

**BEng Electronic and Information 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.

<b>Programme Information</b>			
Award(s)	BEng		
Programme Title	Electronic and Information Engineering		
Programme code	HG65		
Awarding Institution	Imperial College London		
Teaching Institution	Imperial College London		
Faculty	Faculty of Engineering		
Department	Department of Electrical and Electronic Engineering		
Associateship	City and Guilds of London Institute (ACGI)		
Mode and Period of Study	3 academic years full-time		
Cohort Entry Points	Annually in October		
Relevant <a href="#">QAA Benchmark Statement(s)</a> and/or other external reference points	<a href="#">Honours Degrees in Engineering</a>		
Total Credits	ECTS:	186	UK Credit: 360
<a href="#">FHEQ Level</a>	Level 6		
<a href="#">EHEA Level</a>	1 <sup>st</sup> cycle		
External Accrator(s)	<a href="#">Institute of Engineering and Technology</a> (IET)		
<b>Specification Details</b>			
Student cohorts covered by specification	2016-17 Entry		
Person responsible for the specification	Dr. K. Fobelets		
Date of introduction of programme	October 2013		
Date of programme specification/revision	August 2016		

## Description of Programme Contents

The goal of this course is the preparation of high quality graduates who will innovate beyond the current practises, whether in the electronic/electrical industry, in information technology, in research, or in the more commercial activities that attract many of our graduates. Our teaching and learning is supported by a variety of teaching methods covering large group sessions and 3-to-1 sessions. Members of staff are experts in their electrical engineering field and bring their research and industrial expertise into the classrooms.

Teaching on this programme is based on an integrated 3-year programme leading to the award of a BEng degree. The BEng course has been designed based upon a number of key principles:

- **Competence in the fundamental principles of mathematics and electrical/electronic engineering:** Students are expected to develop a firm grasp of the fundamental concepts and principles, and able to model complex systems analytically, to analyse and optimise these models.
- **Competence in computing:** Students are expected to acquire an extensive level of competence in both programming and using the latest computing technologies.
- **Pro-active learning:** Students are expected to learn how to learn by themselves and acquire the skill and discipline of lifelong learning.
- **Design Proficiency:** Students are expected to develop their ability to incorporate concepts into design of new products or processes, provide innovations.
- **Development of professional and transferrable skills:** Students are expected to learn how to work in groups, develop their abilities to communicate scientific/engineering ideas orally or in written form, and to develop general problem-solving skills.
- **Industrial perspectives:** Students are expected to participate in industrial internships where possible.
- **Flexibility of provision:** We aim to provide students with a wide variety of options in the last year of the course in order to allow them to specialise in specific areas in electrical/electronic engineering and in computing.

## Learning Outcomes

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

### Knowledge and Understanding of:

- Fundamental concepts and physical principles that underpin electronic and information engineering in the areas of circuits, systems, networks and the paradigms of high-level programming (declarative, imperative and object-orientated).
- Mathematical principles and techniques that underpin the analysis of engineering systems, circuits discrete processes and algorithms.
- Formal aspects of software engineering, including program specification, program reasoning and design methods.
- The application of the principles to engineering design and analysis.
- Software engineering and programming skills as appropriate to electrical and electronic engineering.
- The design and architecture of the CPU in portable devices, information theory and wireless protocols for connections to the internet, and in the operating systems and databases

providing back-end support in the cloud.

- Role of business processes in engineering, including the commercial, societal and legal framework within which industry operates.
- Moral and ethical issues including professional conduct and intellectual property.

#### **Intellectual Skills**

- Performance of the analysis of engineering systems and circuits in order to solve qualitative and quantitative problems.
- Synthesise solutions using established methodologies.
- Adapt and apply methodologies to the solution of unfamiliar problems.
- Derive methodologies for unfamiliar problems.
- Practical application of theory using computer software and models.
- Analyse computing system design problems of varying types and specify problems and solutions in a suitable format.
- Demonstrate the skills necessary to plan, conduct and report a programme of independent research.

#### **Practical Skills**

- Acquisition and interpretation of data and testing hypotheses.
- Interpretation of datasheets and industry standards.
- Ability to design and construct circuits or systems.
- Implementation of algorithms as software code.
- Use of commercial software tools to analyse, design and simulate engineering systems.
- Recognise risks and identify safe working practices.
- Ability to write programs in at least one common programming language.
- Preparation of technical reports.

#### **Professional Skills Development**

- Communication of scientific material and arguments in written and oral formats.
- Recognise professional and ethical issues in the use of technology and identify appropriate ethical, professional and legal practices.
- Recognise issues of leadership and responsibility.
- Adoption of appropriate roles in group activities.
- Ability to interact with professionals from other disciplines.
- Ability to make decisions in complex and unpredictable situations.
- Ability to plan work in terms of time-plans and deliverables.
- Independent learning ability required for continuing professional development.

#### **Entry Requirements**

Academic Requirement

Minimum A\*AA overall to include A\* in Mathematics and A in Physics. Relevant subjects for the remaining A-level include: Applied ICT, Biology, Chemistry, Computer Science, Computing, Design and Technology, Economics, Electronics, English Literature, Further Mathematics, Geography, History, ICT, Languages (Classical and Modern), Music, Music Technology, Statistics and Technology.

Non-academic Requirements	None
Home/EU/international students will be invited to attend an interview.	
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: <a href="http://www3.imperial.ac.uk/electricalengineering/teaching/undergraduate/teaching">http://www3.imperial.ac.uk/electricalengineering/teaching/undergraduate/teaching</a>	
<b>Learning &amp; Teaching Strategy</b>	
Scheduled Learning & Teaching Methods	<ul style="list-style-type: none"> <li>• Lectures</li> <li>• Problem solving classes</li> <li>• Tutorial sessions</li> </ul>
E-learning & Blended Learning Methods	<ul style="list-style-type: none"> <li>• Hardware laboratory</li> <li>• Software laboratory</li> </ul>
Project and Placement Learning Methods	<ul style="list-style-type: none"> <li>• Group projects</li> <li>• Individual projects</li> </ul>
<b>Assessment Strategy</b>	
Assessment Methods	<ul style="list-style-type: none"> <li>• Written examinations</li> <li>• Coursework software or hardware deliverable</li> <li>• Oral and poster presentations</li> <li>• Reports</li> </ul>
<b>Academic Feedback Policy</b>	
<p>The progress of first year students is evaluated via a Christmas and Easter test. Students receive feedback on these through their tutorials and study groups. Written feedback is made available on reports while in-situ comments give feedback on presentations.</p> <p>Two feedback strategies are applied to coursework based modules in the 3<sup>rd</sup> year. One involves comments on the individual reports while the second approach involves feedback sessions in class that discuss the solutions.</p> <p>Feedback on exams is made available via the on-line publication of the answers with annotations that highlight the strength and weakness of understanding of the cohort on particular aspects of the module covered in the exams.</p>	
<b>Re-sit Policy</b>	
The College's Policy on Re-sits is available at: <a href="http://www.imperial.ac.uk/registry/exams/resit">www.imperial.ac.uk/registry/exams/resit</a>	
The departmental re-sit policy is available in the Awards of Honours document at: <a href="https://workspace.imperial.ac.uk/electricalengineering/Public/HonoursSchemes/EEE%20Scheme%20for%20Award%20of%20Honours%202015-16.pdf">https://workspace.imperial.ac.uk/electricalengineering/Public/HonoursSchemes/EEE%20Scheme%20for%20Award%20of%20Honours%202015-16.pdf</a>	

## Mitigating Circumstances Policy

The College's Policy on Mitigating Circumstances is available at: [www.imperial.ac.uk/registry/exams](http://www.imperial.ac.uk/registry/exams).  
The department's policy on the registering of Mitigating Circumstances is available at:  
<http://www3.imperial.ac.uk/electricalengineering/teaching/undergraduate/examinations/illnessug>

## Assessment Structure

### Marking Scheme

#### Year 1

In order to progress to Part II, students are normally required to achieve the following minimum marks:

1. 40% in each of the examined modules.
2. 40% in the aggregate of the practical work.

#### Year 2

In order to progress to Part III of BEng, students are normally required to achieve the following minimum marks:

1. 40% in each of the examined modules.
2. 40% in the aggregate of the practical work.

Compensation: 1 module (excluding maths) with a mark in the range 30% to 40% can be compensated (considered as a pass), *if* the exam aggregate is > 45%

#### Year 3

To obtain an honours degree, a candidate must obtain at least 40% in Part III, normally by obtaining at least 40% in the individual project and in the module aggregate. There is no pass mark for individual modules, only for the module aggregate.

#### Final Assessment and Honours Classification

The marks from each Part are combined using the weightings defined in the Awards of Honours document.

First class honours:	A > 70%
Second class honours (upper division):	70 > B > 60%
Second class honours (lower division):	60 > C > 50%
Third class honours:	50 > D > 40%
Fail:	40 > E

Year	% Year Weighting	Module	% Module Weighting
Year One	12.5%	Analysis of Circuits	7.5%
		Digital Electronics 1	7.5%
		Introduction to Signals and Communications	7.5%
		Software Engineering 1: Introduction to Computing	7.5%
		Software Engineering 1: Algorithms and Data Structures	7.5%
		Introduction to Computer Architecture and Systems	7.5%
		Mathematics I (E-stream and I-stream)	15%
		User-centred Information Systems	7.5%
		Engineering Design and Practice	7.5%
		EIE 1st Year Computing Lab	10%
		EIE 1st Year Electronics Lab	5%
		EIE1 Group Design Project	10%
Year Two	37.5%	Databases	6%
		Computer Networks and Distributed Systems	6%
		Digital Electronics II	6%
		Communication Systems	6%
		Signals and Linear Systems	6%
		Mathematics II	14%
		Algorithms and Complexity	4%
		Software Engineering 2: Object-oriented Software Engineering	6%
		Computer Architecture II	6%
		Language Processors	6%
		Feedback Systems	4%
		EIE2 Computing Lab	10%
		EIE2 Electronics Lab	12%
EIE2 Architecture Workshop	8%		

Year	% Year Weighting	Module	% Module Weighting
Year Three	50%	EIE3 BEng Project	35%
		Seven modules from elective group (A) to include: <b>at least ONE</b> module from the Department of Electrical and Electronic Engineering, <b>at least ONE</b> from the Department of Computing and <b>exactly ONE</b> non-technical option from the Humanities, Language or Business schools.	9.28% each

**Indicative Module List**

Code	Title	Core/ Elective	Year	L&T Hours	Ind. Study Hours	Place- ment Hours	Total Hours	% Written Exam	% Course- work	% Practical	FHEQ Level	ECTS
EE1-01	Analysis of Circuits	CORE	1	35	90	0	125	100%	0%	0%	4	5
EE1-02	Digital Electronics 1	CORE	1	35	90	0	125	100%	0%	0%	4	5
EE1-06	Introduction to Signals and Communications	CORE	1	35	90	0	125	100%	0%	0%	4	5
EE1-07	Software Engineering 1: Introduction to Computing	CORE	1	20	105	0	125	0%	100%	0%	4	5
EE1-08	Software Engineering 1: Algorithms and Data Structures	CORE	1	20	80	0	100	100%	0%	0%	4	4
EE1-09	Introduction to Computer Architecture and Systems	CORE	1	25	75	0	100	100%	0%	0%	4	4
EE1-10	Mathematics I (E-stream and I-stream)	CORE	1	90	160	0	250	100%	0%	0%	4	10
EE1-12	User-centred Information Systems	CORE	1	25	100	0	125	0%	100%	0%	4	5
EE1-13	Engineering Design and Practice	CORE	1	20	105	0	125	0%	50%	50%	4	5
EE1-ILABC	EIE 1st Year Computing Lab	CORE	1	40	10	0	50	0%	100%	0%	4	2
EE1-ILABE	EIE 1st Year Electronics Lab	CORE	1	100	25	0	125	0%	50%	50%	4	5
EE1-IPRJ	EIE1 Group Design Project	CORE	1	15	110	0	125	100%	0%	0%	4	5



**Indicative Module List**

Code	Title	Core/ Elective	Year	L&T Hours	Ind. Study Hours	Place- ment Hours	Total Hours	% Written Exam	% Course- work	% Practical	FHEQ Level	ECTS
CO526	Databases	CORE	2	27	73	0	100	85%	15%	0%	7	4
CO527	Computer Networks and Distributed Systems	CORE	2	27	73	0	100	85%	15%	0%	7	4
EE2-01	Digital Electronics II	CORE	2	24	76	0	100	100%	0%	0%	5	4
EE2-04	Communication Systems	CORE	2	24	76	0	100	100%	0%	0%	5	4
EE2-05	Signals and Linear Systems	CORE	2	24	76	0	100	100%	0%	0%	5	4
EE2-08	Mathematics II	CORE	2	60	140	0	200	100%	0%	0%	5	8
EE2-10C	Algorithms and Complexity	CORE	2	17	58	0	75	100%	0%	0%	5	3
EE2-12	Software Engineering 2: Object-oriented Software Engineering	CORE	2	24	76	0	100	100%	0%	0%	5	4
EE2-13	Computer Architecture II	CORE	2	24	76	0	100	100%	0%	0%	5	4
EE2-15	Language Processors	CORE	2	24	76	0	100	100%	0%	0%	5	4
EE2-21	Feedback Systems	CORE	2	15	60	0	75	100%	0%	0%	5	3
EE2-ILABC	EIE2 Computing Lab	CORE	2	40	60	0	100	0%	100%	0%	5	3
EE2-ILABE	EIE2 Electronics Lab	CORE	2	90	60	0	150	0%	50%	50%	5	6

**Indicative Module List**

Code	Title	Core/ Elective	Year	L&T Hours	Ind. Study Hours	Place- ment Hours	Total Hours	% Written Exam	% Course- work	% Practical	FHEQ Level	ECTS
EE2-IPRJ	EIE2 Architecture Workshop	CORE	2	30	70	0	100	0%	100%	0%	5	4
EE3-IPRJ	EIE3 BEng Project	CORE	3	80	370	0	450	0%	80%	20%	6	18
EE3-03	Communication Systems	ELECTIVE (A)	3	20	130	0	150	100%	0%	0%	6	6
EE3-05	Digital System Design	ELECTIVE (A)	3	20	130	0	150	0%	100%	0%	6	6
EE3-07	Digital Signal Processing	ELECTIVE (A)	3	20	130	0	150	100%	0%	0%	6	6
EE3-08	Advanced Signal Processing	ELECTIVE (A)	3	20	130	0	150	0%	100%	0%	6	6
EE3-09	Control Engineering	ELECTIVE (A)	3	20	130	0	150	100%	0%	0%	6	6
EE3-10	Mathematics for Signals and Systems	ELECTIVE (A)	3	20	130	0	150	100%	0%	0%	6	6
EE3-16	Artificial Intelligence	ELECTIVE (A)	3	20	130	0	150	100%	0%	0%	6	6
EE3-17	Communication Networks	ELECTIVE (A)	3	20	130	0	150	100%	0%	0%	6	6
EE3-19	Real-time Digital Signal Processing	ELECTIVE (A)	3	20	130	0	150	0%	100%	0%	6	6
EE3-18	Microwave Technology	ELECTIVE (A)	3	20	130	0	150	100%	0%	0%	6	6
EE3-22	High Level Programming	ELECTIVE (C)	3	20	130	0	150	0%	100%	0%	6	6
EE3-23	Introduction to Machine Learning	ELECTIVE (C)	3	20	130	0	150	0%	100%	0%	6	6

**Indicative Module List**

Code	Title	Core/ Elective	Year	L&T Hours	Ind. Study Hours	Place- ment Hours	Total Hours	% Written Exam	% Course- work	% Practical	FHEQ Level	ECTS
EE3-24	Embedded Systems	ELECTIVE (C)	3	20	130	0	150	0%	100%	0%	6	6
CO112	Advanced Databases	ELECTIVE (A)	3	27	98	0	125	82%	18%	0%	6	4
CO316	Computer Vision	ELECTIVE (A)	3	27	73	0	100	85%	15%	0%	6	4
CO317	Graphics	ELECTIVE (A)	3	27	73	0	100	85%	15%	0%	6	4
CO318	Custom Computing	ELECTIVE (A)	3	27	73	0	100	85%	15%	0%	6	4
CO333	Robotics	ELECTIVE (A)	3	27	73	0	100	85%	15%	0%	6	4
CO337	Simulation and Modelling	ELECTIVE (A)	3	27	73	0	100	85%	15%	0%	6	4
CO341	Introduction to Bioinformatics	ELECTIVE (A)	3	27	73	0	100	85%	15	0	6	4
CO343	Operations Research	ELECTIVE (A)	3	27	85.5	0	112.5	85	15%	0%	6	4
CO347	Distributed Algorithms	ELECTIVE (A)	3	27	73	0	100	85	15	0	6	4
CO528	Concurrent Programming	ELECTIVE (A)	3	27	73	0	100	85	15	0	7	4
N/A	Business for Professional Engineers & Scientists	ELECTIVE (A)	3	Various			150	Various				6
N/A	Horizons	ELECTIVE (A)	3	Various			150	Various				6

## Supporting Information

The Programme Handbook is available at:

<http://www3.imperial.ac.uk/electricalengineering/teaching/undergraduate>

The Module Handbook is available at:

<http://www3.imperial.ac.uk/electricalengineering/teaching/undergraduate>

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

[www.imperial.ac.uk/study/ug/apply/requirements/](http://www.imperial.ac.uk/study/ug/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:

<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/>

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