

BEng Biomedical 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	Biomedical Engineering			
Programme code	BH81			
Awarding Institution	Imperial College London			
Teaching Institution	Imperial College London			
Faculty	Faculty of Engineering			
Department	Department of Bioengineering			
Associateship	City and Guilds of London Institute (ACGI)			
Mode and Period of Study	3 academic years full time			
Cohort Entry Points	Internal transfer only			
Relevant QAA Benchmark Statement(s) and/or other external reference points	Bachelor's awards in Engineering UK-SPEC			
Total Credits	ECTS:	180	CATS:	360
FHEQ Level	Level 6			
EHEA Level	1 st cycle			
External Accrator(s)	Institution of Engineering and Technology (IET) Institution of Mechanical Engineers (IMechE) Institute of Materials, Minerals and Mining (IOM3) Institute of Physics and Engineering in Medicine (IPEM)			
Specification Details				
Student cohorts covered by specification	2016/17 entry			
Person responsible for the specification	Professor Martyn Boutelle			

Date of introduction of programme	October 2002
Date of programme specification/revision	August 2016
Description of Programme Contents	
<p>Students are admitted with high grades in three to five STEM subjects. The first year is designed to ensure that all students achieve a common breadth and depth of knowledge in Mathematics, Physics, Chemistry, Biology and Medical Science. The second year builds upon the first year to provide a platform for specialisation.</p> <p>Practical skills (that complement technical modules) are gained in the first two years in the context of wet and dry laboratories. Design, test and build activities start in the first year, and group working is introduced in fresher's week, as collaboration in interdisciplinary teams is a key feature of working as a professional Biomedical Engineer. The second year includes a substantial group project. Broader issues such as Ethics are also covered.</p> <p>In the first two years all modules are compulsory and are delivered in the department. Thereafter students may elect to take some modules in other departments of the Faculty of Engineering. Our students attend the same lectures and take the same assessments as the senior year students in the hosting department. This confirms that the first two years have provided a solid platform for specialisation. The knowledge, understanding and skills acquired throughout the Faculty will be translated into a Bioengineering themed final year individual project.</p> <p>After two years of compulsory courses (taught in-house) progression on to the third year of the MEng course requires an overall mark of at least 60%. The Director of Courses has the discretion to condone a near miss to this requirement. Otherwise, students are obliged to move to the third year of the BEng programme.</p>	
Learning Outcomes	
<p>The programme has been designed so that graduates will be able to demonstrate the following UK-SPEC general learning outcomes:</p> <p>Knowledge and Understanding:</p> <ul style="list-style-type: none"> • The underlying scientific principles, engineering mathematics and computational tools that underpin Biomedical Engineering. • The core concepts, principles and theories of Electrical Engineering, Mechanical Engineering, Materials Engineering deployed in a Biological and Medical context. • Innovative and creative engineering solutions applied to healthcare problems and quality-of-life issues. • Moral and ethical issues (including professional conduct) and the role of the Professional Engineering Institutes. <p>Intellectual Abilities:</p> <ul style="list-style-type: none"> • The application of engineering principles to the analysis and design of Biomedical applications. • The application of functional decomposition to manage the development of large scale complex systems. • Critical evaluation of information gathered from academic and technical resources. 	

Practical Skills:

- Develop graduate attributes including global challenges, business and economics, humanities.
- Plan and safely execute experiments in diverse types of laboratories.

General Transferable Skills:

- Build team working and communication skills.

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

Non-academic Requirements

English Language Requirement

Internal transfer only

Standard Requirement: IELTS 6.5 with a minimum of 6.0 in each element or equivalent

The programme's competency standards document can be found at:

<http://www.imperial.ac.uk/media/imperial-college/faculty-of-engineering/bioengineering/public/student/Competency-Standards---Bioengineering-UG-PG---June-2016-Final.pdf>

Learning & Teaching Strategy

Scheduled Learning & Teaching Methods

- Lectures.
- Tutorials and Study groups.
- Dry laboratories in Electrical Engineering; Mechanical Engineering, Microcontrollers workshop, Computing, Mathematics, and Wet laboratories to handle Biological and Chemical materials.

E-learning & Blended Learning Methods

- Virtual Learning Environment using Blackboard.
- Lectures recorded using Panopto.
- Anonymous feedback using Learning Catalytics, and Mentimeter.
- YouTube videos.

Project Learning Methods

- Final year individual project.
- Group project work including peer review.

Assessment Strategy

Assessment Methods

- Assessed coursework includes problem sheets, evaluation of laboratory/technical/project (including planning) reports, oral and poster presentations, academic tutorials, viva-voce examinations.
- Examinations include in-class, mastery (online/written) and written examinations.

Academic Feedback Policy

Feedback will be provided on coursework within two weeks of submission. Feedback may be provided in one of a number of formats, including:

- Oral (during or after lectures)
- Personal (discussion with academics during office hours)
- Interactive (problem solving tutorials with GTAs & study groups)
- Written (solutions/model answers to coursework)

In line with College policy, feedback will not be provided on written examinations.

Preliminary results will be provided to students as alpha-grades. Numerical results will be published after the meeting of the final Board of Examiners.

Re-sit Policy

Eligibility for resits is determined by the Examination Board in line with the College policy. The Department of Bioengineering does not normally offer resits in September. Students with marginal failure may be offered a supplementary qualifying test in place of a re-sit opportunity.

The Departmental policy on resits for each year can be found in the regulation documents found at: <http://www.imperial.ac.uk/bioengineering/admin/current-undergraduate-students/>

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

Mitigating Circumstances Policy

The College's Policy on mitigating circumstances makes provision for Boards of Examiners to use their discretion where extenuating circumstances are independently corroborated and are judged by the advisory panel to be of sufficient severity to have substantially affected a student's performance.

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

Programme Structure					
Year One	Pre-session	Term One	Term Two	Term Three	Term Four
Core Modules		6	9	1	
Projects				1	
Year Two	Pre-session	Term One	Term Two	Term Three	Term Four
Core Modules		7	6	1	
Projects		1			
Year Three	Pre-session	Term One	Term Two	Term Three	Term Four
Core Modules		2			
Elective Modules		1-4	1-6		
Projects		1			
Assessment Dates & Deadlines					
Year One					
Written Examinations		December/January and May/June			
Coursework Assessments		Continuous			
Project Deadlines		June			
Practical Assessments		Continuous			
Year Two					
Written Examinations		December/January and May/June			
Coursework Assessments		Continuous			
Project Deadlines		June			
Practical Assessments		Continuous			
Year Three					
Written Examinations		December/January and May/June			
Coursework Assessments		Continuous			
Project Deadlines		June			
Practical Assessments		Continuous			

Assessment Structure (BEng)		
Programme Component	ECTS	% Year Weighting
Year 1: Core modules x 15	60	12.5%
Year 2: Core modules x14	60	37.5%
Year 3: Core modules x 2 Elective modules x 6 BEng Individual Project	60	50%
TOTAL		100%

Rules of Progression
<p>The BEng degree mark is calculated with the year weightings 1:3:4, so year 3 contributes $\frac{1}{2}$ of the overall degree mark.</p> <p>In order to pass the first year examinations and qualify to progress to the second year, the candidate must achieve a pass mark in every assessment. In addition they must achieve an aggregate mark of at least 40% for Electrical Engineering Labs, Vibrations and Waves, Biomolecular Engineering 1, and Programming 1.</p> <p>In order to pass the second year examination and qualify to progress to the third year, the candidate must achieve a pass mark in each assessment.</p> <p>In order to pass the third year examination and graduate with a BEng degree, the candidate must satisfy the conditions for years 1 and 2 and following the conditions on subjects taken in the Bioengineering Department for year 3:</p> <ul style="list-style-type: none"> (a) achieve a pass-mark in each of the compulsory courses (b) achieve an overall average mark of at least 40% across the optional courses taken (c) achieve a pass mark in the final year project. <p>In addition, the regulations for courses taken outside of the Bioengineering Department will follow those of the host Department except under exceptional circumstances where the final decision lies with the Director of Undergraduate Studies of Bioengineering.</p> <p>If a student attains a mark below the pass mark in no more than one exam or item of coursework in their final year, but their aggregate is above 40% such that the failed mark is no further away from 40% than their aggregate is above 40%, and their performance in similar subjects is satisfactory enough to demonstrate their competence, the Examiners may, at their discretion, and taking into account information about the student's performance on the entire course, consider the exam a pass and allow the student to graduate.</p>

Final Degree Classifications

Third – a student must achieve an aggregate mark of 40%

Lower Second – a student must achieve an aggregate mark of 50%

Upper Second – a student must achieve an aggregate mark of 60%

First - a student must achieve an aggregate mark of 70%

Year	% Year Weighting	Module	% Module Weighting
Year One	12.5%	Mathematics 1	18.7%
		Molecules, Cells and Processes	9.3%
		Electromagnetics 1	4.7%
		Logic and Digital Systems	9.3%
		Medical Science 1	9.3%
		Electrical Engineering 1	9.3%
		Mechanics 1	9.3%
		Heat and Mass Transport 1	9.3%
		Bioengineering in Action	1.9%
		Wet Lab Skills	0%
		Electronic Build Project	0%
		Electrical Engineering Labs	4.7%
		Vibrations and Waves	4.7%
		Biomolecular Engineering 1	4.7%
		Programming 1	4.7%

Year	% Year Weighting	Module	% Module Weighting
Year Two	37.5%	Mathematics 2	15.38%
		Engineering Design Project	7.69%
		Electromagnetics 2	7.69%
		Biomolecular Engineering 2	7.69%
		Programming 2	7.69%
		Medical Science 2	7.69%
		Electrical Engineering 2	7.69%
		Mechanics 2 Solids	7.69%
		Mechanics 2 Fluids	7.69%
		Heat and Mass Transport 2	7.69%
		Signals and Systems	7.69%
		Control Systems	7.69%
		Wet Lab Skills	0%
		Mechanics Workshop	0%
Year Three	50%	Physiological Imaging and Monitoring	9.09%
		Modelling in Biology	9.09%
		<u>EITHER:</u> 4 x modules from elective group (A) and 2 x modules from elective group (B) OR 5 x modules from elective group (A) and 1 x module from elective group (B)	9.09% each
		Final Year Project	27.27%

Indicative Module List												
Code	Title	Core/ Elective	Year	L&T Hours	Ind. Study Hours	Place- ment Hours	Total Hours	% Writte n Exam	% Course- work	% Practi cal	FHEQ Level	ECTS
BE1-HEBP	Electronic Build Project	CORE	1	3	9.5	0	12.5	100%	0%	0%	4	0.50
BE1-HEE1	Electrical Engineering 1	CORE	1	28	84.5	0	112.5	100%	0%	0%	4	4.50
BE1-HEEL	Electrical Engineering Labs	CORE	1	30	57.5	0	87.5	0%	100%	0%	4	3.50
BE1-HEM1	Electromagnetics 1	CORE	1	14	98.5	0	112.5	100%	0%	0%	4	4.50
BE1-HBIA	Bioengineering in Action	CORE	1	12.5	0	0	12.5	0%	100%	0%	4	0.50
BE1-HHMT1	Heat and Mass Transport 1	CORE	1	23	89.5	0	112.5	100%	0%	0%	4	4.50
BE1-HLDS	Logic and Digital Systems	CORE	1	36	76.5	0	112.5	90%	10%	0%	4	4.50
BE1-HMATH1	Mathematics 1	CORE	1	90	185	0	275	50%	50%	0%	4	11.00
BE1-HMCP	Molecules, Cells and Processes	CORE	1	27	85.5	0	112.5	100%	0%	0%	4	4.50
BE1-HMECH1	Mechanics 1	CORE	1	28	84.5	0	112.5	45%	55%	0%	4	4.50
BE1-HMS1	Medical Science 1	CORE	1	32	80.5	0	112.5	78%	22%	0%	4	4.50
BE1-HPROG1	Programming 1	CORE	1	28	72	0	100	50%	50%	0%	4	4.00
BE1-HVAW	Vibrations and Waves	CORE	1	60	52.5	0	112.5	0%	100%	0%	4	4.50
BE1-HBMOLE1	Biomolecular Engineering 1	CORE	1	15	85	0	100	0%	100%	0%	4	4.00

Code	Title	Core/ Elective	Year	L&T Hours	Ind. Study Hours	Place- ment Hours	Total Hours	% Writte n Exam	% Course- work	% Practi- cal	FHEQ Level	ECTS
BE1-HWLS	Wet Lab Skills	CORE	1	12.5	0	0	12.5	0%	0%	100%	4	0.50
BE2-HBMOLE2	Biomolecular Engineering 2	CORE	2	28	84.5	0	112.5	60%	40%	0%	5	4.50
BE2-HCTRL	Control Systems	CORE	2	26	86.5	0	112.5	80%	10%	10%	5	4.50
BE2-HEDP	Engineering Design Project	CORE	2	55	57.5	0	112.5	0%	55%	45%	5	4.50
BE2-HEE2	Electrical Engineering II	CORE	2	28	84.5	0	112.5	80%	20%	0%	5	4.50
BE2-HEM2	Electromagnetics II	CORE	2	28	84.5	0	112.5	100%	0%	0%	5	4.50
BE2-HFLM	Mechanics II Fluids	CORE	2	28	84.5	0	112.5	78%	22%	0%	5	4.50
BE2-HHMT2	Heat and Mass Transport II	CORE	2	28	84.5	0	112.5	80%	20%	0%	5	4.50
BE2-HMATH2	Mathematics II	CORE	2	52	185.5	0	237.5	90%	10%	0%	5	9.5
BE2-HMEW	Mechanical Workshop Skills	CORE	2	12.5	0	0	12.5	0%	0%	100%	5	0.50
BE2-HMS2	Medical Science II	CORE	2	28	84.5	0	112.5	100%	0%	0%	5	4.50
BE2-HPROG2	Programming II	CORE	2	38	74.5	0	112.5	55%	45%	0%	5	4.50
BE2-HSAS	Signals and Systems	CORE	2	48	64.5	0	112.5	100%	0%	0%	5	4.50
BE2-HSDM	Mechanics II Solids	CORE	2	34	78.5	0	112.5	60%	40%	0%	5	4.50
BE2-HWLS	Wet Lab Skills II	CORE	2	12.5	0	0	12.5	0%	0%	100%	5	0.50

Code	Title	Core/ Elective	Year	L&T Hours	Ind. Study Hours	Place- ment Hours	Total Hours	% Writte n Exam	% Course- work	% Practi- cal	FHEQ Level	ECTS
BE3-HMIB	Modelling in Biology	CORE	3	30	120	0	150	50%	50%	0%	6	6.00
BE3-HPIM	Physiological Imaging and Monitoring	CORE	3	26	124	0	150	70%	30%	0%	6	6.00
BE3-HBIP	BEng Final Year Project	CORE	3	21	279	0	300	0%	100%	0%	6	12.0
BE3-HSYNB	Synthetic Biology	ELECTIVE (A)	3	35	115	0	150	60%	30%	10%	6	6.00
BE3-HBACSA	Biomedical Advanced and Computational Stress Analysis	ELECTIVE (A)	3	30	120	0	150	70%	30%	0%	6	6.00
BE3-MBMX	Biomechanics	ELECTIVE (A)	3	28	122	0	150	95%	5%	0%	6	6.00
BE3-HIPR	Image Processing	ELECTIVE (A)	3	38	112	0	150	100%	0%	0%	6	6.00
BE3-HHCARD	Human Centred Design of Assistive and Rehabilitation Devices	ELECTIVE (A)	3	28	122	0	150	0%	30%	70%	6	6.00
BE3-HTERM	Tissue Engineering and Regenerative Medicine	ELECTIVE (A)	3	26	124	0	150	100%	0%	0%	6	6.00
BE3-MHASP	Hearing and Speech Processing	ELECTIVE (A)	3	27	123	0	150	100%	0%	0%	6	6.00
BE3-MBMIME	Biomimetics	ELECTIVE (A)	3	26	124	0	150	100%	0%	0%	6	6.00
BE3-HPFM	Physiological Fluid Mechanics	ELECTIVE (A)	3	26	124	0	150	70%	30%	0%	6	6.00
BE9-MDEVEN	Medical Device Entrepreneurship	ELECTIVE (B)	3	27	123	0	150	0%	100%	0%	7	6.00

Code	Title	Core/ Elective	Year	L&T Hours	Ind. Study Hours	Place- ment Hours	Total Hours	% Writte n Exam	% Course- work	% Practi cal	FHEQ Level	ECTS
ME3-HDNVC	Design Led Innovation and New Venture Creation	ELECTIVE (B)	3	31	119	0	150	0%	70%	30%	6	6.00
CS341	Introduction to Bioinformatics	ELECTIVE (A)	3	27	73	0	100	85%	15%	0%	6	6.00
MSE315	Biomaterials	ELECTIVE (A)	3	24	126	0	150	100%	0%	0%	6	6.00
CE4.31	Transport Systems for Biological Processes	ELECTIVE (A)	3	30	120	0	150	100%	0%	0%	7	6.00
N/A	Horizons	ELECTIVE (B)	3	Various			150	Various			6	6.00
N/A	Business for Professional Engineers & Scientists	ELECTIVE (B)	3	Various			150	Various			6	6.00

Supporting Information

The Programme Handbook is available at:

<http://www.imperial.ac.uk/bioengineering/admin/current-undergraduate-students/>

The Module Handbook is available at:

<http://www.imperial.ac.uk/bioengineering/admin/current-undergraduate-students/>

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:

<http://www.imperial.ac.uk/about/governance/academic-governance/>

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

<http://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".

<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/>