

PROGRAMME SPECIFICATION

KEY FACTS

Programme name	BEng Biomedical Engineering / BEng Biomedical Engineering with Placement
Award	BEng (Hons)
School	School of Mathematics Computer Science and Engineering
Department or equivalent	Department of Electrical and Electronic Engineering
UCAS Code	BH81/BHV1
Programme code	USBIMB
Type of study	Full Time
Total UK credits	360
Total ECTS	180

PROGRAMME SUMMARY

The BEng in Biomedical Engineering is a three year Bachelor Undergraduate Programme, aimed at developing graduates to play a leading role in the rapidly growing medical engineering industry. The programme provides you with basic knowledge in electronic engineering, mathematics and signal processing, and specialised knowledge in areas such as biomedical instrumentation, radiation physics, respiratory and cardiovascular measurements and medical imaging.

The programme consists of 360 academic credits spread over three full academic years (120 credits each year). You are required to successfully complete each year of study before progressing to the next year. The programme includes an optional placement year, which carries no academic credit but is it strongly recommended to you. Each academic year consists of a number of modules (seven, or eight), which typically carry 15 or 30 credits. You will learn at formal lectures, at tutorials and problem solving sessions, and in laboratory sessions. Modules are assessed using the typical range of assessment methods; majority of the modules are assessed through written examination and practical work. The programme includes individual and group project work and gives you the opportunity to develop your personal, presentation and communication skills.

The programme shares Programme Stage 1 and Programme Stage 2 with the MEng in Biomedical Engineering. You can transfer to the listed MEng programme at the end of Programme Stage 2.

Certificate / Programme Stage One

For all of you completing Programme Stage one *or* the Certificate in Biomedical Engineering you will be able to discuss underlying concepts and principles associated with electronics, design and biomedical engineering and interpret these within the context of your practice. Subjects covered include modules in general mathematics, engineering science and practice, introduction to programming, circuit theory, analogue electronics, digital logic, introduction to biomedical engineering, and anatomy and

physiology.

Diploma / Programme Stage Two

For all of you completing Programme Stage Two *or* the Diploma in Biomedical Engineering you will build on your previous knowledge and experience. You will develop skills of enquiry in your subject and develop different approaches to problem-solving as well as identify the limitations of your knowledge. Modules include engineering mathematics, computer programming, biomedical optics, biomedical instrumentation, and engineering management.

Degree / Programme Stage Three

For all of you completing Programme Stage Three *or* the degree you will further develop a coherent systematic, detailed knowledge of your discipline. You will be able to develop techniques for practice drawing on research and scholarship demonstrating your role as a reflective practitioner. You will cover subject areas in respiratory and cardiovascular measurement, radiation physics and imaging, biosensors, and biosignals and image processing and will also undertake an individual final year project.

The programme is delivered by the School of Mathematics Computer Science and Engineering and is supported by the School of Health Sciences. It is accredited by the Institute of Engineering and Technology, the Institute of Measurement and Control and the Institute of Physics and Engineering in Medicine as partially meeting the Engineering Council UK educational requirements for Chartered Engineer registration.

Aims

The programme aims to produce graduates who:

- are equipped to play leading roles in the healthcare technology industry, NHS, the professions and public service;
- have a sound theoretical and practical education in biomedical engineering and relevant subjects, who will qualify for appropriate exemptions to membership of professional institutions by providing modules of appropriate standard;
- are able to undertake and complete a major piece of independent work on a given topic in biomedical engineering;
- are able to meet the needs of industry, healthcare institutions (NHS) and commerce by providing distinctive courses which reflect the demand for qualified graduates and by teaching engineering design concepts relevant to bioengineering;
- have the ability to reflect relevant specialisations in medical instrumentation, and physiological monitoring systems based on the teaching and research strengths of the field;
- can develop the ability to adapt to new healthcare technologies and to seek and assimilate new information;
- have a knowledge and practical understanding of engineering management;
- can acquire oral, written and IT communication skills and interpersonal skills to develop a positive aptitude for independent thinking and action.

An underpinning aim of the programme is to enable graduates with a variety of educational backgrounds to benefit from the programme, irrespectively of race, background, gender or physical disability both from within the UK and overseas.

WHAT WILL I BE EXPECTED TO ACHIEVE?

On successful completion of this programme, you will be expected to be able to:

Knowledge and understanding:

- understand basic Mathematics, Physics and electronics relevant to the field of Biomedical Engineering;
- appreciate fundamental concepts, principles and theories underpinning of Biomedical Engineering and Biomedical Sciences in general;
- relate to detailed knowledge and understanding of essential facts, concepts, principles and theories of biomedical engineering, informatics, modelling, biomedical science and statistics, physiology, pathology, anatomy and healthcare, medical imaging and medical instrumentation;
- demonstrate a sound theoretical knowledge in engineering and physical science appropriate to the level of the programme selected;
- understand the operating principles of selected medical imaging and instrumentation systems;
- appreciate the role of the biomedical engineer in the health sector, society and the healthcare industry and the business and management techniques that are relevant to engineering and biomedical engineers.

Skills:

- analyse and solve problems relevant to biomedical engineering;
- design systems or processes using principles of electrical/electronic engineering and physical sciences;
- Exercise critical evaluation of information accessed from a wide variety of sources (the Internet, scientific databases, technical reports and data sheets) relevant to the field;
- exercise professional judgement in biomedical engineering and in clinical support and take account of non-technical issues such as economics and benefit to society;
- formulate and test student hypotheses;
- plan and perform safely experimental work in a laboratory and appropriate clinical environment;
- use test and measurement equipment, take accurate measurements and record progress of an experiment in a laboratory book and/or computer database;
- acquire, analyse and critical evaluate experimental results and data;
- work effectively with IT tools - to program and to use computational packages for modelling, design and simulation of physiological phenomena and medical equipment;
- prepare formal technical reports and give technical oral presentations using a variety

of information sources and constructed using appropriate computer tools and packages;

- use scientific and medical literature effectively;
- research for information to develop ideas for future study;
- communicate effectively both verbally and in writing;
- be competent in the use of information technology;
- build team working skills and work with other staff in the hospital or industrial environment;
- be familiar with methods of mathematical modelling and analysis relevant to biomedical engineering;
- learn to adapt to new technologies and their implementation in the hospital/clinical environment;
- plan and perform safely experimental work in a laboratory and appropriate clinical environment.

Values and attitudes:

- demonstrate an understanding of the role of a biomedical engineer in the present and future directions of healthcare related institutions and industries;
- understand the responsibilities of a biomedical engineer in enforcing and maintaining safety standards in the clinical context and for patient use and management of medical equipment;
- maintain and develop a professional engineering attitude;
- maintain and develop an awareness of safety and environment;
- show respect and tolerance for other people on the group Correctly reference the work of other people;
- show consideration for the rules and regulations of City.

This programme has been developed in accordance with the QAA Subject Benchmark for Engineering.

HOW WILL I LEARN?

The programme is designed to enable you to acquire and develop generic and subject-specific knowledge and understanding, thinking, practical and transferable skills. This is assured by a diverse and carefully planned teaching and learning styles based upon lectures, tutorials, practical work and design projects.

Taught modules, which may be single or double, are designed to provide the bulk of the formal teaching of mathematical and subject-specific engineering subjects. Single taught modules normally comprise 20 hours of lectures, 10 hours of problem, example and revision classes, and 15 hours of coursework and/or laboratory classes. Single modules are run for one Term and double modules - over two Terms. The fundamental principles of engineering that underpin the design of medical

equipment are studied in the first two years. This provides you the background and tools for more in-depth study or specialisation in the final year.

In the first two years of the programme you will have modules fundamental to electronic engineering while providing specialised biomedical engineering modules, as well as an essential insight into engineering design and computing. In addition to this, biomedical engineering requires management skills, the ability to communicate effectively, a good measure of human understanding and awareness for the economic, environmental and social implications of their activity. Modules are designed to provide excellent training in all those areas.

During the first, second and third years of study specialised biomedical engineering modules, which cover a wide area of the field are delivered. These modules will help you to gain sufficient familiarity with physiological concepts and the language of medicine and also allow them to communicate with clinical colleagues with real understanding of the problems associated with the application of medical technology. All the modules have a theoretical, demonstrative and practical (design and development) part. Detailed laboratory exercises are in place which will enable you to understand further the underlying theory of a particular subject.

A popular feature of this programme is the final year individual project. This may be a detailed design study, and experimental and/or theoretical investigation of some topic in biomedical engineering. Engagement in such a project allows you to interact with members of the School's various research teams or clinical teams, working with researchers on highly relevant and exciting projects.

The programme is interdisciplinary and is taught by staff from the School of Engineering and Mathematical Sciences, and the School of Community and Health Sciences. Also, the programme includes lectures from hospital consultants and experts from the medical technology who explain how technologies are currently used in clinical practice.

The programme structure is designed to accommodate the different background of the students and is in a modular format. It covers the design of medical technologies (devices), physiological measurement, safety of electromedical equipment and others.

WHAT TYPES OF ASSESSMENT AND FEEDBACK CAN I EXPECT?

Assessment and Assessment Criteria

To obtain the BEng (Honours) degree you need to collect 360 academic credits. You will obtain the credits by satisfying the assessment requirements in a module. The assessment methods will include written examinations, laboratory reports, class tests, and oral presentations and examinations.

The Programme consists of three Programme Stages. Each Programme Stage is delivered in one full academic year and totals 120 credit points. Each Programme Stage consists of route core modules, which are listed elsewhere in the Programme Specification. Route core modules are specified in module specifications. They are assessed through the following methods: written examination, laboratory report submission, project report submission, presentation and/or class test.

Pass mark for all assessment is 40%. Progression rules are detailed elsewhere in the Programme Specification.

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Feedback on assessment

Assessment Criteria are descriptions, based on the intended learning outcomes, of the skills, knowledge or attributes you need to demonstrate in order to complete an assessment successfully, providing a mechanism by which the quality of an assessment can be measured. Grade- Related Criteria are descriptions of the level of skills, knowledge or attributes you need to demonstrate in order achieve a certain grade or mark in an assessment, providing a mechanism by which the quality of an assessment can be measured and placed within the overall set of marks.

Assessment Criteria and Grade-Related Criteria will be made available to you to support you in completing assessments. These may be provided in programme handbooks, module specifications, on the virtual learning environment or attached to a specific assessment task.

Feedback on your work will be provided in a number of ways. Each module has practical component and you will receive immediate feedback on your work in the laboratories. Feedback will also be given on all your written assignments. You will normally be provided with feedback within three weeks of the submission deadline or assessment date. This would normally include a provisional grade or mark. For end of module examinations or an equivalent significant task (e.g. an end of module project), feedback will normally be provided within four weeks. The timescale for feedback on final year projects or dissertations may be longer. The full policy can be found at:

https://www.city.ac.uk/_data/assets/pdf_file/0008/68921/assessment_and_feedback_policy.pdf

Assessment Regulations

In order to pass your Programme, you should complete successfully or be exempted from the relevant modules and assessments and will therefore acquire the required number of credits. You also need to pass each Programme Stage of your Programme in

order to progress to the following Programme Stage.

The three Programme Stages of the Programme (years) do not carry identical weight towards your final degree classification. Year 1 results are not included in your final degree calculation, only year 2 and year 3, with weight 33% for year 2 and 67% for year 3.

The pass mark for each module is 40%. It is necessary to pass all components of the module (typically both the written exam and the coursework) in order to pass a module.

If you fail an assessment component or a module, the following will apply:

1. Compensation: where you fail up to a total of one sixth of the total credits of a Programme Stage at first or resit attempt, you may be allowed compensation if:
 - Compensation is permitted for the module involved (see the What will I Study section of the programme specification), and
 - It can be demonstrated that you have satisfied all the Learning Outcomes of the modules in the Programme Stage, and
 - A minimum overall mark of no more than 10% below the module pass mark has been achieved in the module to be compensated, and
 - An aggregate mark of 40% has been achieved for the Programme Stage.

Where you are eligible for compensation at the first attempt, this will be applied in the first instance rather than offering a resit opportunity.

If you receive a compensated pass in a module you will be awarded the credit for that module. The original component marks will be retained in the record of marks and your original module mark will be used for the purpose of your Award calculation.

2. Resit: Where you are not eligible for compensation at the first attempt, you will be offered one resit attempt.

If you are successful in the resit, you will be awarded the credit for that module. The mark for each assessment component that is subject to a resit will be capped at the pass mark for the module. This capped mark will be used in the calculation of the final module mark together with the original marks for the components that you passed at first attempt.

If you do not meet the pass requirements for a module and do not complete your resit by the date specified you will not progress to the next Programme Stage and the Assessment Board will require you to be withdrawn from the Programme.

If you fail to meet the requirements for a particular Programme Stage or the Programme, the Assessment Board will consider whether you are eligible for an Exit Award as per the table below.

If you would like to know more about the way in which assessment works at City, please see the full version of the Assessment Regulations at:

http://www.city.ac.uk/_data/assets/word_doc/0003/69249/s19.doc

WHAT AWARD CAN I GET?

Bachelor's Degree with Honours:

Programme Stage	HE Level	Credits	Weighting (%)
1	4	120	0
2	5	120	33
3	6	120	67

Class	% required
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I	70
II upper division	60
II lower division	50
III	40

Ordinary Degree:

Programme Stage	HE Level	Credits	Weighting (%)
1	4	120	0
2	5	120	33
3	6	60	67

Class	% required
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With Distinction	70
With Merit	60
Without Classification	40

Diploma of Higher Education:

Programme Stage	HE Level	Credits	Weighting (%)
1	4	120	33
2	5	120	67

Class	% required
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With Distinction	70
With Merit	60
Without Classification	40

Certificate of Higher Education:

Programme Stage	HE Level	Credits	Weighting (%)
1	4	120	100

Class	% required
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With Distinction	70
With Merit	60
Without Classification	40

WHAT WILL I STUDY?

Programme Stage 1

Programme Stage 1 consists of 7 modules totalling 120 credits. To pass Programme Stage 1, you must have acquired 120 credits.

Module Title	SITS Code	Module Credits	Core/ Elective	Can be compensated?	Level
Introduction to Biomedical Engineering	EE1409	15	C	Y	4

Engineering Science	EE1427	15	C	Y	4
General Mathematics	EE1460	20	C	N	4
Anatomy and Physiology	EE1466	15	C	Y	4
Engineering Practice	EE1500	10	C	Y	4
Digital Logic	EE1501	15	C	Y	4
Electronic Circuit Design 1	EE1502	30	C	N	4

Programme Stage 2

Programme Stage 2 consists of 7 compulsory modules, totalling 120 credit points. To pass Programme Stage 2, you must have acquired 120 credits. Those of you who undertake the optional placement year will register for the Professional Placement module (ET2014) after completing Programme Stage 2.

Module Title	SITS Code	Module Credits	Core/ Elective	Can be compensated?	Level
Programming and Design	EE1503	15	C	Y	4
Biomedical Optics	EE2506	15	C	Y	5
Pathology and Healthcare	EE2511	15	C	Y	5
Digital Electronics	EE2507	15	C	Y	5
Engineering Management 2	ET2052	15	C	Y	5
Engineering Mathematics 1	EX1002	15	C	N	4
Biomedical Instrumentation	EE2469	30	C	N	5

Professional Placement	ET2014
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Programme Stage 3

Programme Stage 3 consists of 7 compulsory modules, including a substantial final-year project, totalling 120 credit points. To pass Programme Stage 3, you must have acquired 120 credits.

Module Title	SITS Code	Module Credits	Core/ Elective	Can be compensated?	Level
Individual Project, BEng 3	EE3400	30	C	N	6
Respiratory and Cardiovascular Measurement	EE3518	15	C	Y	6
Medical Imaging Modalities	EE3517	15	C	Y	6
Biosensors	EE3431	15	C	Y	6
Biomechanics and Biomaterials	EE3439	15	C	Y	6
Biosignal and Image Processing	EE3438	15	C	Y	6
Engineering Management 3	ET3051	15	C	Y	6

TO WHAT KIND OF CAREER MIGHT I GO ON?

Electrical and biomedical engineers today work in a range of industries. Their problem-

solving skills and multidisciplinary education are well known and well respected in the industry in the UK and abroad.

Electrical engineers design, build and manage a large range of electronic systems, ranging from tiny sensor networks to large national power grids. Being an electrical engineer provides a career that is continuously changing, and is full of new discoveries. Electrical engineers develop devices and systems which have a huge impact on our everyday lives. They are responsible for developing wireless communication systems, medical imaging machines, and control systems which manage operation of large industrial processes.

Biomedical engineering is a relatively young branch of electrical engineering, focused completely on the design of electronic systems with medical applications. Modern provision of healthcare depends greatly on biomedical engineers, and this area of human development has only started. Becoming a biomedical engineer today promises an exciting career, bridging the advances in biomedical sciences with practical skills in delivering engineering projects in a growing field.

In addition to this, our graduates are well received at major Universities in the United Kingdom and overseas, where they pursue advanced Masters and Doctorate courses in electrical and electronic engineering, control engineering, telecommunications, but also in software engineering and business and management studies.

City, University of London has excellent reputation for graduate employment. You will receive excellent support for industrial placement and careers throughout your studies and after you graduate. If you would like more information on the Careers support available at City, please go to: <http://www.city.ac.uk/careers/for-students-and-recent-graduates>.

WHAT STUDY ABROAD OPTIONS ARE AVAILABLE?

At present these options are not available; they are still under development.

WHAT PLACEMENT OPPORTUNITIES ARE AVAILABLE?

A valid placement is a period of Employment of at least six months full-time or equivalent in a role related to your course. You will be visited at least twice during the placement period, either by the Industrial Tutor or Personal Tutor. The first visit should ideally take place within six weeks of the start of the placement. The second visit is typically within six weeks of the end of the placement.

You are helped by the tutor to arrange an industrially-linked final-year project with the Employer (where practical). You are required to organize the visits and send the Tutor a summary of your current role within the placement company.

You will also be required to submit a brief technical report upon your return to University and give a short presentation to Tutor and second-year Students.

Currently the placement students receive an endorsement on their degree. You will not get any academic credit for doing the Industrial Placement.

WILL I GET ANY PROFESSIONAL RECOGNITION?

Accrediting Body: The Institution of Engineering and Technology

Nature of Accreditation

Accreditation of the BEng leads to partial fulfilment of the academic requirements for registration as a Chartered Engineer (CEng).

Accrediting Body: Institute of Measurement and Control

Nature of Accreditation

Accreditation of the BEng leads to partial fulfilment of the academic requirements for registration as a Chartered Engineer (CEng).

Accrediting Body: Institute of Physics and Engineering in Medicine

Nature of Accreditation

Accreditation of the BEng leads to partial fulfilment of the academic requirements for registration as a Chartered Engineer (CEng).

HOW DO I ENTER THE PROGRAMME?

Typical offers require one of the following:

A/AS-level: 320 UCAS tariff points, including 'A' Levels in two science subjects or in Mathematics and one science subject, with grade B or higher required in one science subject or Mathematics.

BTEC: DDD in a relevant subject, including D in L3 mathematics.

IB: 32, including 5 in High Level mathematics and physics.

14-19 Advanced Diploma: Engineering at grade B/250; A-level mathematics at grade B/100.

RPL/RPEL:

Direct entry into Programme Stage 2: direct entry into Programme Stage 2 is possible following successful completion of Programme Stage 1 of a comparable accredited BEng (Honours) programme. Suitable HND and HND equivalents (e.g., equivalent overseas qualifications) are also considered. However, in all cases the final decision is subject to the satisfactory evaluation of prior qualifications by Admissions Tutor.

English language requirements:

IELTS: 6.0 with a minimum of 6.0 in the writing sub-test

GCSE: English language grade C.

Please note that TOEFL is not accepted as evidence of English language ability for students that require a Confirmation of Acceptance for Studies.

Candidates successfully completing City and Islington College Foundation course H606 with City are permitted to enter Programme Stage 1 of the programme.

Scholarships

A range of scholarships are on offer for home and overseas students. Scholarships are awarded mostly on academic merit. A range of awards is given to students with best academic results.

Details of scholarships available to new undergraduate students can be found on City's website at <http://www.city.ac.uk/study/why-study-at-city/fees-and-finance/scholarships>.

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