PROGRAMME SPECIFICATION

KEY FACTS

Programme name	Biomedical Engineering; Biomedical Engineering with Placement
Award	BEng (Hons)
School	Mathematics, Computer Science and Engineering
Department or equivalent	Electrical and Electronic Engineering
UCAS Code	BH81; BHV1
Programme code	USBIMB; USBIBY
Type of study	Full Time
Total UK credits	365
Total ECTS	182.5
Partner (partnership programmes only)	Not applicable
Type of partnership	Not applicable

PROGRAMME SUMMARY

The BEng Honours Programme is a three-year full time degree comprising 365 credits (3650 study hours) structured as three Programme Stages, each typically delivered over 22 contact weeks, 4 examination weeks, 4 reflective learning (private study) weeks and 8 vacation weeks (which may be used for private study) per academic year. A BEng (Hons) Programme therefore requires a commitment of 40 study hours per week during the academic year.

During the degree, engineering knowledge is built-up and nurtured, with specific objectives associated with each component Programme Stage. Development of design skills and team work are at the heart of the City University London engineering degrees throughout the programme. Programme Stage 1 is common across all of the engineering degrees. This introductory year is intended to give you a thorough grounding in the fundamental and applied science and mathematics appropriate for an engineer, as well as developing personal skills such as time and quality management. During Programme Stage 1, you will have the opportunity to undertake preliminary engineering designs through group activity. At the end of Programme Stage 1 (assuming that you have met the academic requirements described below) you will have the opportunity to decide whether to remain on the BEng (Hons) Biomedical Engineering degree or switch to one of 5 other engineering BEng (Hons) degrees.

This flexibility in choice at the end of Programme Stage 1 enables you to follow the discipline that best matches your strengths and most attracts you. In Programme Stage 2 you will start to specialise and learn to apply engineering analysis to simple but representative components of engineering systems. You will also be taught specific biomedical engineering topics while also studying, programming, computer science and digital design.

An important feature of Programme Stage 3 is the individual design exercise. It will be in Programme Stage 3 that you will be provided with a realistic biomedical engineering system design task, approaching a professional level exercise. This enables you to draw together and apply knowledge gained over a number of subject areas. In Programme Stage 3 you also study specialist topics including biosignals, biosensors, imaging, biomedical optics, medical physics and biomedical instrumentation together with the numerical tools used for analysis in industry today. These modules involve looking at analysis in increasing depth alongside examining a greater breadth of system complexity. Engineering management studies in Programme Stage 3 focus upon people and organisations, with case studies and invited lectures from industry professionals.

If you wish to gain practical experience during your degree, then you have the option of spending 12 months, between Programme Stages 2 and 3, on a paid industrial placement. We strongly recommend this (see the subsequent section entitled ‘What Placement opportunities are available?’).

At the end of the programme, you will have acquired the knowledge and understanding of analysis and design techniques, practical and personal skills

WHAT WILL I BE EXPECTED TO ACHIEVE?

This programme has been developed in accordance with the QAA Subject Benchmark for Engineering. On successful completion of this programme, you will be expected to be able to:

Knowledge and understanding

- Evaluate and solve problems in biomedical engineering using your knowledge and understanding of the scientific principles upon which biomedical engineering is based, including those which underpin current technological advances in the sector (UK-SPEC KU1, US1, E1).
- Assess mathematical and computational approaches used to analyse engineering components and systems (UK-SPEC KU1, US2, E1).
- Assess engineering design/build/test process, including customer requirements, dependencies, assumptions, constraints and creative solutions to problems; also with recent or planned developments in practice (UK- SPEC IA2, D1, D2, D3, D4, D6, P1, P8).
- Refer to practical experience of the concept of fitness for purpose and the separate consideration of production, operation, maintenance and disposal of an engineering system (UK-SPEC D2, D5, P7, P8).
- Refer to practical experience of the multi-disciplinary character of engineering and making decisions based upon social, environmental/sustainable development, ethical, legal, economic and commercial considerations (UK-SPEC KU2, KU3, US3, D3, S1, S2, S4).
- Assess critically the current technological and manufacturing/operational practice in the engineering industry (UK- SPEC S1, S3, P1, P3, P6).
- Apply the broad range of management tools and techniques required to run an engineering business (UK-SPEC S2, S4, P2, P5).
- Evaluate knowledge, of the type described above, specific to the principles and practice of biomedical engineering system design, manufacture, operation and maintenance and awareness of developments in the field (UK-SPEC US1, US3, E4, P1).
- Assess and predict the biomedical engineering industry as a business enterprise in the national economy (UK-SPEC E3, S1, S2, P6).

Skills

- Tackle confidently biomedical engineering problems. (UK-SPEC, E2, D1).
- Gather, integrate and evaluate information from various sources including technical literature (UK-SPEC GT1, P4).
- Break down a problem into a series of engineering tasks to be solved under a set of multi-disciplinary constraints (UK-SPEC D1).
- Communicate effectively in technical and non-technical languages, written, oral and graphical forms to individuals and large audiences (UK-SPEC GT1).
- Be proficient with IT and communications systems (UK-SPEC GT1).
- Use laboratory equipment for data measurement, processing, interpreting and analysis (UK-SPEC P2, P8).
- Use workshop equipment to produce or modify an engineering component (UK-SPEC PS1, P2).
- Be proficient with analytical, computational and experimental techniques, coupled with experience and decision-making, to solve engineering problems (UK-SPEC IA1, US2, E2, E3).
- Apply initiative, creativity and innovation to design, construct and test a system, or component to meet specifications (UK-SPEC E4, D5, D6).

HOW WILL I LEARN?

The majority of learning in Higher Education is typically conducted through private study. Engineering is a practical discipline which benefits from significant supervised study, but it cannot be learnt through lectures alone. In Programme Stages 1 and 2 there is a higher proportion of supervised study (compared with Part 3), with typically 20-24 hours of contact timetabled each week. These supervised contact hours are designed to assist and to focus your private study. Teaching involves a combination of theoretical, experimental and computational study. Our approach is to encourage critical thinking and foster your curiosity. By the time that you reach Programme Stage 3, the tutorial and practical elements are managed more by you, especially in relation to your individual project work. The remaining hours of private study each week are essential to the achievement of the learning outcomes and are guided using both formative and summative coursework tasks set during the academic year. Your private study is also supported by the use of Moodle, City's Online Learning Environment. This provides online access to module content, feedback, guidance on completing coursework, audio-visual resources etc.

Contact hours are made up of: lectures, which direct you towards the most important topics in the field and which allow discussion and clarification of areas of uncertainty with expert staff; tutorials where staff are on hand to help with problem-solving exercises; laboratory and workshop classes where practical situations and methods are encountered; and research or design/build projects, both individually and in groups, where personal skills, teamwork, creativity and critical thinking are developed and where knowledge built up elsewhere in the programme is integrated and developed. Site visits are used to place taught sessions in the context of real-world industries or products.

WHAT TYPES OF ASSESSMENT AND FEEDBACK CAN I EXPECT?

Assessment and Assessment Criteria

The Programme is subdivided into Parts (years of study) and each Part into modules (coherent groupings of syllabus topics addressing particular Learning Outcome types). Each module in the programme may have one or more assessment components of differing types. Assessment components may involve more than one assessment task (e.g. they may be an aggregate of different coursework marks or multiple examination papers).

Most modules will have an examination component as well as a coursework (continuous assessment) component. The split between examination and coursework assessment is approximately 50:50 over the programme lifetime.

Examinations are used because they provide a controlled environment in which to assess knowledge and understanding and problem-solving skills. The time pressure and lack of prior warning about specific issues to be tackled is representative of real-world situations faced by practicing engineers. Coursework assessments vary from paper assignments (which may be similar to examinations but with longer time scales and with access permitted to information sources) to the assessment of practical skills which cannot be done in the exam hall. For example communication skills (e.g. presentations, drawings and written reports), personal skills (such as team work or leadership), planning and design (both software and hardware), data analysis, critical review of information and the use of workbench and CAE tools are usually assessed by means of coursework tasks.

Often coursework tasks may be set which are not to be assessed but which are valuable as a learning experience. This is known as formative coursework and is often the key to improving grades on assessed or summative coursework. You will receive feedback from all coursework assessments, both formative and summative, to allow you to learn from mistakes made in the assessment.

Assessment Criteria are descriptions, based on the intended learning outcomes, of the skills, knowledge or attitudes that 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 that 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 assessment

Feedback will be provided in line with our Assessment and Feedback Policy. In particular, you will normally be provided with feedback within three weeks of the submission deadline or assessment date. This may be written (on the hard copies and online) or oral (in class), specific to you or generally applicable, and would normally include a provisional grade or mark. If the coursework submitted is a laboratory report, then your work will not be returned until three weeks after the last report has been

WHAT AWARD CAN I GET?

Bachelor's Degree with Honours in Biomedical Engineering:

Programme Stage	HE Level	
Credits	**Weighting (%)**	
	Class	**%**
required		
1	4	
125	10	
	I	
70		
2	5	
120	30	
	II upper division	
60		
3	6	
120	60	
	II lower division	
50		
	III	
40		

Ordinary Degree in Biomedical Engineering:

Programme Stage	HE Level	
Credits	**Weighting (%)**	
	Class	**%**
required		
1	4	
125	10	
	With Distinction	
70		
2	5	
120	30	
	With Merit	
60		
3	6	
60	60	
	Without classification	
40		

Diploma of Higher Education in Biomedical Engineering:

Programme Stage	HE Level	
Credits	**Weighting (%)**	
	Class	**%**
required		
1	4	
125	25	
	With Distinction	

WHAT WILL I STUDY?

Programme Stage 1

Programme Stage 1 comprises seven core Level-4 modules, totaling 125 credits. To pass Stage 1 you must obtain all 125 credits, as specified in the Programme Scheme. Each module (except for ET1000 and ET1090) is assessed by a combination of course work distributed throughout the academic year and an end of year exam. The proportion of each component is specified in the description for each module. You must achieve a pass mark for the module and any components as set out in each module specification. ET1000 is a pass/fail module assessed by your personal tutor by means of a portfolio of evidence of initial personal and professional development. ET1090 (Design I) is assessed by coursework distributed throughout the academic year for which you must achieve a pass mark.

Code	Module Title	SITS Credits	Core or Elective	Can module be compensated?		Level
	Mathematics I	EX1010	20 Core	No		4
	Engineering Science	ET1060	20 Core	No		4
	Fluid Mechanics and Thermodynamics I	ET1070	20 Core	No		4
	Solid Mechanics	ET1080	20 Core	No		4
	Electronics	ET1061	20 Core	No		4
	Design I	ET1090	20 Core	No		4
	Personal & Professional Development	ET1000	5 Core	No		4

Programme Stage 2

Programme Stage 2 comprises six core Level-5 modules, totalling 120 credits. To pass Programme Stage 2 you must obtain all 120 credits, as specified in the Programme Scheme. Each module (except Digital Design) is assessed by a combination of course work distributed throughout the academic year and an end of year exam. The proportion of each component is specified in the description for each module. You must achieve a pass mark for the module and any components as set out in each module specification. Digital Design is assessed by coursework distributed throughout the academic year for which you must achieve a pass mark.

A student who has successfully completed Programme Stage 2 of a BEng programme may, with the approval of the Assessment Board, transfer to Programme Stage 3 of the related MEng programme provided that they have obtained an overall aggregate mark of at least 50% at Programme Stage 2

TO WHAT KIND OF CAREER MIGHT I GO ON?

In today's modern hospital, the delivery of healthcare has become heavily dependent upon complex engineering systems. Thus the person best suited to assume responsibility of these systems, in terms of design, implementation, management, performance and safety in the healthcare environment, is a professional biomedical engineer. Biomedical engineering is an area that is continually growing and the demand for biomedical engineers is increasing rapidly. The sector depends greatly upon engineers who are skilled in the design and operation of healthcare technologies used for applications across a wide spectrum of societal needs, including breakthroughs in diagnosis, monitoring, treatment and prevention of disease. Graduate biomedical engineers will be able to seek employment in the medical technology industry, the pharmaceutical industry, NHS and private hospitals, government (Department of Health) and other health related departments and organisations.

Recent graduates have joined employers such as major hospitals of the NHS and overseas, Philips Healthcare, Covidien, Siemens, Astra-Zeneca, Draeger, GE Healthcare and many other small and medium-sized companies innovating technologies relating to healthcare.

The Centre for Career & Skills Development provides a service to current undergraduates and postgraduates, as well as recent graduates of the University. Their aim is to provide you with advice, information and skills that you need to make a smooth transition into the world of professional engineering. If you would like further information on the careers support available at City, please go to: http://www.city.ac.uk/careers.

WHAT STUDY ABROAD OPTIONS ARE AVAILABLE?

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

WHAT PLACEMENT OPPORTUNITIES ARE AVAILABLE?

If you wish to take a professional placement between Programme Stages 2 and 3 of your degree, then you will need to register accordingly at the beginning of Programme Stage 3. We strongly encourage you to undertake a 12-month placement or 6-8 week Summer Internship, as you will benefit greatly from the experience; providing you with a distinct advantage when you seek employment upon graduation. MCSE's Professional Liaison Unit (PLU) collaborates with the University Career and Skills Development Service to deliver a series of Professional Development workshops to prepare you for searching for and applying for a work placement. The PLU is in regular contact with companies and other organisations concerning the availability of training opportunities and will advise you on making applications.

You are welcome to make your own applications but you will be asked to discuss these with the PLU's Work Based Learning Advisor. . Support is provided in the MCSE Placement & Internships Resource Centre module on Moodle.

If you are on an approved Professional Placement then your experience will be graded on the basis of (i) reports from two visits made by the Visiting Tutor (a member of academic staff) familiar to the subject and (ii) your final report. Informal contact is maintained throughout the 12 months, as necessary. Although your placement is reported on the degree transcript, the grading does not contribute to the final degree result.

Placement guidelines are issued to you and your employer at the commencement of training, and these include a placement health and safety booklet. The guidelines also include a section on workplace learning. Early in the placement year, you are required to produce a placement plan in conjunction with your Workplace Supervisor and the Visiting Tutor.

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 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 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 requirements for registration as a Chartered Engineer (CEng).

When accredited, this degree will partially satisfy the educational base for a Chartered Engineer (CEng).

HOW DO I ENTER THE PROGRAMME?

The following entrance requirements typically apply.

UCAS tariff points
128.

A-levels
ABB; including A-Level Mathematics and Physics or Chemistry or Biology. You are also required to have passed GCSE English Language at grade 4, or higher.

IB
33 points total including Higher Level Mathematics and Physics or Chemistry or Biology at grade 6.

English language requirements
For overseas candidates, an IELTS score of 6.0 (with a minimum of 5.5 in all components) is required. TOEFL is not accepted as evidence of English language ability for students that require a Confirmation of Acceptance for Studies.

Entry via Foundation Course

You will be offered a place on the BEng (Hons) degree in Biomedical Engineering should you both (i) successfully satisfy the City University London interview panel and (ii) obtain an overall grade of at least 65% on the Biomedical Engineering Foundation programme at: City and Islington College, INTO City University London International or Kaplan International College.

RPL/RPEL

Direct entry into Programme Stage 2 may be considered for candidates who have successfully completed the first year of a similar accredited MEng or BEng degree.

Scholarships
Undergraduate students are considered for a wide range of awards (scholarships, bursaries and prizes) throughout their studies in the School. These (internally and externally funded) awards range from £500-£9000 and they are based on a combination of academic merit and hardship. A number of these awards are also available to international students. Further information can be found at: http://www.city.ac.uk/study/undergraduate/funding-and-financial-support/scholarships-and-bursaries

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