

Programme Information		
Programme Title	Programme Code	HECoS Code
MEng Electrical and Electronic Engineering with Management	H6N2	For Registry Use Only

Award	Length of Study	Mode of Study	Entry Point(s)	Total Credits	
				ECTS	CATS
MEng Electrical and Electronic Engineering – Management <sup>1</sup>	4 years	Full-Time	Annually in October	250-270	500-540

<sup>1</sup>If you leave before completing the MEng Electrical and Electronic Engineering programme, you may be offered the following exit awards at the discretion of the Board of Examiners provided that you have met the minimum ECTS requirements for that award in line with College Regulations: Certificate in Higher Education in Electrical and Electronic Engineering (45 ECTS at level 4, 60 ECTS total), Diploma in Higher Education in Electrical and Electronic Engineering (45 ECTS at level 5, 120 ECTS total), BEng Electrical and Electronic (Ordinary) (30 ECTS at level 6, 150 ECTS total) or BEng Electrical and Electronic (Honours) (45 ECTS at level 6, 180 ECTS total). These exit awards are not accredited.

Ownership			
Awarding Institution	Imperial College London	Faculty	Faculty of Engineering
Teaching Institution	Imperial College London	Department	Electrical and Electronic Engineering
Associateship	City and Guilds of London Institute (ACGI)	Main Location(s) of Study	South Kensington

External Reference	
Relevant <u>QAA Benchmark Statement(s)</u> and/or other external reference points	Master's Award in Electrical and Electronic Engineering
<u>FHEQ Level</u>	Level 7
<u>EHEA Level</u>	2 <sup>nd</sup> Cycle

External Accreditor(s) (if applicable)			
External Accreditor 1:	Institution of Engineering and Technology		
Accreditation received:	2018	Accreditation renewal:	2023

Collaborative Provision			
Collaborative partner	Collaboration type	Agreement effective date	Agreement expiry date
N/A	N/A	N/A	N/A

Specification Details	
Programme Lead	Director of Undergraduate Studies

Student cohorts covered by specification	2022-23 entry
Date of introduction of programme	2019
Date of Programme Specification/revision	July 2022

## Programme Overview

### ABOUT THE DEPARTMENT

The Department's main objectives are to deliver high quality teaching and conduct internationally leading research. We see educating the next generation of engineers as a key role, and our graduates are highly valued by industry and commerce around the world. Our undergraduate degrees are aligned to our research strengths, and we are proud of the depth of analytical treatment and the specialised optional subjects we offer within our degree programmes. Our research feeds especially into the 4<sup>th</sup> year MEng where members of staff bring their research into the classroom and devise exercises in line with research expectations. The department carries out research across a wide range of topics, and targets both fundamental advances and practical applications of science and technology. The quality and impact of our research are demonstrated by our many highly cited publications, the personal recognition of our researchers through awards and honours, and the commercial adoption of our results and innovations.

The Electrical and Electronic Engineering discipline is considered interdisciplinary in character because Electrical and Electronic Engineers work in a wide range of areas including renewable power and smart grids, robotics including machine learning as well as the hardware and control systems, communication systems such as 5G and signal processing, e.g. wearable medical diagnostic devices. Design and analysis of systems is at the core of this programme and you will be offered multiple opportunities to develop your skills in this area. The programme offers technical rigour and depth in a wide range of modern engineering topics. Due to our different streams and extensive list of elective modules in later years, you shape your own specialisation route.

Further information about the Department and our courses is available on our website:  
[www.imperial.ac.uk/electrical-engineering/about/](http://www.imperial.ac.uk/electrical-engineering/about/).

### ABOUT THE MEng PROGRAMME

The department offers both a three-year BEng programme and four-year integrated Master's MEng programme. Both degree programmes involve substantial group and individual project work. The MEng programme has the added benefit of an industrial placement or consultancy group project. In the final year of your programme you will be able to choose from a range of Master's level elective modules and gain further exposure to cutting-edge research problems in a wide range of electrical engineering topics.

The goal of this programme, where 50% of your lectures in the final two years will be taken in the Imperial College Business School, is to prepare you to become a high quality graduate with excellent technical as well as management skills. This stream stands apart from the MEng technical stream in that specialisation in the final two years is both in engineering as well as in management/business options. Due to our extensive list of elective modules in later years, you shape your own technical specialisation route.

This Programme Specification describes the academic path given in figure 1.

After the first year you will be able to choose between the Electrical and Electronic Engineering (EEE) stream and the Electronic and Information Engineering (EIE) stream. EEE focuses more on the physics behind electrical engineering, whilst EIE is oriented towards information processing. This document describes the EEE stream. After the second year, you can again choose between two different streams, the management and the technical stream. Please refer to the MEng Electrical and Electronic Engineering – Technical Programme Specifications for more information concerning the technical stream.

In the first two years you will be taught the fundamental principles in engineering. In third and fourth year, you will take 3 compulsory modules from the Imperial College Business School in each year and be able to take advanced specialised technical topics. This will give you the most direct route to a professional engineering career or a career in the financial sector. You will also have access to some modules offered by other departments in Imperial College London that includes non-technical study opportunities.

In the third year, the MEng degree gives you the opportunity to be involved in industry-led consultancy

projects or an industrial placement within the degree structure. This will give you an opportunity to develop your engineering skills outside a purely academic setting. In the fourth year of the accredited MEng programme, you will be required to complete an Individual Project.

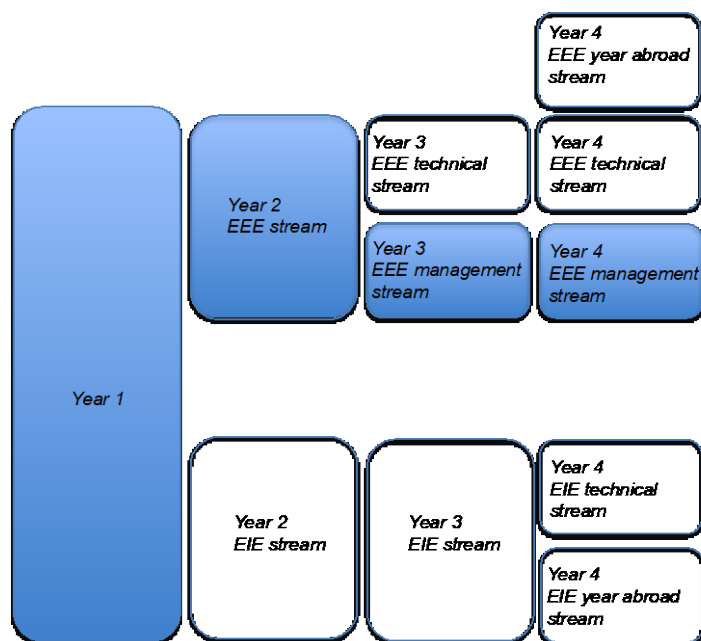


Figure 1: MEng programme structure with the different streams opening up after the 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> year. The colour filled boxes relate to this Programme Specification. For the other streams, please refer to the appropriate Programme Specification. Note that the Management Stream does not give access to the year abroad option.

### TRANSFERRING BETWEEN PROGRAMMES

All stream changes should be discussed with your personal tutor or the senior tutor and must be approved by the Director of Undergraduate Studies.

#### All Programmes

All programmes within the department have a common first year. It is therefore possible to transfer between the EIE and EEE streams up until the end of your first year.

#### BEng to MEng

Year two is common between the EEE MEng and EEE BEng. You can choose at any point up until end of year two to change between MEng and BEng. If you hold a Student Route visa you will need to contact the International Office before making any stream changes at this stage

To progress to year four of the MEng, you must have achieved a minimum of 50% overall (weighted average of years 1 to 3).

A move to the BEng stream will remove your opportunity to be involved in an industry-related experience within the degree structure and will limit your access to Business School modules.

#### MEng (management) to MEng (technical)

You can choose at any point up until the end of spring term of year two to change between EEE MEng (Management) and EEE MEng (technical).

### ABOUT OUR TEACHING

We use a variety of teaching methods that include large group lecture sessions, workshops, small group exercise sessions, and 3-to-1 tutorial sessions. For practical skills you will participate in laboratory sessions with a partner from the same year group, and in the group projects within a larger team of 6-7 people. Most modules offered by the Business School will be online (in the form of Massive Open Online Courses or MOOCs) with Teaching Assistant support who will also monitor your progress.

Your learning will be supported by online tools such as Blackboard for self-assessment and for-credit tests, virtual labs to prepare you for lab sessions and video recordings to demonstrate how certain equipment needs to be used. Members of staff are experts in their field and bring their research and industrial expertise into the classroom, especially in years three and four. You can find out more about

the connections between our research and teaching here: [www.imperial.ac.uk/electrical-engineering/about/](http://www.imperial.ac.uk/electrical-engineering/about/).

Graduate and Undergraduate Teaching Assistants (GTAs and UTAs) are involved in our tutor schemes, small group teaching and laboratory teaching.

The MEng programme has been designed based upon a number of key principles:

- **Competence in the fundamental principles of mathematics and electrical/electronic/information engineering:** You will develop a firm grasp of the fundamental concepts and principles, be able to model complex systems analytically, and analyse and optimise these models.
- **Competence in computing:** You will acquire a high level of competence in both programming and in using the latest computing technologies.
- **Pro-active learning:** You are expected to learn how to learn by yourself and acquire the skill and discipline of lifelong learning.
- **Design Proficiency:** You will develop your ability to incorporate new concepts into the design of new products, systems or processes, in order to provide innovations.
- **Development of professional and transferrable skills:** You will learn how to work in groups, develop your ability to communicate scientific/engineering ideas orally or in written form, and to develop general problem-solving skills. You'll gain an understanding of the financial, strategic, operational and organizational context in which engineering and science takes place.
- **Industrial perspectives:** You will be able to participate in an industrial based project via a 6-month industrial placement, or a term long industry-led group consultancy project at the end of your third year. You will be encouraged to find industrial experience where possible. You will also obtain an insight in strategic and financial management.
- **Flexibility of provision:** We aim to provide you with a wide variety of technical options in the third and fourth years of the programme in order to allow you to obtain management expertise with excellent insight in electrical/electronic/computer engineering.

#### **Benefits of accreditation**

This programme is professionally accredited by the Institution of Engineering and Technology (IET) on behalf of the Engineering Council for the purposes of fully meeting the academic requirements for registration as a Chartered Engineer.

Achieving a professionally accredited integrated Master's degree (MEng) means that you have satisfied the first step to becoming a Chartered Engineer (CEng) in your chosen field by satisfying the educational requirements of professional registration. To gain Chartered status, you will need to demonstrate your ability to meet additional graduate level competences described in the Engineering Council's UK-SPEC

A CEng is a highly respected qualification earned by professionals working in engineering, which can lead to higher earning potential and better career prospects.

Professional registration also brings international recognition of your qualification, which is particularly useful when preparing for a career abroad.

#### **Learning Outcomes**

At the end of the four-year MEng programme you will be able to:

##### **Science and Mathematics**

1. Explain and derive the fundamental concepts, mathematical, physical principles and techniques that underpin electrical and electronic engineering in depth while being able to extrapolate your insight into related disciplines.
2. Solve familiar and unfamiliar problems using established methodologies as well as deriving, adapting and applying new ones that enable innovation towards future developments in specialised fields.

##### **Engineering Analysis**

3. Apply analytic principles and techniques, software engineering skills, and commercial software packages, to critically analyse, design, implement and simulate electrical and electronic engineering systems, justifying approaches and recommending alternative ones in line with design criteria.
4. Interpret abstraction, justify the use of computational techniques, and be able to identify appropriate components to automate and optimise systems and processes.

##### **Design**

5. Communicate, interact and work with peers and professionals from other disciplines, as well as non-specialist stakeholders, making decisions in complex and unpredictable situations, and manage work in terms of project plans, deliverables and costs.
6. Generate creative and innovative design for products, systems, components or processes to fulfil new needs.

***Economic, legal, social, ethical and environmental context***

7. Explain and contrast the role of business processes in engineering, including the commercial, societal and legal framework within which industry operates and advise stakeholders on their implications.
8. Incorporate ethical, sustainability and environmental issues into your professional conduct, and integrate these into your engineering practice.
9. Formulate and appraise the key drivers for business success, including innovation, calculated commercial risks and customer satisfaction. Revise current approaches and create new ones for increased economic impact taking other legal parameters into account.

***Engineering Practice***

10. Manage projects in both interdisciplinary and multidisciplinary environments by using relevant practical and laboratory skills on your own or as a member or leader of a team.
11. Design relevant systems, components or processes that meet specified industrial requirements and constraints while keeping within public health and safety, cultural, societal, and environmental constraints. Work proactively with others to formulate solutions to the implications of ethical dilemmas.

**Exit awards** are only granted at the discretion of the Board of Examiners in line with College Regulations. None of the exit awards are accredited, apart from the BEng Electrical and Electronic (Honours) exit award. Should you wish to pursue recognition as a professional electrical engineer after leaving without an accredited degree, a full review of your academic history and possibly further study will be necessary to support your application for professional registration.

On completion of Year Three (BEng Electrical Engineering (Management) exit award) you will be able to:

***Science and Mathematics***

1. Explain the fundamental concepts, mathematical, physical principles and techniques that underpin electrical and electronic engineering while having an insight into related disciplines.
2. Solve familiar and unfamiliar problems using established methodologies as well as deriving, adapting and applying new ones with minimal guidance.

***Engineering Analysis***

3. Apply analytic principles and techniques, software engineering skills, and commercial software packages, to critically analyse, design, implement and simulate electrical and electronic engineering systems, justifying approaches and recommending alternative ones in line with design criteria.
4. Interpret abstraction and justify the use of computational techniques, and be able to identify appropriate components to automate and optimise systems and processes.

***Design***

5. Communicate, interact and work with peers and professionals from other disciplines, as well as non-specialist stakeholders, making decisions in complex situations, and manage work in terms of project plans, deliverables and costs.

***Economic, legal, social, ethical and environmental context***

6. Explain the role of business processes in engineering, including the commercial, societal and legal framework within which industry operates and advise stakeholders on their implications.
7. Incorporate ethical, sustainability and environmental issues into your professional conduct, and integrate these into your engineering practice.
8. Formulate the key drivers for business success, including innovation, calculated commercial risks and customer satisfaction.

***Engineering Practice***

9. Manage projects in both interdisciplinary and multidisciplinary environments by using relevant practical and laboratory skills on your own or as a member of a team.
10. Design relevant systems, components or processes that meet specified industrial requirements and constraints while keeping within public health and safety, cultural, societal, and environmental constraints.

On completion of Year Two (Diploma in Higher Education exit award) you will be able to:

***Science and Mathematics***

1. Explain the fundamental concepts, mathematical, physical principles and techniques that underpin electrical and electronic engineering.

- Solve familiar problems using established methodologies as well as deriving, adapting and applying new ones with guidance.

**Engineering Analysis**

- Apply analytic principles and techniques, software engineering skills to analyse, design, implement and simulate electrical and electronic engineering systems, justifying approaches in line with design criteria.

**Design**

- Communicate, interact and work with peers and professionals from other disciplines and manage work in terms of project plans, deliverables and costs.

**Economic, legal, social, ethical and environmental context**

- Explain the role of business processes in engineering, including the commercial, societal and legal framework within which industry operates and advise stakeholders on their implications.
- Have an insight into ethical, sustainability and environmental issues related to your professional conduct.

**Engineering Practice**

- Manage projects by using relevant practical and laboratory skills on your own or as a member of a team.

On completion of Year One (Certificate in Higher Education exit award) you will be able to:

**Science and Mathematics**

- Describe and recall the fundamental concepts, mathematical, physical principles and techniques that underpin electrical and electronic engineering.
- Solve familiar problems using established methodologies with guidance.

**Engineering Analysis**

- Apply analytic principles and techniques, software engineering skills to analyse and simulate electrical and electronic engineering systems, recognising the approaches needed in line with design criteria.

**Design**

- Communicate, interact and work with peers and manage work in terms of project plans, deliverables and costs.

**Economic, legal, social, ethical and environmental context**

- Recognise the need for a commercial, societal and legal framework for business processes in engineering.
- Have an insight into ethical, sustainability and environmental issues related to your professional conduct.

**Engineering Practice**

- Manage projects by using relevant practical and laboratory skills on your own or as a member in a team.

The Imperial Graduate Attributes are a set of core competencies that we expect you 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](http://www.imperial.ac.uk/students/academic-support/graduate-attributes)

**Entry Requirements**

Academic Requirements	<p>Our minimum entry standard for 2023 entry is A*A*A or A*AAA overall, to include</p> <p>A* in Mathematics  A*/A in Physics (A* is required if applying with three A levels)  A in a third and/or fourth subject</p> <p>Recommended subjects: Further mathematics (strongly encouraged), Chemistry, Computer Science, Computing, Design and Technology, Electronics.</p> <p>Students taking English exam board science A levels will be required to pass the practical endorsement.  For non A-level students, a comparable qualification recognised by the College – e.g. for International Baccalaureate: a minimum grade of 40 overall with 7 in both Mathematics and Physics at higher level.</p>
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	For further information on entry requirements, please go to <a href="http://www.imperial.ac.uk/study/apply/undergraduate/entry-requirements/">www.imperial.ac.uk/study/apply/undergraduate/entry-requirements/</a>
Non-academic Requirements	N/A
English Language Requirement	<u>Higher requirement</u> Please check for other <u>Accepted English Qualifications</u>
Admissions Test/Interview	<p>Admissions Tutors consider all the evidence available during our rigorous selection process and the College flags key information providing assessors with a more complete picture of the educational and social circumstances relevant to the applicant. Some applicants may be set lower offers and some more challenging ones.</p> <p>If your application passes initial screening, you'll be invited to take a 60-minute, online admissions test.</p> <p>The test will be held in November (for applications received by 15 October 2021) and in February (for all other applications).</p> <p>The test will mostly be based on areas in mathematics and physics which you study in your final years of secondary school.</p> <p>We look holistically at candidates' UCAS applications and admissions test scores when deciding who to invite for interview.</p> <p>Interviews will be held with academic staff between November and March.</p>

The programme's competency standards documents can be found at: [www.imperial.ac.uk/electrical-engineering/study/undergraduate/](http://www.imperial.ac.uk/electrical-engineering/study/undergraduate/).

## Learning & Teaching Approach

### Teaching Delivery Methods

Your course material will be delivered in different ways, including large cohort lectures in lecture theatres, learning in smaller groups, flipped classroom approaches, workshops, video recordings for online learning and laboratory work in software, hardware and embedded systems. In addition, tutorials in groups of three to four students will support you in analysing your progress and allow you to discuss problems in a more personal environment. Work in the laboratories is carried out in small teams and will teach you experimental skills, data management and how to work with other people. Team-based-learning will focus mainly on developing analytical skills in solving both well defined as well as open-ended engineering problems. You will be expected to carry out preparation work before lectures and laboratories. Revision of material is a continuous process and keeping up with new contents is key to understanding and remembering engineering concepts and how they link together.

Most of the Business School modules are offered online via the HUB (click on HUB for more information).

### Design and build projects

The aim of the laboratories is to add a practical aspect to the taught modules, to teach you experimental skills, including the safe use of equipment and how to choose components. It intends to encourage you to develop robust data recording and analysis skills. The labs are carried out in pairs while design and build projects are in a team of six to eight students. The projects aim to bring all the taught concepts and skills together to design more complex engineering systems. These projects will allow you to fine-tune your teamwork and project management skills. The progress, creativity and success of your design and build project is controlled by you and your team.

There are group projects in the first and second years. In the third year you will have a choice between a group project as a consultancy team for an industry defined problem or an individual industrial placement. There is no group project in the fourth year but you will carry out an individual project (Final Year Project), often as part of a research team.

### Professional and transferable skills

Throughout your programme, you will attend workshops designed to develop transferable skills (e.g. career development, team building, ethical behaviour, and report-writing and presentation skills). These will be complemented by options to develop individual interdisciplinary interests by choosing electives in humanities, business and management studies and other STEM subjects from across the College. Professional Engineering is a topic that is integrated in all projects (group, individual and industrial) and is assessed by a Professional Portfolio that needs to be built over four years and completed by the fourth and final year. The aim of a professional portfolio is to encourage you to reflect on what you have learned and evidence this in a digital or paper format.

### **Independent learning**

Independent study is an important part of higher education and we expect you to invest at least two to three hours of independent study for every contact hour. E-learning tools, books in the library and online digital information will support independent study. You are advised to read widely around the topic to expand your knowledge. The aim of independent study is not only to assimilate taught material but also to help you become independent learners who, after graduation, can take responsibility for their future learning and development.

### **Overall Workload**

Your overall workload consists of face-to-face sessions and independent learning. While your actual contact hours may vary according to the optional modules you 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 College London, each ECTS credit equates to an expected total study time of 25 hours. Of course, assimilation of new topics is different for everyone and therefore some students will need more or less time to achieve the same Learning Outcomes.

#### Year 1 and 2:

The ECTS allocated to each module are defined in the programme structure. Normally for 5 ECTS you will have 20 hours of lectures, 10 hours of team based learning, and 20 hours of laboratories. For every hour of face-to-face support you will be expected to spend two to three hours in self-study, supported by videos, online self-assessment, course notes and lecture hand-outs. This estimation includes tests and exam preparation time. For the laboratory, preparation/revision time will be less but you are expected to spend an hour of preparation for each hour of lab. Preparation for labs will include engaging in the virtual labs, watching the support videos in your own time and reading around the topic. The Electronics Design Projects run in the summer term. Timetabled hours will be allocated to Engineering Practice within the project module. Access to laboratories will be timetabled. You will receive help to get organised and how to manage the time spent on the project with the members of your team. A member of staff will follow and guide your progress but will not micromanage. We estimate that you will have to spend about 200 hrs on the project. The ratio of self-study to face-to-face time will increase from Year 1 to Year 4 since we expect you to develop towards becoming independent learners.

#### Year 3 and 4:

Technical modules have 5 ECTS with approximately 20 hours of face-to-face lecture time and 5 hours of revision support for exam assessed modules. Video recordings support a move to a more self-learning style. Support outside the timetable is available upon request and is delivered by both the academic lead as well as the GTAs. You are expected to spend a significant amount of time in self-study – approximately 163 hours/module.

For modules that are assessed by coursework, an additional 10 hours face-to-face time will be put in place to support the hardware or software labs for the coursework. Coursework-assessed modules are mainly in teams and it is expected that a team spends an additional 163 hour/module on coursework outside the face-to-face time. Help from lab technicians and GTAs can be obtained upon request. To be successful with multiple coursework assessment modules that run in parallel, good time management skills will be required to fulfil these obligations.

The Business School's HUB provides information on how to manage the workload involved.

Year 3 specific: you must take an I-Explore module in this year.

Year 4 specific: you must complete an individual project.

Members of staff define Final Year Projects (Year 4), however we encourage you to propose your own project and seek a supervisor amongst the members of staff. Industry-led projects are also allowed but you will need to take initiative to organise this and receive approval from the department. Although meetings with your supervisor are not timetabled, both you and your supervisor should mutually agree on suitable times to meet on



a regular basis. The success of the outcome will mainly depend on your initiative, creativity, hard work and good communication with your supervisor or the GTA/research assistant who will be helping you.

## Assessment Strategy

### Assessment Methods

#### Year 1 and 2:

Formative assessment (low stakes evaluations that give you an insight in your understanding and progress) will be conducted through different techniques, including online self-assessment, key skills assessments, tutorial sessions and other approaches that might evolve based on the developments in learning and teaching technology.

Summative assessment (assessments that evaluate your understanding of engineering concepts and gives the department an insight into how well you master these). Summative assessments have significant weight towards your final degree and will take one or more of the following forms:

1. On-line in-class confidence test that evaluates your understanding of the fundamental principles explained in the modules. This will be closed-book tests and will in general be organised during the mid-term weeks.
2. Laboratory tests evaluate your lab skills and also your understanding of the key concepts in each module and test your engineering competence. Your logbooks of your lab experiments support your lab orals. Laboratory tests will happen in the mid-term weeks and the last week of each term.
3. Some modules will not have online tests, confidence test marks will come from the team-based-learning (TBL) tests or from portfolios.
4. Module level exams. Exams will be closed book but formulae sheets are made available during the exams when needed. Exams are organised in the beginning of the summer term, unless otherwise specified in the module description. Some modules will not be examined but will be fully assessed by coursework.
5. Projects are mainly assessed via reports, presentations and portfolios that evaluate your mastery of concepts across module boundaries. These will also represent the evaluation of Engineering Practice.

In year 1 the module weighting is: 5 ECTS - 8.2%, 7.5 ECTS - 12.5%, 10 ECTS - 16.7%.

In year 2 the module weighting is: 5 ECTS - 8.5%, 7.5 ECTS - 12.5%, 10 ECTS - 16.5%.

#### Year 3 and 4

Formative assessment will be available as feedback on reports and professional portfolios.

Summative assessment might take any of the following forms:

1. Individual tests (online, oral, written).
2. Alternative methods (demonstrations, presentations, reports, peer assessments)

Assessment type	Individual tests	Alternative methods
Exam-based modules	80%	20%
Coursework-based modules	20%	80%

The number and type of assessments depend on your elective module choices. Coursework consists of mini-projects that are module specific and are normally done in small groups. The actual ratio may vary slightly and full details will be in the individual module specifications.

For year 3, on average 50% of the assessments will be exam based and 50% on alternative assessment methods.

Test	% Weighting in year
Individual tests	50
Alternative methods	50

In year 3 you take 3 compulsory modules and 4 elective modules weighted at 12.5%, 1 I-Explore module without year weighting and 1 Industrial Placement/Consultancy project that carries 12.5% of the total marks. Management stream students cannot take an I-Explore module offered by the Business School.

For year 4, we recommend that you choose your modules such that there is a balance between coursework and exam-assessed modules. The assessment for business school modules will be mainly online except those where coursework forms a part of the assessment strategy. For year 4, each module carries 8% of the marks. The Individual Project carries 40% of the marks.

You will be expected to start a Professional Portfolio in your first year. During the following years you must increase and refine the contents, based on evolving experience, insight and formative feedback. Formative

feedback will be given every year within the context of the group projects and industrial placement. In year 4 you must submit your Professional Portfolio as part of your degree. It carries ECTS but not a marks weighting towards your final degree.

#### Academic Feedback Policy

##### Formative feedback

Will be via online self-assessment opportunities, team-based-learning approaches (in class and online), comments on reports and portfolios, in-class module feedback and feedback via tutorials.

Laboratory demonstrators will be available for help and feedback during the laboratory session. For your Final Year Project, you will receive feedback during an interview on approach and progress from your second marker at an interim stage.

##### Summative feedback

Will be via online assessment, team-based-learning approaches (in class and online), comments on reports and portfolios and in-class module test feedback. Feedback on exams is in the form of grades and annotated example answers that will be made available after the September Examiners' Meeting. Summative feedback on the presentations will be provided during the presentation sessions themselves.

It is the policy of the Department to provide feedback within 10 working days, except in those circumstances where automatic feedback is implemented or where other arrangements are made.

##### Business School

For details, please check their Programme Specifications.

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/](http://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/](http://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/](http://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 that are not included in students' tuition fees.

Description	Mandatory/Optional	Approximate cost
Laptop computer	Optional	The recommendation is that you bring your own laptop to join the bring-your-own-devices (BYOD) scheme. The Department runs a free laptop loan scheme for those without laptop or those who forgot to bring their laptop to College.
Computer software	Optional	The College/Department gives you access to the required software that support the modules. In those cases where external GPU time is needed, the department runs a refund scheme.

**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 when implemented in session. Updated versions will be on-line at the start of the academic year.

Programme Structure <sup>1</sup>					
Year 1 – FHEQ Level 4 You study all core modules.					
Code	Module Title	Core/ Elective	Group*	Term	Credits
ELEC40010	Mathematics 1A	Core		1	5
ELEC40011	Mathematics 1B	Core		2	7.5
ELEC40009	Topics in Electrical Engineering	Core		1&2	7.5
ELEC40002	Analysis and Design of Circuits	Core		1&2	10
ELEC40003	Digital and Computer Architecture	Core		1&2	10
ELEC40004	Programming for Engineers	Core		1&2	10
ELEC40006	Electronics Design project 1	Core		3	10
Credit Total					60
Year 2 - FHEQ Level 5 You study all core modules.					
Code	Module Title	Core/ Elective	Group	Term	Credits
ELEC50011	Mathematics for Engineers	Core		1	5
ELEC50013	Signals and Systems	Core		1	5
ELEC50007	Electromagnetism	Core		1&2	10
ELEC50001	Circuits and Systems	Core		1	7.5
ELEC50012	Power Electronics and Power Systems	Core		2	7.5
ELEC50002	Communications	Core		2	7.5
ELEC50004	Control Systems	Core		2	7.5
ELEC50008	Electronics Design project 2	Core		3	10
Credit Total					60

<sup>1</sup> **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.

**Year 3 - FHEQ Level 6**

**You must take all Compulsory modules (group C). You must choose 2 modules from group A and 2 from group B. You must choose 1 module from group P.**

Code	Module Title	Core/ Elective	Group	Term	Credits
BUSI60037	Accounting	Compulsory	C	1	5
BUSI60042	Entrepreneurship	Compulsory	C	1	5
ELEC60020	Managing Engineering Projects	Compulsory	C	2	5
	I-Explore <sup>2</sup>	Compulsory	C	1 and/or 2	5 or 7.5
ELEC60021	Mathematics for Signals and Systems	Elective	A	1	5
ELEC60003	Analogue Integrated Circuits and Systems	Elective	A	1	5
ELEC60004	Artificial Intelligence	Elective	A	1	5
ELEC60005	Biomedical Electronics	Elective	A	1	5
ELEC60006	Communication Networks	Elective	A	1	5
ELEC60008	Control Engineering	Elective	A	1	5
ELEC60010	Digital Signal Processing	Elective	A	1	5
ELEC60012	Electrical Energy Systems	Elective	A	1	5
ELEC60019	Machine Learning	Elective	A	1	5
ELEC60022	Microwave Technology	Elective	A	1	5
ELEC60023	Optoelectronics	Elective	A	1	5
ELEC60029	Semiconductor Devices	Elective	A	1	5
ELEC60002	Statistical Signal Processing and Inference	Elective	B	2	5
ELEC60009	Deep Learning	Elective	B	2	5
ELEC60011	Digital Systems Design	Elective	B	2	5
ELEC60033	Electric Vehicle Technology	Elective	B	2	5
ELEC60013	Embedded Systems	Elective	B	2	5
ELEC60015	High Level Programming	Elective	B	2	5
ELEC60016	Instrumentation	Elective	B	2	5
ELEC60024	Power Electronics	Elective	B	2	5
ELEC60031	Principles of Modern and Classical Radar	Elective	B	2	5

<sup>2</sup> You may not take a Business School module.

ELEC60025	Real Time Digital Signal Processing	Elective	B	2	5
ELEC60031	Robotic manipulation	Elective	B	2	5
ELEC60016	Electrical Engineering Industrial Placement	Elective	P	3	20
ELEC60014	Group Consultancy Project	Elective	P	3	20
Credit Total					60 or 62.5
<b>Year 4 - FHEQ Level 7</b>					
<b>You must take the 4 compulsory modules and the core Individual Project. You must choose a total of 3 modules from group A and B and 1 module from C.</b>					
Code	Module Title	Core/ Elective	Group	Term	Credits
	Managerial Economics	Compulsory		1	5
	Business Strategy	Compulsory		1	5
	Corporate Finance	Compulsory		1	5
ELEC70030 Or TBC	Professional Portfolio and Industrial Placement OR Professional Portfolio and Group Consultancy project	Compulsory		1, 2, 3	20
ELEC70017	Individual Project	Core		1,2,3	35
ELEC70003	Advanced Electronic Devices	Elective	A	1	5
ELEC70001	Adaptive Signal Processing and Machine Intelligence	Elective	A	1	5
ELEC70012	Full-Custom Integrated Circuit Design	Elective	A	1	5
ELEC70015	High Performance Computing for Engineers	Elective	A	1	5
ELEC70056	Hardware and Software Verification	Elective	A	1	5
ELEC70015	Human-Centred Robotics	Elective	A	1	5
ELEC70065	Optimisation	Elective	B	2	5
ELEC70073	Computer Vision and Pattern Recognition	Elective	A	1	5
ELEC70028	Predictive Control	Elective	A	1	5
ELEC70071	Self Organising Multi Agent Systems	Elective	A	1	5
ELEC70037	Topics in Large Dimensional Data Processing	Elective	A	1	5
ELEC70081	Wireless Communications	Elective	A	1	5
ELEC70045	Advanced Communication Theory	Elective	B	2	5
ELEC70066	Advanced Optimisation	Elective	B	2	5
ELEC70004	Analogue Signal Processing	Elective	B	2	5
ELEC70069	Coding Theory	Elective	B	2	5

ELEC70006	Design of Linear Multivariable Control Systems	Elective	B	2	5
ELEC70078	Digital Image Processing	Elective	B	2	5
ELEC70077	Digital Signal Processing and Digital Filters	Elective	B	2	5
ELEC70009	Discrete-event Systems	Elective	B	2	5
ELEC70090	Digital Control Systems	Elective	B	2	5
ELEC70015	High Performance Analogue Electronics	Elective	B	2	5
ELEC70047	HVDC Technology and Control	Elective	B	2	5
ELEC70070	Information Theory	Elective	B	2	5
ELEC70102	Microelectromechanical Systems (MEMS)	Elective	B	2	5
ELEC70022	Modelling and Control of Multi-body Mechanical Systems	Elective	B	1	5
ELEC70065	Optimal Control	Elective	B	2	5
ELEC70052	Optical Communication	Elective	B	2	5
ELEC70048	Power System Dynamics, Stability and Control	Elective	B	2	5
ELEC70051	Power System Economics	Elective	B	2	5
ELEC70048	Probability and Stochastic Processes	Elective	B	2	5
ELEC70051	Radio Frequency Subsystems	Elective	B	2	5
ELEC70101	Sensors	Elective	B	2	5
ELEC70103	Signal Processing and Machine Learning for Finance	Elective	B	2	5
ELEC70080	Speech Processing	Elective	B	2	5
ELEC70087	Stability and Control of Nonlinear Systems	Elective	B	2	5
ELEC70076	Sustainable Electrical Systems	Elective	B	2	5
ELEC70092	Systems Identification and Learning	Elective	B	2	5
ELEC70067	Traffic Theory and Queuing Systems	Elective	B	2	5
ELEC70039	Wavelets, representation Learning and their Applications	Elective	B	2	5
	DOC Modules	Elective	C	1 or 2	5
	IDX Modules <sup>†</sup>	Elective	C	1 or 2	5
	BPES Modules	Elective	C	1 or 2	5
	Horizons Modules	Elective	C	1 and/or 2	5 or 7.5

Credit Total	90 or 92.5
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\* 'Group' refers to module grouping (e.g. a group of electives from which one/two module(s) must be chosen).

†One or more modules may be made available to you from across the Faculty of Engineering through the Inter-Departmental Exchange (IDX) scheme. Module availability and eligibility may vary, as approved on an annual basis by the Faculty Education Committee. Full details on the modules currently available to you can be found

here: <https://www.imperial.ac.uk/engineering/study/current/inter-departmental-exchange-idx/>

**Important notice:** The range of electives available in a given year is dependent on staff availability (influenced by illness, sabbaticals, retirements and resignations). The module choices will also be dependent on changes that result from the curriculum review process. Where possible, you will be given notice of the available options ahead of making module choices.



## Progression and Classification

### Progression

In order to progress to the next level of study, you must have passed all modules in the current level of study at first attempt, at resit or by a compensated pass.

The overall weighted average for each year must be 40%, including where a module(s) has been compensated, in order for you to progress to the next year of the programme. The pass mark in the fourth and final year is 50%.

In order to progress to the fourth year of the MEng degree you must have achieved a minimum of 50.00% in the weighted total mark over the first three years.

### Compensation

Compensation is the practice of allowing marginal failure of one or more modules, on the basis of good overall academic performance. Core modules cannot be compensated.

### Classification

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

In order to be considered for an award, you 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.

Your classification will be determined through:

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

For this award the weightings are:

Year 1	7.50%
Year 2	20.00%
Year 3	36.25%
Year 4	36.25%

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

First	70% or above for the average weighted module results
Upper Second	60% or above for the average weighted module results
Lower Second	50% or above for the average weighted module results
Third	40% 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 this 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: [www.imperial.ac.uk/electrical-engineering/internal/current-students-course-handbook/undergraduate-handbook/](http://www.imperial.ac.uk/electrical-engineering/internal/current-students-course-handbook/undergraduate-handbook/)

The Module Handbook is available at: [www.imperial.ac.uk/electrical-engineering/internal/current-students-course-handbook/undergraduate-handbook/](http://www.imperial.ac.uk/electrical-engineering/internal/current-students-course-handbook/undergraduate-handbook/)

The College's entry requirements for postgraduate programmes can be found at: [www.imperial.ac.uk/study/pg/apply/requirements](http://www.imperial.ac.uk/study/pg/apply/requirements)

The College's Quality & Enhancement Framework is available at: [www.imperial.ac.uk/registry/proceduresandregulations/qualityassurance](http://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](http://www.imperial.ac.uk/about/governance/academic-governance/regulations)

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[www.imperial.ac.uk/admin-services/secretariat/college-governance/charters/](http://www.imperial.ac.uk/admin-services/secretariat/college-governance/charters/)

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[www.officeforstudents.org.uk/advice-and-guidance/the-register/](http://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
Addition of new modules: Principles of Classical and Modern Radar Hardware and Software Verification	Yes - DTC	10/2019	
Clarification of 1 <sup>st</sup> year module assessment	Yes - DTC	11/2019 & 12 Feb 2020	
Addition of new modules for next academic year (2020-21): Optimal Control Advanced Optimisation Self Organising Multi Agent Systems Hardware and software verifications Re-introduced: High Performance Computing for Engineers Artificial Intelligence Name change: "Discrete-time Systems and Computer Control" to "Digital Control Systems" Adaptive Signal Processing and Machine Intelligence Withdrawn: Estimation and Fault Detection module	Yes - DTC	09/2019 02/2020	

Selected topics in Computer Vision			
Major change to module organisation in year 1.	Yes - DTC	12 Feb 2020	
Name change 4 <sup>th</sup> year module: System Identification to Systems Identification and Learning	Yes - DTC	March 2020	
Adapt Industrial placement to that of DOC	Chairs action		
All other modifications are related to small changes in word use in text and re-organisation of 4 <sup>th</sup> year modules between autumn and spring term.		July 2020	
1 <sup>st</sup> year: ECTS for ELEC50010 and ELEC50011 originally mis-assigned. Swopped around	DUGS	March 2020	
3 <sup>rd</sup> year: number of modules wrong for 60 ECTS. Changed from <i>You must choose 2 modules from group A and 1 from group B</i> to <i>2 modules from group A and 2 from group B</i>	DUGS	December 2021	
Programme structure: list of modules updated	DUGS	July 2021	