Quality Assurance

Masters, Postgraduate Diploma, Postgraduate Certificate in Biomedical Engineering 2018-19 onwards

Programme Specification: Postgraduate

Information for students: the programme specification is the definitive document summarising the structure and content of your degree programme. It is reviewed and updated every year as part of Keele's Curriculum Annual Review and Development process. The document aims to clarify to potential and current students what you can expect from the study of the subject over the course of your programme.

Names of programme(s) and award title(s)	MSc Biomedical Engineering PGDip Biomedical Engineering PGCert Biomedical Engineering
Mode of study	Full time / part time
Framework of Higher Education Qualification (FHEQ) level of final award	Level 7
Duration:	One year full time / two years part time

Details of professional, statutory and regulatory body (PSRB) (If appropriate):
MSc is accredited by the Institute for Physics and Engineering in Medicine.
http://www.keele.ac.uk/qa/professionalstatutoryregulatorybodies/

External Examiner(s) names: http://www.keele.ac.uk/qa/externalexaminers/

1. What is the philosophy of the Programme?

The Masters in Biomedical Engineering at Keele was established in 1999 in partnership with Biomedical Engineering and Medical Physics at the University Hospital of North Staffordshire (UHNS). Restructuring since then has seen the course brought under the auspices of the Keele Medical School and the Research Institute for Science and Technology in Medicine (ISTM). There is thus a strong clinical background and history to the department that forms the foundation, alongside the research-focussed ISTM through which most of the teaching is delivered.

The objectives of the programme are to:

- provide postgraduate-level education leading to professional careers in biomedical engineering in industry, academia and a wide range of healthcare establishments such as medical organisations, medical research institutions and hospitals;
- provide an opportunity for in-depth research into specialist and novel areas of biomedical and clinical engineering;
- expose students to practical work in a hospital environment with hands-on knowledge of patient care involving technological developments at the forefront of the field;
- introduce students to exciting new fields such as regenerative medicine and novel technologies for physiological monitoring and diagnostics.

The course runs alongside an MSc course in Cell and Tissue Engineering, giving students unique access to specialists in that field, as well as more traditional topics in biomedical engineering such as physiological and functional measurement, medical device design and applications, and medical equipment management.

On successful completion of the programme, students can expect to be able to:

1. Apply core engineering and physical principles to solve clinically-relevant problems at the forefront of Biomedical Engineering;
2. Display a systematic understanding of physiological and biomedical measurement and related quality management issues;
3. Use a range of ICT tools such as spreadsheets and programming languages to interpret and analyse data, including the use of modelling and statistics;
4. Display a systematic understanding of the working principles behind the maintenance and management of medical equipment and associated safety procedures;
5. Carry out a research project, including planning, implementation, and documentation of methods, findings and implications.
6. Challenge, evaluate, modify, and develop the theory and practise surrounding Biomedical Engineering including social and ethical aspects.
7. Demonstrate skills associated with self-management and an ability to synthesize and evaluate information obtained from diverse sources and settings.

The goal of the course is to provide multi-disciplinary Masters level postgraduate training in Biomedical Engineering to prepare students for future employment across a range of technical and healthcare environments including academic research, medical devices industry, and hospital and other healthcare environments. This philosophy underpins the professional accreditation of the course by the Institute for Physics and Engineering in Medicine.

Engagement with this programme will enable you to further develop your intellectual, personal and professional capabilities. At Keele, we call these our ten Graduate Attributes and they include independent thinking, synthesizing information, creative problem solving, communicating clearly, and appreciating the social, environmental and global implications of your studies and activities. Whilst you will undoubtedly have already developed these skills and abilities to varying degrees, such existing capabilities can always be deepened and enriched. Our educational programme and learning environment is designed to help you to develop further as a well-rounded postgraduate who is capable of making a positive and valued contribution in a complex and rapidly changing world, whichever spheres of life you engage in during and after your studies at Keele.

Please refer to the programme webpages for a statement of how you can achieve the Keele Graduate Attributes through full engagement in the programme and other educational opportunities at Keele. Further information about the Keele Graduate Attributes can be found here: http://www.keele.ac.uk/journey/

2. How is the Programme taught?

Teaching is delivered primarily through lectures and seminars, and associated web-based Virtual Learning Environment materials. These are accompanied by tutorials, laboratory-based practical sessions, and research seminars by internationally and nationally known scientists, engineers and clinicians. In addition, students attend workshops and site visits, participate in problem-solving scenarios, and receive dedicated research project

supervision. Reflective of postgraduate education, self-directed learning is also a major component during both full-time and part-time studies.

The diversity of learning and teaching methods encountered by students supports development of independent learning skills and critical thinking as well as the acquisition of subject specific knowledge. This enables students to meet the range of intended learning outcomes covering specific engineering and scientific principles and demonstration of independent research and problem solving.

There are 12 module leads (all with PhDs), plus several other key staff members who have substantive teaching roles on the course. Three are Fellows of the Higher Education Academy.

3. What is the Structure of the Programme?

The programme consists of 2 entry-level conversion modules of 15 credits each (Engineering for Medical Applications for those without an engineering background, and Human Anatomy and Physiology for those without a medical science background), 5 15 credit core modules in areas of medical engineering, and 2 elective 15 credit modules. Finally, there is a 60-credit dissertation project in the third semester.

Module code	Module title	FHEQ Level	Credit value	Compulsory (C) or optional (O)	Prerequisites	Learning Outcome
MTE-40022	Bioreactor & Growth Environment	7	15	O	Bachelors degree (or equivalent proof of training) in an approved discipline	1,6,7
MTE-40023	Biomechanics	7	15	O	Basic knowledge of trigonometry and (vector) calculus	1,3,6
MTE-30001	Human Physiology and Anatomy	6	15	C	Compulsory for students entering the Biomedical Engineering course who cannot demonstrate previous knowledge of anatomy	3,6
MTE-30003	Engineering for Medical Applications	6	15	C	Compulsory for students entering the Biomedical Engineering course who cannot demonstrate previous knowledge of engineering	1,3,5
MTE-40025	Molecular Techniques: Applications in Tissue Engineering	7	15	O	Bachelors degree (or equivalent proof of training) in an approved discipline	2,6
MTE-40026	Physiological Measurement	7	15	C	Basic knowledge of physics or electronics. In addition completion of undergraduate module in human physiology and anatomy. If not, the student will be required to attend the module on Physiology and Anatomy which will runs parallel with the module.	1,2
MTE-40028	Stem Cells: Types, Characteristics and Applications	7	15	O	Bachelors degree (or equivalent proof of training) in an approved discipline	1,6,7
MTE-40029	Medical Equipment and Technology	7	15	C	Appropriate competence in mathematics, including algebra (e.g. elementary determinants, matrices and vectors), simple	4,7

	Services Management				differential and integral calculus and trigonometry	
MTE-40030	Nanomagnetics in Nanomedicine	7	15	O	Bachelors degree in Physics, Engineering, Biomedical Science, Materials Science or related discipline	1,6
MTE-40031	Biomedical Signal Processing and Modelling	7	15	C	Knowledge of basic mathematics including algebra, trigonometry, differentiation and integration	1,2,3
MTE-40033	Cell and Tissue Engineering	7	15	O	Bachelors degree (or equivalent proof of training) in an approved discipline	1,7
MTE-40034	Cell Biomechanics	7	15	O	Bachelors degree (or equivalent proof of training) in an approved discipline	1,6,7
MTE-40036	Biomaterials	7	15	O	Bachelors degree (or equivalent proof of training) in an approved discipline	1,2,6
MTE-40037	Introduction to Medical Imaging	7	15	O	Bachelors degree (or equivalent proof of training) in an approved discipline	1,2,3,4
MTE-40038	Medical Device Design Principles	7	15	C	Appropriate mathematical competence, including algebra (e.g. elementary determinants, matrices and vectors), elementary differential and integral calculus and trigonometry	1,6,7
MTE-40039	Experimental Research Methodology	7	15	C		6,7
MTE-40015	Project – Medical Technology (dissertation)	7	60	C for Masters		5,6,7

MSc Biomedical Engineering *180 credits*

PGDip Biomedical Engineering *120 credits*

PGCert Biomedical Engineering *60 credits*

4. How is the Programme assessed?

A variety of assessment methods are used across the programme. These include coursework-based essays, written examinations, reports on laboratory-based practicals, essay-based examination, interactive oral presentations, and a dissertation based on the student research project. Clear marking guidelines accompany each mode of assessment where a mark of 50% or above is required to achieve a pass. Through adoption of the above assessment methods students are given an opportunity to display achievements spanning knowledge and problem-solving abilities, communication and research skills, development of practical skills, and critical thinking.

Formative assessment occurs in a continuous process driven by lecturer-led discussion sessions, one-on-one mentoring, and practice presentations and posters. Elements of peer feedback are also used in a formative way.

5. What are the typical admission requirements for the programme?

We welcome applications from people with a first or second-class degree (or equivalent) in engineering, physical or life sciences, medicine, or professions allied to medicine. We also welcome enquiries from people with other professional qualifications acceptable to the University. For international applicants, an English language IELTS score of 6.5 or above is required.

6. How are students supported on the programme?

Support is provided throughout the study period with a broad range of student-centred activities. Initial support is provided during the Induction Week where orientation, study skills introductions, and welcoming events are held, led by the course and the university. Accompanying these events the course handbook, which students receive on their first day, details key course information, module structure, module content, assessment formats, and relevant University regulations.

All students are allocated a personal tutor at the beginning of the course. This offers an individual resource for assistance with both academic and personal issues where detrimental impacts on academic outputs can develop. Students are invited to meet with personal tutors twice a semester unless special needs require a greater frequency. More information is available in the University's Personal Tutoring Policy document. Students for whom English is not their first language are offered language classes, facilities and services by the University's Language Centre. In addition to credit-bearing postgraduate modules on English for academic study, students also have access to one-to-one tutorials for individual help and advice, and to a wealth of resources for self-study and practice. Incoming non-native English speaking students take a diagnostic English language assessment during their first week at Keele, after which personalised recommendations for modules or other forms of support are made.

7. Learning Resources

This course is based within the Institute of Science and Technology in Medicine at the Guy Hilton Research Centre. The administration team are based on Keele's main campus within the David Weatherall Building. Teaching delivery will be held on Keele Campus, the Royal Stoke University Hospital site, and at the Guy Hilton Research Centre.

Students on this award are Keele students and have access to all the facilities that title conveys. In particular students have access to a Computer Room at the Guy Hilton Research Centre and extensive IT facilities on the main campus; the Health Library on the hospital site, and the University library located on the main campus. The main library, for example, houses study spaces that can be used for group work. On-line, physical and electronic data sources area available through Keele University Library. In addition, students on this award may use the Health Library based at the Royal Stoke University Hospital.

8. Other learning opportunities

Opportunities exist for research projects to be performed at other institutions either by prior arrangement or through regular offerings at the Robert Jones and Agnes Hunt Hospital, Oswestry and the Royal Stoke University Hospital.

9. Quality management and enhancement

The course director assumes overall management responsibility for the programme and is accountable to the Director of Postgraduate Programmes and the School of Medicine Postgraduate Learning & Teaching Committee, with student representation.

In addition to:
Student feedback
Module evaluation questionnaires
Regular module leaders' meetings

Meetings between the programme leads of the cognate courses (Cell and Tissue Engineering and Biomedical Engineering).
Annual Examinations Board
Annual External Examiner Reports
Curriculum Annual Report to the University
School of Medicine staff development programme

Programme leads report bimonthly to the PGLTC in the School of Medicine, and annually module leaders' meet and review teaching effectiveness and plan changes. This feeds into the university's CARD process. Further levels of accountability and course development are achieved through regular student feedback, module evaluation questionnaires, Examinations Boards, External Examiners reports, and ongoing staff development programmes.

A student representative attends PGLTC meetings, and coordinates student feedback from his/her peer group. Module evaluation forms are collected at the end of each module and the comments addressed by module leads.

10. The principles of programme design

Programme has been designed according to University's Learning and Teaching Assessment Strategies, and in accordance with the requirements from the professional body, the Institute for Physics and Engineering in Medicine. These are based on learning outcomes defined by the UK Standard for Professional Engineering Competence.

11. Programme Version History

Version History	**Date**	**CHANGES / NOTES**
Date first created	01-02-2012	Date taken from previous document.
Revision history		**Update on module lead numbers** **Removal of MTE-40032 Biosensor** This elective is to be removed as the member of staff with the expertise is leaving (also historically very poor uptake) NB this has only very recently come to light- on advice from QA office I have removed it from the programme specification and will follow up with appropriate programme modification form
Date approved	21.9.17	PG LTC
FLTC approval	October 2017	