,2	5
MECH70014	Design, Art and Creativity B	Elective	B	1	5
MECH70004	Stress Analysis 3B	Elective	B	1,2	5
MECH70005	Fracture Mechanics B	Elective	B	1,2	5
MECH70011	Fluid Mechanics 3B	Elective	B	1.2	5
MECH70013	Embedded C for Microcontrollers B	Elective	B	1,2	5
MECH70018	Computational Continuum Mechanics B	Elective	B	1	5
MECH70012	Finite Element Analysis and Applications B	Elective	B	1,2	5

MECH70025	Machine Learning	Elective	B	1,2	5
MECH70026	Energy Systems	Elective	B	1,2	5
MECH70027	Environmental and Applied Fluid Dynamics	Elective	B	1,2	5
MECH70052	Equality, Diversity and Inclusion in Engineering B	Elective	B	1	5
MECH70053	Manufacturing Technology and Management B	Elective	B	1	5
MECH70043	Structure, Properties and Application of Polymers B	Elective	B	1,2	5
MECH70045	Advanced Numerical Methods for Engineers	Elective	B	2	5
MECH70054	Introduction to Robotics	Elective	B		5
MECH70041	Statistics B	Elective	B		5
MECH70051	Mathematics B	Elective	B		5
MECH70047	Thermodynamics 3B	Elective	B	1,2	5
MECH70050	Machine Dynamics and Vibrations B	Elective	B	1,2	5
MECH70044	Tribology B	Elective	B	1,2	5
	IDX†	Elective	C	1,2	5
				Credit Total	60

* 'Group' refers to module grouping (e.g. a group of electives from which one/two module(s) must be chosen).

†There are multiple IDX modules available: https://www.imperial.ac.uk/engineering/study/current/inter-departmental-exchange-idx/

Progression and Classification

Transferring to the with Nuclear Engineering and a Year in Industry programme

All students must apply to and join the Mechanical Engineering MEng. You will be able to transfer to a Year in Industry at any point up until the start of the placement, which takes place in Year Three.

You will be able to transfer to this Nuclear Engineering programme up at any point, provided you have chosen the electives which meet core requirements outlined in the module table.

Progression

Requirements for progression between years of study and for classifications of degrees are provided in the Academic Regulations.

If a candidate fails any core modules at the first attempt, the Examining Board may, against criteria determined on a year by year basis, record a Deferred Decision and require reassessment(s).

A maximum of 15 ECTS credits can be compensated across the entire programme.

Classification

The marks from modules in each year contribute towards the final degree classification.

In order to be considered for an award, students must have achieved the minimum number of credits at the required levels prescribed for that award and met any programme specific requirements as set out in the Programme Specification.

Classification will be determined through:

i) Aggregate Module marks for all modules
ii) Year Weightings

For this award, Year One is weighted at 7.50%, Year Two at 20.00%, Year Three (in industry) at 0%, Year Four at 36.25% and Year Five at 36.25%.

The College sets the class of undergraduate degree that may be awarded as follows:

i)	First	70.00% or above for the average weighted module results
ii)	Upper Second	60.00% or above for the average weighted module results
iii)	Lower Second	50.00% or above for the average weighted module results
iv)	Third	40.00% or above for the average weighted module results

Please find the full Academic Regulations at https://www.imperial.ac.uk/about/governance/academic-governance/regulations/. Please follow the prompts to find the set of regulations relevant to your programme of study.

Programme Specific Regulations

As an accredited degree, students on the MEng programme are subject to the standards set by the Engineering Council in relation to compensation: a maximum of 15 ECTS credits can be compensated across the entire programme.

Supporting Information
The Programme Handbook is available at: N/A
The Module Handbook is available at: N/A
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: www.imperial.ac.uk/about/governance/academic-governance/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". www.imperial.ac.uk/admin-services/secretariat/college-governance/charters/
Imperial College London is regulated by the Office for Students (OfS) www.officeforstudents.org.uk/advice-and-guidance/the-register/
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 primarily intended as a reference point for prospective and current students, academic and support staff involved in delivering the programme and enabling student development and achievement, for its assessment by internal and external examiners, and in subsequent monitoring and review.

Modifications			
Description	**Approved**	**Date**	**Paper Reference**
N/A	N/A	N/A	N/A