UNIVERSITY OF Southampton

Programme Specification

MSc Biomedical Engineering 2020/21

This specification provides a concise summary of the main features of the programme and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if s/he takes full advantage of the learning opportunities that are provided.

Awarding Institution	University of Southampton
Teaching Institution	University of Southampton
Mode of Study	Full time
Duration	1 year
Accreditation details	Accreditation by the Institution of Mechanical Engineers (IMechE)
Final award	Master of Science
Name of award	Biomedical Engineering
Interim Exit awards	Postgraduate Certificate
	Postgraduate Diploma
FHEQ level of final award	7
UCAS code	Not Applicable
QAA Subject Benchmark or other external reference	QAA Subject Benchmark – Engineering 2015; Accreditation of Higher Education Programmes, Edition 3, Engineering Accreditation Board Characteristic Statement: Master's Degree, QAA 2015
Programme Lead	Professor Markus Heller
Date specification was written	24 August 2015
Date Programme was validated	10 February 2016
Date specification last updated	June 2019

Programme Overview

Brief outline of the programme
Within this particular programme of study, we aim to develop and enhance your knowledge of, and enthusiasm for, Biomedical Engineering which can be focussed in a number of themed areas of application (currently Musculoskeletal, Cardiovascular, Imaging, Diagnostic Systems, and Audiology).

This programme is suitable for engineering, mathematics and physical science graduates who wish to specialise in Biomedical Engineering or to support continued professional development. The programme aims to provide you with an academically challenging exposure to the current state of the art in Biomedical Engineering underpinned by interdisciplinary approaches and emphasising clinical translation strategies. The programme intends to equip you with the necessary skills to take on a leading role in developing novel engineering solutions which will allow healthcare practitioners and providers including clinicians, clinical support services and carers as well as individuals' themselves to improve or maintain their health and well-being by better preventive, diagnostic, prognostic, restorative, rehabilitative and palliative measures.

Learning and teaching
The programme will be delivered through a combination of lectures, tutorials (small group teaching), example classes, laboratory experiments, industrial visits, coursework, and projects to enable you to demonstrate knowledge and understanding of the fundamental scientific and technical aspects of Biomedical Engineering, including a wide range of engineering materials, components, devices, and a wide range of measurement and analysis techniques. Knowledge of underlying physical principles as well as basics in biomedicine will further enable advanced and effective engineering developments not only for the clinic but also in healthcare applications more generally. Creating an understanding of the interface between engineering and biomedicine, in order to translate technology for medical purposes, underpins the learning and teaching activities in this

programme. By way of example, there are a number of ongoing research collaborations between the Faculties of Engineering and Physical Sciences, Faculty of Medicine and Faculty of Environmental and Life Sciences related to Active and Healthy Aging, the role of Sport and Exercise in Osteoarthritis, new approaches for the prevention and treatment of Osteoporosis and bone fractures more generally, Alzheimer's disease, stroke and heart disease, for example, all of which have inspired content in the Programme. Additionally, cross-faculty interdisciplinary activities at the interface of life sciences including those seeded by the Institute for Life Sciences (IfLS) have helped shaping the programme and underpin the distinct emphasis on understanding the biomedical context and clinical translation in this programme.

Through essays, coursework, group discussions, industrial visits and projects, you will be able to acquire the ability to demonstrate knowledge and understanding of the technical background of Biomedical Engineering to enable critical analysis of the current literature, identification of gaps in information, and also engagement in discussion with peers and a wide range of audiences. You are encouraged throughout to contribute your own professional experiences and thoughts to the learning of the whole class through a free exchange of ideas. Through this programme you can gain knowledge and understanding of the limitations of current knowledge and the changing nature of technologies and society, as well as the need to gain new knowledge through further study and team-based project work.

Research Project
Research projects may concern any of the areas of application covered by the programme. Interdisciplinary projects across engineering and biomedicine will be available with normally supervisors from at least two disciplines. The research project is intended to bring together the full range of skills in the programme and to provide you with an opportunity to build on all of the learning outcomes described below, while demonstrating in-depth knowledge and understanding of Biomedical Engineering. It involves information gathering and handling, critical analysis and evaluation, and presentation skills. The key requirement, however, is that the project must contain your own ideas and proposals: it should not simply be a technical design carried out to existing standards, but a problem with an element of novelty requiring the application of new information and concepts.

Assessment
Testing of the knowledge base is through a combination of unseen written examinations and assessed coursework in the form of problem solving exercises, laboratory reports, design exercises, essays, and an individual research project with a dissertation. Analysis and problem-solving skills are assessed through unseen written examinations and problem based exercises. Experimental, research and design skills are assessed through laboratory reports, coursework exercises, project reports and oral presentations.

Please note: As a research-led University, we undertake a continuous review of our programmes to ensure quality enhancement and to manage our resources. As a result, this programme may be revised during a student's period of registration; however, any revision will be balanced against the requirement that the student should receive the educational service expected. Please read our Disclaimer to see why, when and how changes may be made to a student's programme.

Programmes and major changes to programmes are approved through the University's programme validation process which is described in the University's quality handbook.

Educational Aims of the Programme

The aims of the programme are to:

- Enable you to acquire advanced knowledge and practical skills needed for a professional career in Biomedical Engineering, and to provide you with specialist knowledge and skills relevant to that end.
- Provide you with a sound understanding of the fundamental principles, operation requirements, design criteria and engineering applications in Biomedical Engineering.
- Enhance your transferable skills, including critical analysis, problem solving, project management, decision making, leadership, and communication by oral, visual and written means.
- Equip you with specialist knowledge, scientific and technical expertise and research skills for further research in Biomedical Engineering.

Programme Learning Outcomes

The programme provides opportunities for you to develop and demonstrate knowledge and understanding, qualities, skills and other attributes in the areas detailed below. The programme learning outcomes have been developed with reference to the Subject Benchmark Statement for engineering (https://www.qaa.ac.uk/docs/qaa/subject-benchmark-statements/sbs-engineering-15.pdf) and the Characteristics Statement for Master's Degrees (https://www.qaa.ac.uk/docs/qaa/quality-code/master's-degree-characteristics-statement.pdf?sfvrsn=6ca2f981_10) . The former of these is aligned with the Engineering Council publication Accreditation of Higher Education Programmes (AHEP): UK Standard for Professional Engineering Competence (third edition) (https://www.engc.org.uk/engcdocuments/internet/Website/Accreditation%20of%20Higher%20Education%20Programmes%20third%20edition%20(1).pdf

The MSc programme provides opportunities for you to achieve and demonstrate the learning outcomes developing Knowledge and Understanding, Subject Specific Intellectual and Research Skills as well as Transferable and Generic Skills as described below.

Codes in the left hand column below indicate the related Engineering Accreditation Board learning outcome.

Knowledge and Understanding

Having successfully completed this programme you will be able to demonstrate knowledge and understanding of:

	Science and mathematics Engineering is underpinned by science and mathematics, and other associated disciplines, as defined by the relevant professional engineering institution(s). On graduation you will have achieved:
SM7	A comprehensive understanding of the relevant scientific principles of Biomedical Engineering
SM8	A critical awareness of current problems and/or new insights most of which is at, or informed by, the forefront of aerodynamic and computation
SM9	Understanding of concepts relevant to Biomedical Engineering, some from outside engineering, and the ability to evaluate them critically and to apply them effectively, including in engineering projects

	Design Design at this level is the creation and development of an economically viable product, process or system to meet a defined need. It involves significant technical and intellectual challenges and can be used to integrate all engineering understanding, knowledge and skills to the solution of real and complex problems. On graduation you will have the knowledge, understanding and skills to:
D9	Knowledge, understanding and skills to work with information that may be incomplete or uncertain, quantify the effect of this on the design and, where appropriate, use theory or experimental research to mitigate deficiencies
D10	Knowledge and comprehensive understanding of design processes and methodologies and the ability to apply and adapt them in unfamiliar situations

	Economic, legal, social, ethical and environmental context Engineering activity can have impacts on the environment, on commerce, on society and on individuals. On graduation you will have the skills to manage your activities and to be aware of the various legal and ethical constraints under which you are expected to operate, including:
EL8	Awareness of the need for a high level of professional and ethical conduct in engineering
EL9	Awareness that engineers need to take account of the commercial and social contexts in which they operate
EL10	Knowledge and understanding of management and business practices, their limitations, and how these may be applied in the context of Biomedical Engineering
EL11	Awareness that engineering activities should promote sustainable development and ability to apply quantitative techniques where appropriate
EL12	Awareness of relevant regulatory requirements governing engineering activities in the context of Biomedical Engineering
EL13	Awareness of and ability to make general evaluations of risk issues in the context of Biomedical Engineering, including health & safety, environmental and commercial risk

	Engineering practice This is the practical application of engineering skills, combining theory and experience, and use of other relevant knowledge and skills. On graduation you will have achieved:
P9	A thorough understanding of current Biomedical Engineering practice and its limitations, and some appreciation of likely new developments
P11	Understanding of different roles within an engineering team and the ability to exercise initiative and personal responsibility, which may be as a team member or leader
P12	Advanced level knowledge and understanding of a wide range of engineering materials and components

Teaching and Learning Methods
Acquisition of core knowledge and understanding is through lectures, seminars, tutorials, field and laboratory classes, computer classes, workshops, and independent study and research. You are encouraged from an early stage to supplement and consolidate your understanding and knowledge by independent study.

Assessment methods
Testing of the knowledge base is through a combination of unseen written examinations and assessed coursework in the form of problem solving exercises, laboratory reports design exercises, essays and individual and group projects.

Skills

Having successfully completed this programme you will be able to:

	Engineering analysis Engineering analysis involves the application of engineering concepts and tools to the solution of engineering problems. On graduation you will have achieved:
EA5	Ability to use fundamental knowledge to investigate new and emerging technologies
EA6M	Ability both to apply appropriate engineering analysis methods for solving complex problems in engineering and to assess their limitations
EA7	Ability to collect and analyse research data and to use appropriate engineering analysis tools in tackling unfamiliar problems, such as those with uncertain or incomplete data or specifications, by the appropriate innovation, use or adaptation of engineering analytical methods

	Design Design at this level is the creation and development of an economically viable product, process or system to meet a defined need. It involves significant technical and intellectual challenges and can be used to integrate all engineering understanding, knowledge and skills to the solution of real and complex problems. On graduation you will have the knowledge, understanding and skills to:
D11	Ability to generate an innovative design for products, systems, components or processes to fulfil new needs

	Engineering practice This is the practical application of engineering skills, combining theory and experience, and use of other relevant knowledge and skills. On graduation you will have achieved:
P10	Ability to apply engineering techniques taking account of a range of commercial and industrial constraints

	Additional general skills On graduation you will have developed transferable skills, additional to those set out in the other learning outcomes, that will be of value in a wide range of situations, including the ability to:
G1	Apply their skills in problem solving, communication, working with others, information retrieval, and the effective use of general IT facilities
G2	Plan self-learning and improve performance, as the foundation for lifelong learning/CPD
G3	Monitor and adjust a personal programme of work on an on-going basis
G4	Exercise initiative and personal responsibility, which may be as a team member or leader

	Discipline Specific Skills On completion of the Biomedical Engineering Science programme you will be able to:
	Design and conduct an appropriate programme of work to set objectives for research in the context of Biomedical Engineering
	Use scientific and technical literature in support of research
	Apply fundamental knowledge and understanding of essential facts, concepts and principles relevant to Biomedical Engineering in researching complex problems

Teaching and Learning Methods

Intellectual skills are developed through the teaching and learning activities. Analysis and problem solving skills are further developed through regular problem sheets issued by module lecturers and through small group teaching. Experimental, research and design skills are further developed through coursework exercises, laboratory work, and design and research projects. Individual feedback is provided on all work submitted. Appreciation of the practical applications of these skills is provided by interaction with industry through visiting lectures and industrial visits.

Assessment methods

Analysis and problem solving skills are assessed through unseen written examinations and problem based exercises. Experimental, research and design skills are assessed through laboratory reports, coursework exercises, project reports and oral presentations. Skills are formatively assessed through written reports and oral presentations, practical and laboratory reports. Summative assessment is through unseen examinations, extended essays, written reports and oral presentations, and completion of a research project.

For the MSc all learning outcomes will be satisfied. For the Postgraduate Certificate you will fully satisfy learning outcome LO_1, while for PGDip, you will have additionally satisfied LO_6 and LO_7 in full with some of the other learning outcomes only partially addressed.

Programme Structure

The University uses the European Credit Transfer Scheme (ECTS) to indicate the approximate amount of time a typical student can expect to spend in order to complete successfully a given module or programme, where 1 ECTS indicates around 20 nominal hours of study. Previously, Credit Accumulation and Transfer Scheme (CATS) points were used for this purpose where 1 CATS credit was 10 nominal hours of study. The University credit accumulation and transfer scheme is detailed at
https://www.southampton.ac.uk/calendar/sectioniv/index.page

The full-time MSc programme lasts for 12 months. The first 8 months are spent mainly on the taught component, with lectures divided into two 12-week periods (Semesters 1 and 2), with exams at the end of each semester. The final four months are spent full-time on a research project, for which a considerable amount of preparation is undertaken in Semester 2. A strict timetable of milestones for the starting in Semester 2 ensures maximum time is devoted to the project as the manufacture, integration and testing of physical artefacts is involved.

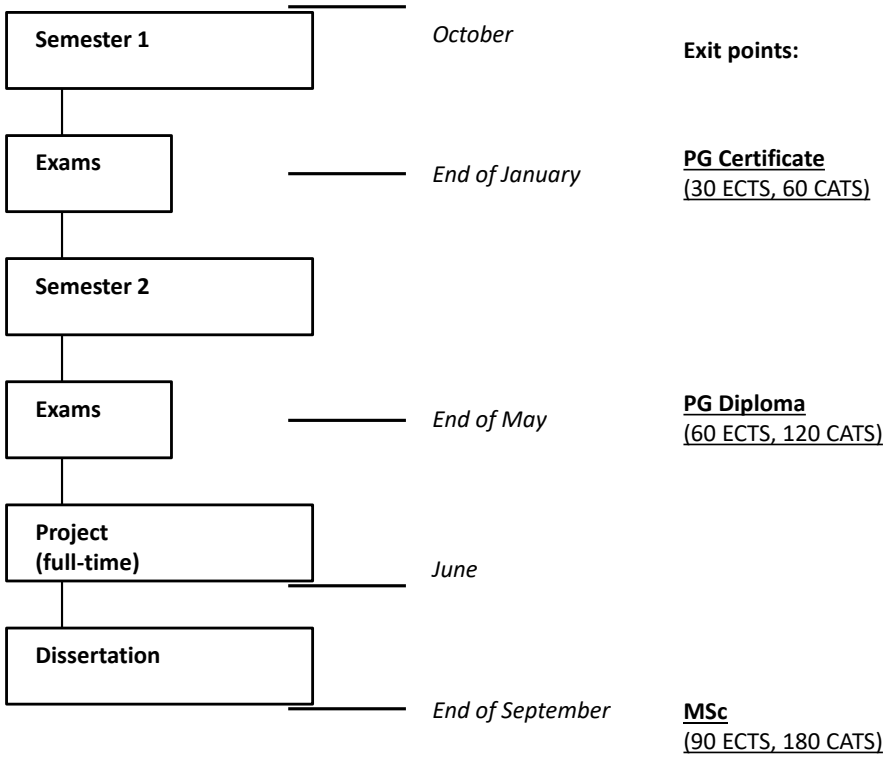
The MSc award depends on passing the examinations and on successful completion of a dissertation on the project. The diagram below shows the overall structure and possible exit points.

Typical course content

Biomedical Engineers work at the interface of engineering, biology, and medicine, combining their engineering expertise with an understanding of human biology and medical needs to make the world a healthier place. This program allows you to develop the breadth and depth of your knowledge, understanding and skills related to engineering principles and practices. The programme aims to provide you with the essential skills to succeed in an interdisciplinary environment, working in teams of clinicians, scientists, engineers, business people, support staff and other professionals to monitor, restore and enhance normal body function, abilities and outcomes.

Understanding the biological and medical healthcare context is key to this Biomedical Engineering course in order to prepare you to solve real problems and provide effective solutions. Compulsory modules running in both semester 1 and semester 2 provide you with the essential training that will enable you to integrate biology and medicine with engineering to solve medical and healthcare challenges facing society. Within these modules, existing initiatives such as the NHS' Public Patient Involvement (PPI) will be utilised to help you understand the nature and context of clinical research. Further, practicing clinicians will present special seminars to illustrate how healthcare needs demand and benefit from collaboration across the life technologies interface. You can then choose additional modules in semesters 1 and 2 to further develop the breadth and depth of your knowledge and skills in Biomedical Engineering and allied areas. An interdisciplinary research project at the end of the program will provide you with a further opportunity to integrate your engineering skills with an understanding of the complexity of biological systems to work successfully at this exciting intersection of science, medicine and mathematics to solve biological and medical problems.

The programme follows university guidelines for inclusivity and flexibility and provides and array of teaching and learning approaches that will enable any student who meets the entry requirements to access the curriculum and demonstrate achievement of all the intended learning outcomes.



Full-time Programme Structure

For all students the following modules are compulsory:

Module Code	Module Name	Semester	ECTS/CATS Points
ISVR6144	Introduction to Biomedical Engineering	1	7.5/15
MEDI6226	Human Biology & Systems Physiology	1	7.5/15
MEDI6219	Translational Medicine	2	7.5/15
FEEG6012	MSc Research Project **(core)**	2	30/60

Progression Requirements

The programme follows the University's regulations for ***Progression, Determination and Classification of Results: Postgraduate Master's Programmes*** as set out in the University Calendar https://www.southampton.ac.uk/calendar/sectioniv/index.page

Intermediate exit points (where available)

You will be eligible for an interim exit award if you complete part of the programme but not all of it, as follows:

Qualification	Minimum overall credit in ECTS/CATS credits	Minimum ECTS/CATS credits required at level of award
Postgraduate Diploma	at least 60/120	45/90
Postgraduate Certificate	at least 30/60	20/40

Programme outcomes for different exit points

Level 7 (MSc)	Much of the study undertaken at Masters level reflects research at the forefront of Biomedical Engineering. You will have shown originality in the application of knowledge, and you will understand how the boundaries of knowledge are advanced through research. You will be able to deal with complex issues both systematically and creatively, and show originality in tackling and solving problems individually and as part of a team. You will have the qualities needed for employment in circumstances requiring sound judgement, personal responsibility and initiative, in complex and unpredictable professional environments.
PGDip	You will have attained knowledge of research being undertaken by academic staff at the forefront of Biomedical Engineering. You will have shown that you are capable of applying knowledge to solve problems, and you will understand how the boundaries of knowledge are advanced through research. You will be able to deal with complex issues both systematically and creatively, and be able to contribute to solving problems individually and as part of a team. You will have the qualities needed for employment in circumstances requiring sound judgement and personal responsibility under the guidance of others, in complex and unpredictable professional environments.
PGCert	You will have been exposed to research being undertaken by academic staff at the forefront of Biomedical Engineering. You will have gained experience in

	applying knowledge to solve problems, and you will understand how the boundaries of knowledge are advanced through research. You will be able to deal with complex issues by following existing procedures, and will be able to contribute to solving problems individually and as part of a team. You will have some of the qualities needed for employment in circumstances requiring sound judgement and personal responsibility under the guidance of others, in complex and unpredictable professional environments.

Additional Costs

Students are responsible for meeting the cost of essential textbooks, and of producing such essays, assignments, laboratory reports and dissertations as are required to fulfil the academic requirements for each programme of study. Costs that students registered for this programme typically also have to pay for are included in Appendix 3.

Support for student learning

There are facilities and services to support your learning some of which are accessible to students across the University and some of which will be geared more particularly to students in your particular Faculty or discipline area.

The University provides:

- Library resources, including e-books, on-line journals and databases, which are comprehensive and up-to-date; together with assistance from Library staff to enable you to make the best use of these resources
- High speed access to online electronic learning resources on the Internet from dedicated PC Workstations onsite and from your own devices; laptops, smartphones and tablet PCs via the Eduroam wireless network. There is a wide range of application software available from the Student Public Workstations
- Computer accounts which will connect you to a number of learning technologies for example, the Blackboard virtual learning environment (which facilitates online learning and access to specific learning resources)
- Standard ICT tools such as Email, secure filestore and calendars
- Access to key information through the MySouthampton Student Mobile Portal which delivers timetables, Module information, Locations, Tutor details, Library account, bus timetables etc. while you are on the move
- IT support through a comprehensive website, telephone and online ticketed support and a dedicated helpdesk in the Hartley Library
- Enabling Services offering support services and resources via a triage model to access crisis management, mental health support and counselling
- Assessment and support (including specialist IT support) facilities if you have a disability, long term health problem or Specific Learning Difficulty (e.g. dyslexia)
- Student Services Centre (SSC) to assist you with a range of general enquiries including financial matters, accommodation, exams, graduation, student visas, ID cards
- Career Destinations, advising on job search, applications, interviews, paid work, volunteering and internship opportunities and getting the most out of your extra-curricular activities alongside your degree programme when writing your CV
- Other support that includes health services (GPs), chaplaincy (for all faiths) and 'out of hours' support for students in Halls (18.00-08.00)
- Centre for Language Study, providing assistance in the development of English language and study skills for non-native speakers

The Southampton University Students' Union (SUSU) provides

- An academic student representation system, consisting of Course Representatives, Academic Presidents, Faculty Officers and the Vice-President Education; SUSU provides training and support for all these representatives, whose role is to represent students' views to the University
- Opportunities for extracurricular activities and volunteering
- An Advice Centre offering free and confidential advice including support if you need to make an academic appeal
- Support for student peer-to-peer groups, such as Nightline

Associated with your programme you will be able to access:

- Induction programme for orientation, introduction of the programme and staff, and dissemination of materials.
- Student Coursebook, including guidance on selection of study programmes.
- Administrative and academic material on the Faculty, Programme and individual module web sites and/or Blackboard.
- A personal tutor to assist with organisational and personal matters. This role is taken over by the project supervisor when the research project starts.
- Careers advice and dissemination of available job advertisements.
- Personal e-mail account and e-mail access to staff via University system.
- School clusters of computers with relevant specialist software.
- Formal progress monitoring during research project.
- Support for international students.

Methods for evaluating the quality of teaching and learning

You will have the opportunity to have your say on the quality of the programme in the following ways:

- Completing student evaluation questionnaires for each module of the programme
- Acting as a student representative on various committees, e.g. Staff: Student Liaison Committees, Faculty Programmes Committee OR providing comments to your student representative to feedback on your behalf
- Serving as a student representative on Faculty Scrutiny Groups for programme validation
- Taking part in programme validation meetings by joining a panel of students to meet with the Faculty Scrutiny Group

The ways in which the quality of your programme is checked, both inside and outside the University, are:

- Discipline, Part, education and project boards, convening regularly during each academic year, which consider the outcomes of each module's delivery and evaluation.
- Moderation of examination papers, coursework and projects, both internally and externally.
- Annual examiners' meetings and examiners' boards.
- Annual programme and module reviews considering your feedback from all sources, feedback from teaching panels, external examiners and other bodies and student performance.
- Periodic meetings of the School Industrial Advisory Board.
- Response to results from the National Student Survey.
- Revalidation by the University at least every five years.

Each of the modules that make up the programme will be taught at the University of Southampton. The academic coordinator of the module is responsible for ensuring appropriate content of modules and quality of delivery.

Each research project will be supervised by a member of academic staff. A co-supervisor will be allocated who will normally be an academic or senior consulting engineer from within the Faculty; in the case of projects carried out externally, the co-supervisor may be from the institution/ company offering project facilities. The supervisor and co-supervisor conduct a formal progress review with the student, normally during July/August.

Career Opportunities

A career in Biomedical Engineering offers you the opportunity to apply yourself to shape a healthier future with an excellent perspective: according to the American Institute for Medical and Biomedical Engineering, the projected growth rate of Biomedical Engineering careers from 2012-2022 is 27% (as of January 2016).

Several of the major challenges facing humanity are associated with healthy ageing and the growing population, and it will be up to biomedical engineers to address these challenges. Biomedical engineers develop devices and procedures that solve medical and health related problems by combining their knowledge of biology and medicine with sound engineering principles and practices. Many do research, either in academia or industry, along with medical scientists, to develop and evaluate systems and products such as artificial organs, prostheses, instrumentation, and diagnostic, health management and care delivery systems. Biomedical engineers may design devices used in various medical procedures and develop imaging systems and devices for observing and controlling body functions. Biomedical engineers therefore make careers in academia, industry, health care and clinical medicine, as well as government.

In order to support your career, you might want to become professionally chartered. Here, accreditation through e.g. the Institution of Mechanical Engineers (IMechE) can confirm that the programme partially meets the educational requirements for Chartered Engineer (CEng) registration. All established MSc programmes offered by the Faculty of Engineering and Physical Sciences have been accredited. However, such accreditation can generally only be obtained after the programme has run and we will thus seek to obtain such accreditation retrospectively, as is routine practice.

You may be interested to continue from your Biomedical Engineering study into more clinical roles such as postgraduate entry medicine, audiology, prosthetics and orthotics. After successful completion of the MSc Biomedical Engineering degree programme you could consider applying for the three-year, work-based postgraduate NHS Scientist Training Programme to become a NHS Clinical Engineer.

Alternatively, you might be interested to bring you own business ideas to life. Self-employment is a growth area of the economy and is something that many people want to do at some point in their career, even if not immediately after graduation. Moreover, Biomedical Engineering offers a multitude of opportunities to turn the challenges our aging society faces into opportunities and solutions. Through the SetSquared Partnership, a world-wide leading business incubator, the University of Southampton supports your entrepreneurial and enterprising activities either during your studies or after graduation.

For further information about Biomedical Engineering and your career opportunities here please also consult the following web resources:

- Institution of Mechanical Engineers (IMechE): About Biomedical Engineering
- Institution of Mechanical Engineers (IMechE): Career Information
- Institute of Physics and Engineering in Medicine (IPEM): Career Information
- American Institute for Medical and Biological Engineering
- IEEE Engineering in Medicine and Biology Society (EMB): About Biomedical Engineering
- IEEE Engineering in Medicine and Biology Society (EMB): Career Centre

External Examiner for the programme

Name Professor Cathy A. Holt
Institution. Cardiff University

Students must not contact External Examiner(s) directly, and external examiners have been advised to refer any such communications back to the University. Students should raise any general queries about the assessment and examination process for the programme with their Course Representative, for consideration through Staff: Student Liaison Committee in the first instance, and Student representatives on Staff: Student Liaison Committees will have the opportunity to consider external examiners' reports as part of the University's quality assurance process.

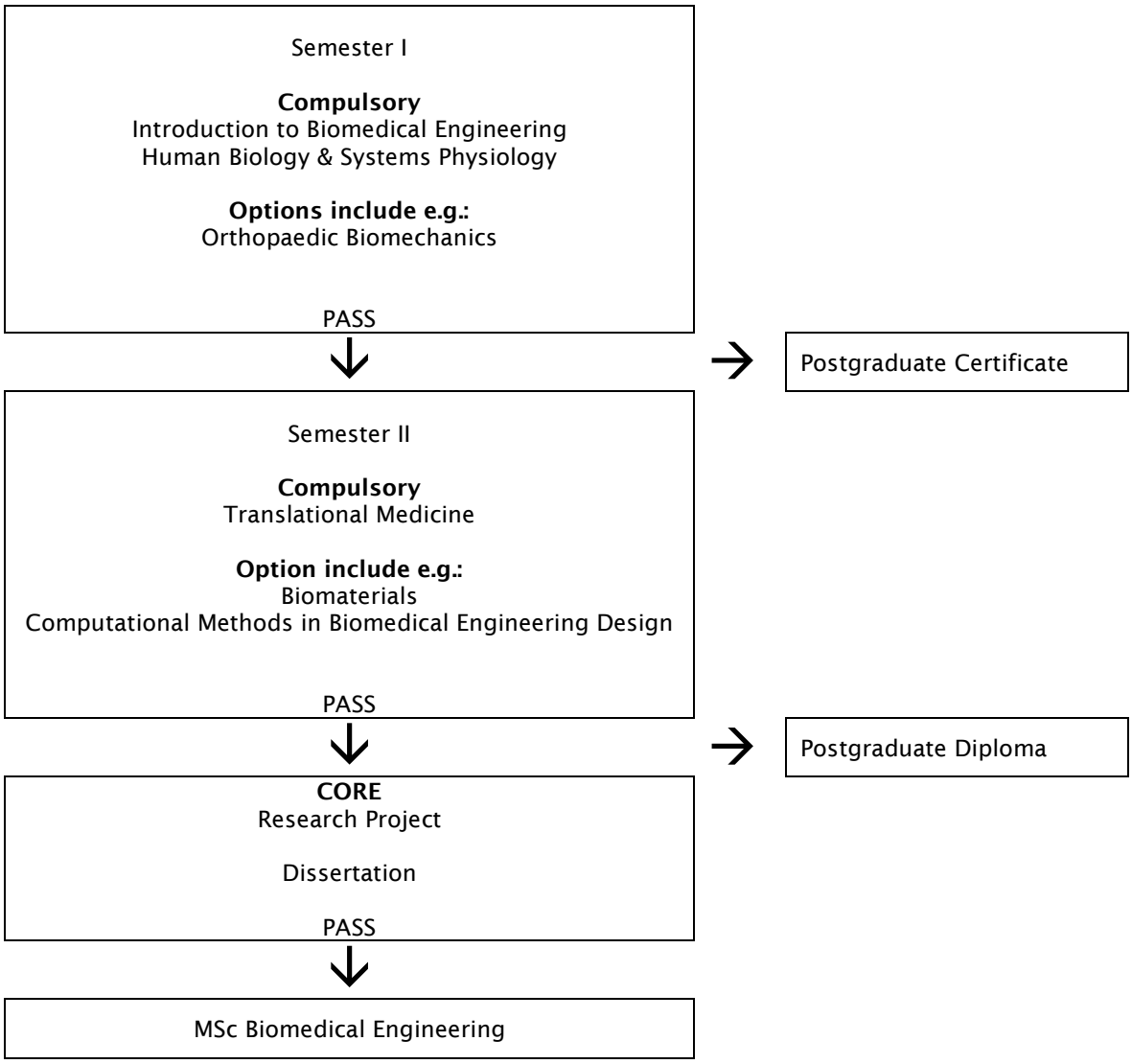
External examiners do not have a direct role in determining results for individual students, and students wishing to discuss their own performance in assessment should contact their personal tutor in the first instance.

Please note: This specification provides a concise summary of the main features of the programme and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if s/he takes full advantage of the learning opportunities that are provided. More detailed information can be found in the programme handbook (or other appropriate guide) or online at http://www.southampton.ac.uk/studentservices/academic-life/faculty-handbooks.page and at http://www.southampton.ac.uk/engineering/postgraduate/taught_courses/engineering.page

Revision History
20.10.2015, 12.11.2015, 17.12.2015, 19.01.2016
Updated textual revisions– MH/CQA - May 2016
Updated textual revisions – CQA October 2016
Updated textual revisions – CQA January 2017, May 2017
Updated to reflect 201819 version and removal of Admissions Criteria – CQA March 2018
Updated Faculty name to Faculty of Engineering and Physical Sciences July 2018

Appendix 1:

Programme Structure Diagram



The taught component of the MSc consists of a number of compulsory modules plus option modules chosen to total 60 ECTS points (120 CATS), at least 45 ECTS points (90 CATS) of which must be at level 7 (taught modules for MSc). The research project and dissertation are equivalent to 30 ECTS points (60 CATS) at level 7 (Masters).

Where optional modules have been specified, the following is an indicative list of available optional modules, which are subject to change each academic year. Please note in some instances modules have limited spaces available.

The list below provides preferential examples (but is not restricted to these) for the choice of option modules with an indication for which focus theme the modules would be suitable. The list reflects modules offered in 2018-19, and is subject to minor alteration from year to year. Please note that due to e.g. timetabling restrictions not all combinations of module choices might be possible.

Please be advised that your choice of option modules is subject to confirmation by the Programme Lead.

Module Code	Module Title	ECTS/CATS	Semester	Level	Focus themes*				
					MS	CV	IM	DS	AU
SESM3033	Orthopaedic Biomechanics	7.5/15	1	6	x				
FEEG3001	Finite Element Analysis in Solid Mech.	7.5/15	1	6	x	x	x		
SESM3030	Control and Instrumentation	7.5/15	1	6	x	x		x	
FEEG3004	Human Factors in Engineering	7.5/15	1	6	x			x	
SESG3024	Manufacturing and Materials	7.5/15	1	6	x	x	x	x	
SESM3028	Biomaterials	7.5/15	2	6	x	x	x	x	
SESM3032	Heat Transfer and Applications	7.5/15	2	6		x			
FEEG6002	Advanced Computational Methods I	7.5/15	1	7	x	x		x	
SESM6034	Advanced Electrical Systems	7.5/15	2	7				x	
SESM6036	Biomedical Implants and Devices	7.5/15	1	7		x		x	
MATH6141	Numerical Methods	7.5/15	1	7	x	x			
SESG6040	Failure of Materials and Components	7.5/15	2	7	x	x			
SESG6035	Advanced Sensors and Condition Monitoring	7.5/15	1	7	x			x	
FEEG6010	Advanced Finite Element Analysis	7.5/15	2	7	x	x			
FEEG6009	Design Search and Optimisation	7.5/15	2	7	x	x			
SESM6038	Computational Methods in Biomedical Engineering Design	7.5/15	2	7	x	x			
SESA6066	Biological Flow	7.5/15	2	7		x			
ISVR6138	Biomedical Application of Signal and Image Processing	7.5/15	2	7		x	x	x	x
ISVR6139	Active Control	7.5/15	2	7	x			x	
ISVR3061	Human Responses to Sound and Vibration	7.5/15	2	7	x				x
ELEC3201	Robotic Systems	7.5/15	1	6	x				
ELEC6213	Image Processing	7.5/15	2	7	x	x	x		x
ELEC6205	Bionanotechnology	7.5/15	1	7		x		x	
ELEC6212	Biologically Inspired robotics	7.5/15	2	7	x				
ELEC6227	Medical Electrical & Electronic Technologies	7.5/15	2	7				x	
NATS6008	Biomedical Spectroscopy and Imaging	7.5/15	2	7	x	x	x	X	
AUDI6009	Physiology and Psychology of Hearing	7.5/15	1	7					x
AUDI6010	Rehabilitation of Auditory Disorders	7.5/15	1	7					x
AUDI6006	Clinical Audiology 1	7.5/15	1	7					x
AUDI6008	Assessment and Management of Vestibular Disorders	7.5/15	2	7					x
AUDI6012	Fundamentals of Auditory Implants	7.5/15	2	7					x

*MS: Musculoskeletal; CV: Cardiovascular; IM: Imaging; DS: Diagnostic Systems; AU: Audiology

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Appendix 2:

Learning outcomes and Assessment Mapping

				Learning Outcome										Methods of Assessment							
Module Code	Module Title	Level	ECTS Points	LO_1	LO_2	LO_3	LO_4	LO_5	LO_6	LO_7	LO_8	LO_9	LO_10	Exam	Essay	Laboratory	Report	Presentation	Assessed Problems and Case Studies	In-class Test	Other
ISVR6144	Introduction to Biomedical Engineering	7	7.5	•	•	•		•	•	•	•	•	•		100%						
MEDI6226	Human Biology & Systems Physiology	7	7.5	•							•		•	100%							
MEDI6219	Translational Medicine	7	7.5		•				•	•	•	•	•		80%			20%			
FEEG6012	MSc Project	7	30		•	•	•	•		•	•	•	•				90%	10%			
SESM3033	Orthopaedic Biomechanics	6	7.5	•	•		•		•		•	•	•	75%	25%						
FEEG3001	Finite Element Analysis in Solid Mechanics	6	7.5	•							•	•		80%			20%				
SESM3030	Control and Instrumentation	6	7.5	•			•				•	•		70%	20%	10%					
FEEG3004	Human Factors in Engineering	6	7.5	•		•	•		•	•	•	•			100%						
SESG3024	Manufacturing and Materials	6	7.5	•							•	•		70%			20%				10%
SESM3028	Biomaterials	6	7.5	•	•		•	•	•	•	•	•	•	75%	25%						
SESM3032	Heat Transfer and Applications	7	7.5	•							•	•		70%			30%				
FEEG6002	Adv Computational Methods I	7	7.5	•			•				•	•			50%						50%
SESM6034	Advanced Electrical Systems	7	7.5	•			•				•	•		70%	30%						
SESM6036	Biomedical Implants and Devices	7	7.5	•	•	•		•	•	•	•	•	•	40%			60%				
MATH6141	Numerical Methods	7	7.5	•							•	•		60%						10%	30%
SESG6040	Failure of materials and components	7	7.5	•							•	•		80%			20%				
SESG6035	Advanced Sensors and Condition Monitoring	7	7.5	•							•	•		65%			35%				
FEEG6010	Advanced Finite Element Analysis	7	7.5	•							•	•		40%					60%		
FEEG6009	Design Search and Optimisation	7	7.5	•							•	•		50%			50%				
SESM6038	Computational Methods in Biomedical Engineering Design	7	7.5	•	•	•	•	•	•	•	•	•	•		100%						
SESA6066	Biological Flow	7	7.5	•							•	•		100%							
ISVR6138	Biomedical Application of Signal and Image Processing	7	7.5	•	•	•	•	•		•	•	•	•	50%	50%						
ISVR6139	Active Control	7	7.5	•			•				•	•			70%			30%			
ISVR3061	Human Responses to Sound and Vibration	7	7.5	•	•	•	•		•		•	•			100%						
ELEC3201	Robotic Systems	6	7.5	•							•	•		75%							25%
ELEC6213	Image Processing	7	7.5	•							•	•		70%		30%					
ELEC6205	Bionanotechnology	7	7.5	•							•	•		70%			30%				
[illegible]	[illegible]	[illegible]	[illegible]											[illegible]			[illegible]				
ELEC6212	Biological inspired robotics	7	7.5	•							•	•									100%
ELEC6227	Medical Electrical & Electronic Technologies	7	7.5	•							•	•					100%				
NATS6008	Biomedical Spectroscopy and Imaging	7	7.5	•	•		•	•			•	•		70%	15%			15%			
AUDI6009	Physiology and Psychology of Hearing	7	7.5	•			•				•	•			100%						
AUDI6010	Rehabilitation of Auditory Disorders	7	7.5	•	•					•	•	•		100%							
AUDI6006	Clinical Audiology 1	7	7.5	•						•	•	•	•	75%							25%
AUDI6008	Assessment and Management of Vestibular Disorders	7	7.5	•						•	•	•	•	50%			50%				
AUDI6012	Fundamentals of Cochlear Implantation	7	7.5	•	•	•	•			•	•	•	•		100%						

Appendix 3
Additional Costs

Students are responsible for meeting the cost of essential textbooks, and of producing such essays, assignments, laboratory reports and dissertations as are required to fulfil the academic requirements for each programme of study. In addition to this, students registered for this programme typically also have to pay for the items listed in the table below.

In some cases you'll be able to choose modules (which may have different costs associated with that module) which will change the overall cost of a programme to you. Details of such costs will be listed in the Module Profile. Please also ensure you read the section on additional costs in the University's Fees, Charges and Expenses Regulations in the University Calendar available at www.calendar.soton.ac.uk.

Main Item	Sub-section	PROGRAMME SPECIFIC COSTS
Approved Calculators		Students may use calculators in the examination room only as specified by the University and as permitted by the rubric of individual examination papers. The University specifies permissible models from time to time and these may be purchased from any source.
Stationery		You will be expected to provide your own day-to-day stationery items, e.g. pens, pencils, notebooks, etc).
Textbooks		Where a module specifies core texts these should generally be available on the reserve list in the library. However due to demand, students may prefer to buy their own copies. These can be purchased from any source. Some modules suggest reading texts as **optional** background reading. The library may hold copies of such texts, or alternatively you may wish to purchase your own copies. Although not essential reading, you may benefit from the additional reading materials for the module.
Equipment and Materials	Design equipment and materials:	We provide a wide range of resources to support project based modules and activities and these will allow you to complete your assessed exercises to the highest standard. However, you may wish to customise your project by purchasing additional resource e.g. alternative manufacturing materials, electronic components, etc. You may also incur additional costs for printing e.g. large format drawings.
Printing and Photocopying Costs		In some cases, coursework and/or projects may be submitted electronically. Where it is not possible to submit electronically students will be liable for printing costs. Students are expected to

Main Item	Sub-section	PROGRAMME SPECIFIC COSTS
		cover the costs associated with the printing of drawings and graphic presentations. These are typically expected to be of the order of £20 - 50 per student.
Visits to the Anatomy Laboratory and Biomedical Imaging Unit at Southampton General Hospital and to the Genomics Centre in the Wessex Investigational Sciences Hub laboratory (WISH Lab).		You will be expected to cover the cost of travel.
Although not foreseen and unlikely at the time of writing, we cannot exclude a requirement to travel between Highfield and SGH sites for specific lectures in modules or individual seminars.		You will be expected to cover the cost of travel
In relation to project work we cannot exclude a requirement to travel between Highfield and SGH sites.		You will be expected to cover the cost of travel
	Disclosure and Barring Certificates or Clearance	We cannot categorically rule out the necessity to perform Disclosure and Barring Service (DBS) check in relation to your MSc Project (i.e. criminal records check (Enhanced with list checks). In the rare conditions under which a check would be necessary you might be required to cover the cost.