Imperial College London

Programme Specification (Undergraduate)

BEng Electrical and Electronic Engineering

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

Programme Information				
Award(s)	BEng			
Programme Title	Electrical & Electronic Engineering			
Programme code	H600			
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 QAA Benchmark Statement(s) and/or other external reference points	Honours Degrees in Engineering			
Total Credits	ECTS:	186	UK Credit:	360
FHEQ Level	Level 6			
EHEA Level	1st cycle			
External Accreditor(s)	Institute of Engineering and Technology (IET)			
Specification Details				
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 a 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.

Knowledge and Understanding

- Fundamental concepts and physical principles that underpin electrical and electronic engineering in the areas of circuits, systems, networks and algorithms.
- Mathematical principles and techniques that underpin the analysis of engineering systems and circuits.
- The application of the principles to engineering design and analysis.
- Software engineering and programming skills as appropriate to electrical and electronic engineering.
- 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;
- 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;
- Construction and testing of circuits;
- 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;
- 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: http://www3.imperial.ac.uk/electricalengineering/teaching/undergraduate/teaching	
Learning & Teaching Strategy	
Scheduled Learning & Teaching Methods	• Lectures • Problem solving classes • Tutorial sessions
E-learning & Blended Learning Methods	• Hardware laboratory • Software laboratory
Project and Placement Learning Methods	• Group projects • Individual projects
Assessment Strategy	
Assessment Methods	• Written examinations • Coursework software or hardware deliverable • Oral and poster presentations • Reports
Academic Feedback Policy	
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. Two feedback strategies are applied to coursework based modules in the 3rd year. One involves comments on the individual reports while the second approach involves feedback sessions in class that discuss the solutions. 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.	
Re-sit Policy	
The College's policy on re-sits is available at: www.imperial.ac.uk/registry/exams/resit	
The departmental re-sit policy is available in the Awards of Honours document at: https://workspace.imperial.ac.uk/electricalengineering/Public/HonoursSchemes/EEE%20Scheme%20for%20Award%20of%20Honours%202015-16.pdf	
Mitigating Circumstances Policy	
The College's Policy on Mitigating Circumstances is available at: 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%
		Semiconductor Devices	7.5%
		Analogue Electronics 1	7.5%
		Energy Conversion	7.5%
		Introduction to Signals and Communications	7.5%
		Software Engineering 1: Introduction to Computing	7.5%
		Mathematics I (E-stream and I-stream)	15%
		Engineering Design and Practice	7.5%
		EEE 1st Year Electronics Lab	15%
		EEE1 Project	10%
Year Two	37.5%	Digital Electronics II	6%
		Analogue Electronics II	6%
		Power Engineering	6%
		Communication Systems	6%
		Signals and Linear Systems	6%
		Control Engineering	6%
		Mathematics II	14%
		Algorithms and Data Structures	6%
		Computer Architecture I	6%
		EEE2 Computing Lab	6%
		EEE2 Electronics Lab	16%
		EEE2 Project	8%
		2 x modules from elective group (A)	4% each

Year	% Year Weighting	Module	% Module Weighting
Year Three	50%	EEE3 BEng Project	35%
		4 x modules from elective group (B)	6% each
		2 x modules from elective group (C)	6% each
		1 x module from elective group (D)	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
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
EE1-03	Semiconductor Devices	CORE	1	35	90	0	125	100%	0%	0%	4	5
EE1-04	Analogue Electronics 1	CORE	1	35	90	0	125	100%	0%	0%	4	5
EE1-05	Energy Conversion	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
EE1-10	Mathematics I (E-stream and I-stream)	CORE	1	90	160	0	250	100%	0%	0%	4	10
EE1-13	Engineering Design and Practice	CORE	1	20	105	0	125	0%	50%	50%	4	5
EE1-LABE	EEE 1st Year Electronics Lab	CORE	1	100	25	0	125	0%	50%	50%	4	5
EE1-PRJ	EEE1 Project	CORE	1	15	110	0	125	100%	0%	0%	4	5
EE2-01	Digital Electronics II	CORE	2	24	76	0	100	100%	0%	0%	5	4
EE2-02	Analogue Electronics II	CORE	2	24	76	0	100	100%	0%	0%	5	4
EE2-03	Power Engineering	CORE	2	24	76	0	100	100%	0%	0%	5	4

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
EE2-04	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
EE2-06	Control Engineering	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
EE2-10A	Devices	ELECTIVE (A)	2	17	58	0	75	100%	0%	0%	5	3
EE2-10B	Fields	ELECTIVE (A)	2	17	58	0	75	100%	0%	0%	5	3
EE2-10C	Algorithms and Complexity	ELECTIVE (A)	2	17	58	0	75	100%	0%	0%	5	3
EE2-18	Algorithms and Data Structures	CORE	2	15	60	0	75	100%	0%	0%	5	3
EE2-19	Computer Architecture I	CORE	2	15	60	0	75	100%	0%	0%	5	3
EE2-LABC	EEE2 Computing Lab	CORE	2	40	60	0	100	0%	100%	0%	5	4
EE2-LABE	EEE2 Electronics Lab	CORE	2	140	60	0	200	0%	50%	50%	5	8
EE2-PRJ	EEE2 Project	CORE	2	10	90	0	100	0%	50%	50%	5	4
EE3-03	Communication Systems	ELECTIVE (B)	3	20	130	0	150	100%	0%	0%	6	6
EE3-05	Digital System Design	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
EE3-07	Digital Signal Processing	ELECTIVE (B)	3	20	130	0	150	100%	0%	0%	6	6
EE3-08	Advanced Signal Processing	ELECTIVE (C)	3	20	130	0	150	0%	100%	0%	6	6
EE3-09	Control Engineering	ELECTIVE (B)	3	20	130	0	150	100%	0%	0%	6	6
EE3-10	Mathematics for Signals and Systems	ELECTIVE (B)	3	20	130	0	150	100%	0%	0%	6	6
EE3-11	Advanced Electronic Devices	ELECTIVE (C)	3	20	130	0	150	0%	100%	0%	6	6
EE3-16	Artificial Intelligence	ELECTIVE (B)	3	20	130	0	150	100%	0%	0%	6	6
EE3-17	Communication Networks	ELECTIVE (B)	3	20	130	0	150	100%	0%	0%	6	6
EE3-01	Analogue Integrated Circuits and Systems	ELECTIVE (B)	3	20	130	0	150	100%	0%	0%	6	6
EE3-02	Instrumentation	ELECTIVE (C)	3	20	130	0	150	0%	100%	0%	6	6
EE3-12	Optoelectronics	ELECTIVE (B)	3	20	130	0	150	100%	0%	0%	6	6
EE3-13	Electrical Energy Systems	ELECTIVE (B)	3	20	130	0	150	100%	0%	0%	6	6
EE3-14	Power Electronics	ELECTIVE (C)	3	20	130	0	150	0%	100%	0%	6	6
EE3-18	Microwave Technology	ELECTIVE (B)	3	20	130	0	150	100%	0%	0%	6	6
EE3-19	Real-time Digital Signal Processing	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
EE3-21	Biomedical Electronics	ELECTIVE (B)	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
EE3-24	Embedded Systems	ELECTIVE (C)	3	20	130	0	150	0%	100%	0%	6	6
EE3-PRJ	EEE3 BEng Project	CORE	3	80	370	0	450	0%	80%	20%	6	18
N/A	Business for Professional Engineers & Scientists	ELECTIVE (D)	3	Various			150	Various				6
N/A	Horizons	ELECTIVE (D)	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/
The College's Quality & Enhancement Framework is available at: www.imperial.ac.uk/registry/proceduresandregulations/qualityassurance
The College's Academic and Examination Regulations can be found at: http://www3.imperial.ac.uk/registry/proceduresandregulations/regulations
Imperial College is an independent corporation whose legal status derives from a Royal Charter granted under Letters Patent in 1907. In 2007 a Supplemental Charter and Statutes was granted by HM Queen Elizabeth II. This Supplemental Charter, which came into force on the date of the College's Centenary, 8th July 2007, established the College as a University with the name and style of "The Imperial College of Science, Technology and Medicine". http://www.imperial.ac.uk/admin-services/secretariat/college-governance/charters-statutes-ordinances-and-regulations/
Imperial College London is regulated by the Higher Education Funding Council for England (HEFCE) http://www.hefce.ac.uk/reg/of/