Programme Specification: Post Graduate Taught

For Academic Year 2024/25

1. Course Summary

Names of programme and award title(s)	MSc Medical Engineering (Biomedical Engineering) MSc Medical Engineering (Cell and Tissue Engineering for Regenerative Medicine) MSc Medical Engineering (Design and Innovation)
Award type	Taught Masters
Mode of study	Full-time Part-time
Framework of Higher Education Qualification (FHEQ) level of final award	Level 7
Normal length of the programme	1 year full-time or 2 years part-time
Maximum period of registration	The normal length as specified above plus 3 years
Location of study	Guy Hilton Research Centre Keele Campus
Accreditation (if applicable)	Biomedical Engineering stream and Medical Engineering Design and Innovation accredited by Institute for Physics and Engineering in Medicine (IPEM)
Regulator	Office for Students (OfS)
Tuition Fees	**UK students:** Full-time fee for 2024/25 is £12,700 Part-time fee for 2024/25 is £7,000 per year* **International students:** Full-time fee for 2024/25 is £24,100

How this information might change: *Please read the important information at http://www.keele.ac.uk/student-agreement/. This explains how and why we may need to make changes to the information provided in this document and to help you understand how we will communicate with you if this happens.*

** We reserve the right to increase fees in subsequent years of study by an inflationary amount. Please refer to the accompanying Student Terms & Conditions for full details. Further information on fees can be found at http://www.keele.ac.uk/studentfunding/tuitionfees/*

2. Overview of the Programme

The Master of Science degree (MSc) in Medical Engineering provides multi-disciplinary training in Biomedical Engineering (BME), Cell and Tissue Engineering for Regenerative Medicine(CTE), and Medical Engineering Design and Innovation (MED), in line with enhancing graduate career prospects. This involves building upon existing skills and knowledge and applying them to the above key areas, particularly to those without previous specific engineering training.

The programme has its origins in 1999 (MSc BME and MSc CTE), as Postgraduate Taught provision in Medicine at

the Institute of Science & Technology in Medicine (ISTM), in partnership with Biomedical Engineering and Medical Physics at the University Hospital of North Staffordshire, now named UHNM. Restructuring since then has seen the course brought under the auspices of School of Pharmacy and Bioengineering within the Faculty of Medicine and Health Sciences in 2019 and then within the School of Life Sciences (SoLS) within the Faculty of Natural Sciences in 2024. Advances in research and the changing landscape of medicine for the 21st century has evolved the programme to include latest biological advances and wider engineering developments, and a focus on entrepreneurship and industry-relevant practical skills.

Engagement to this postgraduate programme will enable participants to further develop their intellectual, personal and professional capabilities. At Keele, we call these our Graduate Attributes and they include independent thinking, synthesizing information, creative problem solving, communicating clearly, and appreciating the social, environmental and global implications of their studies and activities. Whilst participants will undoubtedly have been exposed to these skills and abilities to varying degrees, our programmes offer opportunities where they can be deepened, enriched and focused with these core principles in mind. This creates 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 they engage in during and after their studies at Keele.

Current teaching takes place in the Guy Hilton Research Centre and, combined with the strong clinical background and history of the departmental research, learners are exposed to a working research environment throughout the program delivery, that gives our programme a unique complementary experience of learning and research with peers during their studies.

3. Aims of the programme

The broad aims of the programme are to enable you to:

- enter professional careers in industry, academia and a wide range of healthcare establishments, such as medical organisations, medical research institutions, hospitals, regulatory bodies and other health-related organisations;
- develop in-depth research into novel specialist medical and biological 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, diagnostics and implant technology.

With three specialist but complementary streams, students will have unique access to specialists in each field, as well as access to more traditional topics in medical engineering such as devices for physiological and functional measurement, manufacturing, medical materials, biomechanics and medical device design and applications, or, in biological engineering such as stem cell biology, biomaterials, growth environments and disease biology and genetics.

The educational aims of the programme are designed primarily with student satisfaction at the forefront. Within this you can expect an environment where participants are motivated to develop academically, personally, and professionally. Teaching is designed to provide a multidisciplinary perspective that encourages professional development beyond current specialities and growth into new areas. An area of particular importance to our course is training in the development of critical and evaluative thinking alongside refinement of writing and communication skills for application in individual research and team working scenarios. Through the development of these new and essential skill sets you can expect to feel comfortable transferring scientific knowledge from theory into practice and to empower life-long learning.

4. What you will learn

The intended learning outcomes of the programme (what students should know, understand and be able to do at the end of the programme), can be described under the following headings:

- Subject knowledge and understanding
- Subject specific skills
- Key or transferable skills (including employability skills)

Subject knowledge and understanding

Successful students will be able to demonstrate knowledge and understanding of:

- core engineering, physical and biological principles to solve clinically-relevant problems at the forefront of Medical and Biological Engineering (B,C,M).
- physiological and biological measurements and related quality management issues (B,C,M).
- how to challenge, evaluate, modify, and develop the theory and practice surrounding Medical and Biological Engineering including social and ethical aspects (B,C,M).

- an understanding of statistics and its role in research methods and design quality (B,C,M).
- technologies in their chosen pathway and will develop towards the point where students will comfortably assist in the process of developing research projects, new devices and new solutions (B,C,M)
- the working principles behind the maintenance and management of medical equipment and associated safety procedures (B,M).
- design methodologies and modelling techniques commensurate with medical device design (B,M).
- the generic, contextual principles supporting effective medical device design (B,M).
- advanced biomedical signal processing and analysis to achieve a recognisable output (B)
- the core biological and engineering principles in regenerative medicine including stem cell, cell and gene therapies (C).
- specific in-depth regulatory and manufacturing quality techniques for new medical devices (M).

B - Biomedical Engineering stream

C - Cell and Tissue Engineering for Regenerative Medicine stream

M - Medical Engineering Design and Innovation

Subject specific skills

Successful students will be able to:

- use a range of ICT tools such as spreadsheets and programming languages to interpret and analyse data, including the use of modelling and statistics;
- carry out a research project, including planning, implementation, and documentation of methods, findings and implications.
- demonstrate the critical awareness of advanced technologies in associated Medical and Biological Engineering.
- display the independent working and problem-solving capacity in the research projects alongside critical literature review and data interpretation.
- identify personal and professional requirements to support lifelong learning.

Key or transferable skills (including employability skills)

Successful students will be able to:

- Demonstrate skills associated with self-management and an ability to synthesize and evaluate information obtained from diverse sources and settings.
- Develop the capacity to transfer scientific knowledge into practical application in current studies and subsequent career choice.
- Work in small groups to share best practice, provide mutual support and promote an environment of active learning.
- Demonstrate innovation and originality in the understanding and application of new knowledge.
- Demonstrate self-direction and dedication to independent learning.
- Communicate personal findings and conclusions to specialist and non-specialist listeners using a variety of methods such as verbal presentations, written documents and information technology.
- Act autonomously in implementing and managing activities.

Keele Graduate attributes

The Keele Graduate Attributes are the qualities (skills, values and mindsets) which you will have the opportunity to develop during your time at Keele through both the formal curriculum and also through co- and extra-curricular activities (e.g., work experience, and engagement with the wider University community such as acting as ambassadors, volunteering, peer mentoring, student representation, membership and leadership of clubs and societies). Our Graduate Attributes consist of four themes: **academic expertise, professional skills, personal effectiveness, and social and ethical awareness**. You will have opportunities to engage actively with the range of attributes throughout your time at Keele: through your academic studies, through self-assessing your own strengths, weaknesses, and development needs, and by setting personal development goals. You will have opportunities to discuss your progress in developing graduate attributes with, for example, Academic Mentors, to prepare for your future career and lives beyond Keele.

5. How is the programme taught?

Learning and teaching methods used on the programme vary according to the subject matter and level of the

module. They include the following:

Teaching is delivered primarily through seminars, group work, lectures and associated web-based Virtual Learning Environment materials. These are accompanied by tutor-led tutorials, laboratory-based practical sessions, seminars by nationally and internationally known scientists or engineers or clinicians, workshops, problem-solving scenarios, dedicated research project supervision and site-visits. Reflective of postgraduate education self-directed learning is also a major component during both full-time and part-time studies. The programme also integrates development and execution of entrepreneurial skills, particularly for the field of Regenerative Medicine. 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, relevant to the stream.

Evaluation of learning outcomes is met through a broad range of assessments. These include coursework-based essays, reports on laboratory-based practical experiments, written examinations, interactive oral presentations, and a dissertation based on the student research project. This enables students to meet the range of intended learning outcomes covering specific principles related to the streams, and demonstration of independent research and problem solving.

Apart from these formal activities, students are also provided with regular opportunities to talk through particular areas of difficulty, and any special learning needs they may have, with their Academic Mentors or module lecturers on a one-to-one basis.

6. Teaching Staff

Please add a statement about teaching staff on the programme

There are module leads plus several other key staff members who have substantive teaching roles on the course. All teaching is managed and delivered by academic staff, with Doctorate-level training, as well as key clinical practitioners. Many staff members are Fellows of the Higher Education Academy ensuring a high standard of teaching.

The University will attempt to minimise changes to our core teaching teams, however, delivery of the programme depends on having a sufficient number of staff with the relevant expertise to ensure that the programme is taught to the appropriate academic standard.

Staff turnover, for example where key members of staff leave, fall ill or go on research leave, may result in changes to the programme's content. The University will endeavour to ensure that any impact on students is limited if such changes occur.

7. What is the structure of the programme?

The academic year runs from September to September and is divided into three semesters. For the January intake (students starting from Semester 2), students will proceed as per the module and assessment schedule in the respective semester. The number of weeks of teaching will vary between modules, but you can generally expect to attend scheduled teaching sessions between the end of September and mid-December, and from mid-January to the end of April. Our degree courses are organised into modules. Each module is usually a self-contained unit of study and each is usually assessed separately with the award of credits on the basis of 1 credit = 10 hours of student effort. An outline of the structure of the programme is provided in the tables below.

There are two types of module delivered as part of your programme. They are:

- Compulsory modules - a module that you are required to study on this course;
- Optional modules - these allow you some limited choice of what to study from a list of modules.

The programme requires 180 credits for the Master's qualification. The student must gain 120 credits from taught modules which consist of at least five compulsory modules supplemented by a choice of up to three optional modules (stream dependent). Students must undertake a research project and submit a dissertation with 60 credits.

The programme consists of two entry-level (level 6) 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 biological/medical science background, to take. Level 6 module credits are included towards the total 180 credit requirement for the MSc degree but do not contribute to the numerical classification of the degree (e.g. distinction or merit).

All level 7 modules presuppose a basic level of engineering or biology from previous studies and student selection of option modules will be discussed for suitability before module enrolment.

Note of module prerequisites:

- MTE-30001 Human Physiology and Anatomy: Compulsory for students entering the Biomedical Engineering/Cell and Tissue Engineering for Regenerative Medicine routes who cannot demonstrate previous knowledge of physiology and anatomy
- MTE-30003 Engineering for Medical Applications: Compulsory for students entering the Biomedical Engineering/Medical Engineering Design & Innovation route who cannot demonstrate previous knowledge of engineering
- MTE-40023 Biomechanics: Basic knowledge of trigonometry and (vector) calculus
- MTE-40026 Physiological Measurement: Basic knowledge of physics or electronics. In addition, completion of undergraduate module (level 6) in human physiology and anatomy. If not, the student will be required to attend the module on Human Physiology and Anatomy and/or Engineering for Medical Applications.
- MTE-40029 Medical Equipment and Technology Services Management: Bachelor's degree (or equivalent proof of training) in an approved discipline with appropriate competence in mathematics
- MTE-40031 Biomedical Signal Processing and Modelling: Knowledge of basic mathematics including algebra, trigonometry, differentiation and integration
- MTE-40028 Stem Cells: Types, Characteristics and Applications: Bachelors degree (or equivalent proof of training) in an approved discipline involving cell biology.
- MTE-40055: Students taking this module as optional module, should also take associated module MTE-40028 (Stem Cells) as a supplementary optional module or show proof of knowledge in stem cells at Level 7 as training and concepts in these modules are connected.
- LSC-40133: Basic knowledge of cell biology.

A summary of the credit requirements is as follows:

Biomedical Engineering/Cell and Tissue for Regenerative Medicine Stream

Year	Compulsory	Optional
Level 7	150	30

Medical Engineering Design & Innovation Stream

Year	Compulsory	Optional
Level 7	135	45

Module Lists

Level 7

Biomedical Engineering Stream

Compulsory modules	Module Code	Credits	Period
Medical Devices Design: Design Control Methodologies	MTE-40045	15	Semester 1
Medical Devices Design: Advanced Materials and Manufacturing	MTE-40047	15	Semester 1
Physiological Measurements	MTE-40026	15	Semester 1-2
Experimental Research Methodology	MTE-40039	15	Semester 1-2
Medical Equipment and Technology Services Management	MTE-40029	15	Semester 2
Biomedical Signal Processing and Analysing	MTE-40031	15	Semester 2
Project - medical technology	MTE-40015	60	Semester 3

Optional modules	Module Code	Credits	Period
Green IT	ESC-40047	15	Semester 1
Clean and Green Technologies	ESC-40097	30	Semester 1
Human Physiology and Anatomy	MTE-30001	15	Semester 1
Engineering for Medical Applications	MTE-30003	15	Semester 1
Biomechanics (15 credit module)	MTE-40023	15	Semester 1
Human Physiology and Anatomy	MTE-40024	15	Semester 1
Stem Cells: Types, Characteristics & Applications	MTE-40028	15	Semester 1
Cell and Tissue Engineering	MTE-40033	15	Semester 1
Biotechnology and Omics	PHA-40236	15	Semester 1
Disease Modelling & Therapy for Regenerative Medicine	MTE-40055	15	Semester 1-2
Case Studies in Sustainability	ESC-40095	30	Semester 2
Cancer Bioengineering	LSC-40133	15	Semester 2
Bioreactors and Growth Environments	MTE-40022	15	Semester 2
Nanomagnetics in Nanomedicine	MTE-40030	15	Semester 2
Biomaterials	MTE-40036	15	Semester 2
Medical Devices Design: Regulatory Frameworks	MTE-40049	15	Semester 2
Medical Devices Design: Quality by Design	MTE-40051	15	Semester 2

Cell and Tissue for Regenerative Medicine Stream

Compulsory modules	Module Code	Credits	Period
Experimental Research Methodology	MTE-40039	15	Semester 1-2
Project - medical technology	MTE-40015	60	Semester 3
Bioreactors and Growth Environments	MTE-40022	15	Semester 2
Stem Cells: Types, Characteristics & Applications	MTE-40028	15	Semester 1
Cell and Tissue Engineering	MTE-40033	15	Semester 1
Biomaterials	MTE-40036	15	Semester 2
Disease Modelling & Therapy for Regenerative Medicine	MTE-40055	15	Semester 1-2

Optional modules	Module Code	Credits	Period
Human Physiology and Anatomy (Level 6)	MTE-30001	15	Semester 1
Engineering for Medical Applications (Level 6)	MTE-30003	15	Semester 1
Biomechanics	MTE-40023	15	Semester 1
Human Physiology and Anatomy (Level 7)	MTE-40024	15	Semester 1
Physiological Measurements	MTE-40026	15	Semester 1-2
Medical Equipment and Technology Services Management	MTE-40029	15	Semester 2
Nanomagnetics in Nanomedicine	MTE-40030	15	Semester 2
Biomedical Signal Processing and Analysing	MTE-40031	15	Semester 2
Medical Devices Design: Design Control Methodologies	MTE-40045	15	Semester 1
Medical Devices Design: Advanced Materials and Manufacturing	MTE-40047	15	Semester 1
Medical Devices Design: Regulatory Frameworks	MTE-40049	15	Semester 2
Medical Devices Design: Quality by Design	MTE-40051	15	Semester 2
Biotechnology and Omics	PHA-40236	15	Semester 1
Green IT	ESC-40047	15	Semester 1
Case Studies in Sustainability	ESC-40095	30	Semester 2
Clean and Green Technologies	ESC-40097	30	Semester 1
Cancer Bioengineering	LSC-40133	15	Semester 2

Medical Engineering Design and Innovation stream

Compulsory modules	Module Code	Credits	Period
Experimental Research Methodology	MTE-40039	15	Semester 1-2
Project - medical technology	MTE-40015	60	Semester 3
Medical Devices Design: Design Control Methodologies	MTE-40045	15	Semester 1
Medical Devices Design: Advanced Materials and Manufacturing	MTE-40047	15	Semester 1
Medical Devices Design: Regulatory Frameworks	MTE-40049	15	Semester 2
Medical Devices Design: Quality by Design	MTE-40051	15	Semester 2

Optional modules	Module Code	Credits	Period
Human Physiology and Anatomy (Level 6)	MTE-30001	15	Semester 1
Engineering for Medical Applications (Level 6)	MTE-30003	15	Semester 1
Bioreactors and Growth Environments	MTE-40022	15	Semester 2
Biomechanics	MTE-40023	15	Semester 1
Human Physiology and Anatomy (Level 7)	MTE-40024	15	Semester 1
Physiological Measurements	MTE-40026	15	Semester 1-2
Stem Cells: Types, Characteristics & Applications	MTE-40028	15	Semester 1
Medical Equipment and Technology Services Management	MTE-40029	15	Semester 2
Nanomagnetics in Nanomedicine	MTE-40030	15	Semester 2
Biomedical Signal Processing and Analysing	MTE-40031	15	Semester 2
Cell and Tissue Engineering	MTE-40033	15	Semester 1
Biomaterials	MTE-40036	15	Semester 2
Disease Modelling & Therapy for Regenerative Medicine	MTE-40055	15	Semester 1-2
Biotechnology and Omics	PHA-40236	15	Semester 1
Green IT	ESC-40047	15	Semester 1
Case Studies in Sustainability	ESC-40095	30	Semester 2
Clean and Green Technologies	ESC-40097	30	Semester 1
Cancer Bioengineering	LSC-40133	15	Semester 2

Students may select an option from the diet of L7 modules from across the university but only with the approval of the Course Director and Stream Leads.

Level 7 Stream Requisites

Please note, the order in which you study these semesters will depend upon whether you join the programme in September or January.

- Students joining in September on a full-time programme will study semesters 1, 2 and 3 in sequence.
- Students joining in January on a full-time programme will start the programme in semester 2, then study semester 3, finishing with semester 1.

Part-time students must take all compulsory modules; however Biomedical Engineering and Cell and Tissue for Regenerative Medicine streams have no formal order requirements, and the school will ensure a manageable module load. Medical Engineering Design and Innovation stream requires MTE-40045 Medical Devices Design: Design Control Methodologies and MTE-40047 Medical Devices Design: Advanced Materials and Manufacturing to be taken prior to MTE-40049 Medical Devices Design: Regulatory Frameworks and MTE-40051 Medical Devices Design: Quality by Design.

All routes are required to take Experimental Research Methodology (Semester 1-2).

Students following the Biomedical Engineering stream must take the following compulsory modules: MTE-40045 Medical Devices Design: Design Control Methodologies (semester 1), MTE-40047 Medical Devices Design: Advanced Materials and Manufacturing (Semester 1), MTE-40026 Physiological Measurements (semester 1-2), MTE-40029 Medical Equipment and Technology Services Management (semester 2), MTE-40031 Biomedical Signal Processing and Analysing (semester 2).

Eligibility: Students who cannot demonstrate previous knowledge of engineering must take MTE-30003 Engineering for Medical Applications. Students who cannot demonstrate previous knowledge of Human Physiology and Anatomy must take MTE-30001 Human Physiology and Anatomy.

Part-time students starting in 2023 who have completed MTE-40038 will not have to complete MTE-40045 or MTE-40047 except as option modules. January 2024 students may select MTE-40047 as an elective.

Students following the Cell and Tissue Engineering for Regenerative Medicine stream must take the following compulsory modules: MTE-40028 Stem Cells: Types, Characteristics & Applications (semester 1), MTE-40033 Cell and Tissue Engineering (semester 1), MTE-40055 Disease Modelling & Therapy for Regenerative Medicine (semester 1-2), MTE-40022 Bioreactors and Growth Environments (semester 2), MTE-40023 Biomaterials (semester 2).

Eligibility: Bachelor's degree (or equivalent proof of training) in a relevant discipline; biology subject knowledge is essential. Students who cannot demonstrate previous knowledge of engineering must take MTE-30003 Engineering for Medical Applications.

For January intake (students starting from Semester 2 in January), students taking MTE-40055 will have some of their assessments in their final semester.

Students following the Medical Engineering Design and Innovation stream must take the following compulsory modules: MTE-40045 Medical Devices Design: Design Control Methodologies (semester 1), MTE-40047 Medical Devices Design: Advanced Materials and Manufacturing (Semester 1), MTE-40049 Medical Devices Design: Regulatory Frameworks (semester 2), MTE-40051 Medical Devices Design: Quality by Design (semester 2).

Eligibility: Students who cannot demonstrate previous knowledge of engineering must take MTE-30003 Engineering for Medical Applications. Students who cannot demonstrate previous knowledge of Human Physiology and Anatomy must take MTE-30001 Human Physiology and Anatomy.

Learning Outcomes

The table below sets out what students learn in the programme and the modules in which that learning takes place. Details of how learning outcomes are assessed through these modules can be found in module specifications.

Level 7

The table below sets out what students learn in the programme and the modules in which that learning takes place. Details of how learning outcomes are assessed through these modules can be found in module specifications.

Subject Knowledge and Understanding	
Learning Outcome	**Module in which this is delivered**
Apply core engineering and physical and biological principles to solve clinically relevant problems at the forefront of Medical and Biological Engineering	Stem Cells: Types, Characteristics & Applications - MTE-40028 Nanomagnetics in Nanomedicine - MTE-40030 Biomedical Signal Processing and Analysing - MTE- 40031 Bioreactors and Growth Environments - MTE-40022 Cancer Bioengineering - LSC-40133 Medical Devices Design: Design Control Methodologies - MTE-40045 Disease Modelling & Therapy for Regenerative Medicine - MTE-40055 Biomaterials - MTE-40036 Cell and Tissue Engineering - MTE-40033 Physiological Measurements - MTE-40026 Biomechanics (15 credit module) - MTE-40023 Engineering for Medical Applications - MTE-30003 Medical Devices Design: Advanced Materials and Manufacturing - MTE-40047
Display a systematic understanding of physiological and biomedical measurement and related quality management issues	Medical Devices Design: Advanced Materials and Manufacturing - MTE-40047 Biomaterials - MTE-40036 Physiological Measurements - MTE-40026 Biomedical Signal Processing and Analysing - MTE-40031 Medical Devices Design: Regulatory Frameworks - MTE-40049 Biotechnology and Omics - PHA-40236
Display a systematic understanding of the working principles behind the maintenance and management of medical equipment and associated safety procedures	Medical Devices Design: Advanced Materials and Manufacturing - MTE-40047 Medical Devices Design: Design Control Methodologies - MTE-40045 Medical Equipment and Technology Services Management - MTE-40029 Medical Devices Design: Regulatory Frameworks - MTE-40049

Subject Knowledge and Understanding	
Learning Outcome	**Module in which this is delivered**
Challenge, evaluate, modify, and develop the theory and practice surrounding Medical and Biological Engineering including social and ethical aspects	Bioreactors and Growth Environments - MTE-40022 Biomaterials - MTE-40036 Project - medical technology - MTE-40015 Stem Cells: Types, Characteristics & Applications - MTE-40028 Nanomagnetics in Nanomedicine - MTE-40030 Biomechanics - MTE-40023 Experimental Research Methodology - MTE-40039 Disease Modelling & Therapy for Regenerative Medicine - MTE-40055 Medical Devices Design: Design Control Methodologies - MTE-40045 Biotechnology and Omics - PHA-40236 Medical Devices Design: Advanced Materials and Manufacturing - MTE-40047 Cancer Bioengineering - LSC-40133
Acquire solid knowledge of the core generic principles in regenerative medicine including stem cell, cell and gene therapies	Disease Modelling & Therapy for Regenerative Medicine - MTE-40055 Cell and Tissue Engineering - MTE-40033 Stem Cells: Types, Characteristics & Applications - MTE-40028 Project - Medical Technology - MTE-40015 Biomaterials - MTE-40036 Bioreactors and Growth Environments - MTE-40022 Cancer Bioengineering - LSC-40133
An understanding of statistics and its role in research methods and design quality	Medical Devices Design: Regulatory Frameworks - MTE-40049 Experimental Research Methodology - MTE-40039 Medical Devices Design: Advanced Materials and Manufacturing - MTE-40047 Project - Medical Technology - MTE-40015 Cell and Tissue Engineering - MTE-40033 Physiological Measurements - MTE-40026 Engineering for Medical Applications - MTE-30003
A critical awareness of technologies in their chosen pathway and will develop towards the point where students will comfortably assist in the process of developing research projects, new devices and new solutions	Project - Medical Technology - MTE-40015
Knowledge of the generic, contextual principles supporting effective medical device design	Case Studies in Sustainability - ESC-40095 Physiological Measurements - MTE-40026 Human Physiology and Anatomy - MTE-30001 Biomechanics (15 credit module) - MTE-40023 Medical Devices Design: Design Control Methodologies - MTE-40045 Biomaterials - MTE-40036 Green IT - ESC-40047 Medical Devices Design: Quality by Design - MTE-40051 Clean and Green Technologies - ESC-40097 Human Physiology and Anatomy - MTE-40024
Display a systematic understanding biomedical signal processing and analysis to achieve a recognisable outputs	Biomedical Signal Processing and Analysing - MTE-40031 Project - Medical Technology - MTE-40015 Experimental Research Methodology - MTE-40039 Medical Devices Design: Advanced Materials and Manufacturing - MTE-40047 Physiological Measurements - MTE-40026
Display a systematic understanding of regulatory and manufacturing quality techniques for new medical devices	Medical Devices Design: Regulatory Frameworks - MTE-40049 Medical Devices Design: Advanced Materials and Manufacturing - MTE-40047 Physiological Measurements - MTE-40026
An understanding of design methodologies and modelling techniques commensurate with medical device design	Medical Devices Design: Regulatory Frameworks - MTE-40049 Medical Devices Design: Advanced Materials and Manufacturing - MTE-40047

Subject Specific Skills	
Learning Outcome	**Module in which this is delivered**
Use a range of ICT tools such as spreadsheets and programming languages to interpret and analyse data, including the use of modelling and statistics	Medical Devices Design: Advanced Materials and Manufacturing - MTE-40047 Disease Modelling & Therapy for Regenerative Medicine - MTE-40055 Biomechanics (15 credit module) - MTE-40023 Biomedical Signal Processing and Analysing - MTE-40031 Medical Devices Design: Design Control Methodologies - MTE-40045 Engineering for Medical Applications - MTE-30003
Carry out a research project, including planning, implementation, and documentation of methods, findings and implications	Disease Modelling & Therapy for Regenerative Medicine - MTE-40055 Engineering for Medical Applications - MTE-30003 Project - Medical Technology - MTE-40015
Demonstrate the critical awareness of advanced technologies in associated Medical and Biological Engineering.	Disease Modelling & Therapy for Regenerative Medicine - MTE-40055 Biotechnology and Omics - PHA-40236 Bioreactors and Growth Environments - MTE-40022 Project - Medical Technology - MTE-40015 Nanomagnetics in Nanomedicine - MTE-40030 Experimental Research Methodology - MTE-40039 Biomaterials - MTE-40036 Development of Biopharmaceuticals - PHA-40190 Cell and Tissue Engineering - MTE-40033 Stem Cells: Types, Characteristics & Applications - MTE-40028 Cancer Bioengineering - LSC-40133 Physiological Measurements - MTE-40026 Medical Devices Design: Advanced Materials and Manufacturing - MTE-40047 Medical Devices Design: Design Control Methodologies - MTE-40045
Identify and professional requirements to support lifelong learning	Project - Medical Technology - MTE-40015 Disease Modelling & Therapy for Regenerative Medicine - MTE-40055 Experimental Research Methodology - MTE-40039 Medical Devices Design: Design Control Methodologies - MTE-40045 Medical Devices Design: Quality by Design - MTE- 40051

Key or Transferable Skills (graduate attributes)	
Learning Outcome	**Module in which this is delivered**
Demonstrate skills associated with self-management and an ability to synthesize and evaluate information obtained from diverse sources and settings	Experimental Research Methodology - MTE-40039 Cell and Tissue Engineering - MTE-40033 Medical Equipment and Technology Services Management - MTE-40029 Stem Cells: Types, Characteristics & Applications - MTE-40028 Cancer Bioengineering - LSC-40133 Project - medical technology - MTE-40015 Bioreactors and Growth Environments - MTE-40022 Physiological Measurements - MTE-40026
Develop the capacity to transfer scientific knowledge into practical application in current and subsequent career choice	Project - Medical Technology - MTE-40015 Experimental Research Methodology - MTE-40039 Disease Modelling & Therapy for Regenerative Medicine - MTE-40055 Physiological Measurements - MTE-40026 Medical Devices Design: Advanced Materials and Manufacturing - MTE-40047 Stem Cells: Types, Characteristics & Applications - MTE-40028 Cancer Bioengineering - LSC-40133
Work in small groups to share best practice, provide mutual support and promote an environment of active learning	Disease Modelling & Therapy for Regenerative Medicine - MTE-40055 Physiological Measurements - MTE-40026 Medical Devices Design: Advanced Materials and Manufacturing - MTE-40047

8. Final and intermediate awards

Credits required for each level of academic award are as follows:

Master's Degree • MSc Medical Engineering (Biomedical Engineering) • MSc Medical Engineering (Cell and Tissue Engineering for Regenerative Medicine) • MSc Medical Engineering (Design and Innovation)	180 credits
Postgraduate Diploma	120 credits
Postgraduate Certificate	60 credits

9. How is the Programme Assessed?

The wide variety of assessment methods used on this programme at Keele reflects the broad range of knowledge and skills that are developed as you progress through the degree programme. Teaching staff pay particular attention to specifying clear assessment criteria and providing timely, regular and constructive feedback that helps to clarify things you did not understand and helps you to improve your performance. The following list is representative of the variety of assessment methods used on your programme:

- coursework-based essays
- written examinations
- reports on laboratory-based practicals
- essay-based examination
- interactive oral presentations
- dissertation based on the student research project.

Marks are awarded for summative assessments designed to assess your achievement of learning outcomes.

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. You will also be assessed formatively to enable you to monitor your own progress and to assist staff in identifying and addressing any specific learning needs. Formative assessment occurs in a continuous process driven by lecturer-led discussion sessions, one-on-one mentoring, and practice presentations and posters. Feedback, including guidance on how you can improve the quality of your work, is also provided on all summative assessments within three working weeks of submission, unless there are compelling circumstances that make this impossible, and more informally in the course of tutorial and seminar discussions. Elements of peer feedback are also used in a formative way.

For January intake (students starting from Semester 2 in January), students taking MTE-40055 will have some of their assessments in their final semester.

10. Accreditation

The Biomedical Engineering and Medical Engineering Design & Innovation routes are accredited by the Institute for Physics and Engineering in Medicine. Specific mapping against the Engineering Council Accreditation of Higher Education Programmes (AHEP) framework can be found in the Annex component of this document.

11. University Regulations

The University Regulations form the framework for learning, teaching and assessment and other aspects of the student experience. Further information about the University Regulations can be found at: http://www.keele.ac.uk/student-agreement/

If this programme has any exemptions, variations or additions to the University Regulations these will be detailed in an Annex at the end of this document titled 'Programme-specific regulations'.

12. What are the typical admission requirements for the Programme?

See the relevant course page on the website for the admission requirements relevant to this programme: https://www.keele.ac.uk/study/

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. The admission of 3+1+1 programme students will follow the additional agreement between Keele and the partner university.

Recognition of Prior Learning (RPL) is considered on a case-by-case basis and those interested should contact the Programme Director. The University's guidelines on this can be found here: https://www.keele.ac.uk/qa/programmesandmodules/recognitionofpriorlearning/

13. 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 an Academic Mentor 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 Academic Mentor at least four times a year unless special needs require a greater frequency.

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.

14. Learning Resources

This course and teaching are based mostly at the Guy Hilton Research Centre (GHRC), Hartshill Campus. The administration team are based on Keele's main campus. Some teaching delivery will be held on Keele Campus, and sites in University Hospitals of North Midlands (UHNM).

Students have access to facilities in main campus and the UHNM Hospital campus. 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 campus, 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. GHRC provides photocopy and printing facility to the students.

15. 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 University Hospital of North Midlands (Royal Stoke University Hospital).

Students are encouraged to undertake a modern foreign language to support the CV. These are offered by Keele Language Centre.

16. Additional Costs

As to be expected there will be additional costs for inter-library loans and potential overdue library fines, print and graduation. We do not anticipate any further costs for this programme.

17. Quality management and enhancement

The quality and standards of learning in this programme are subject to a continuous process of monitoring, review and enhancement.

- The School Education Committee is responsible for reviewing and monitoring quality management and enhancement procedures and activities across the School.
- Individual modules and the programme as a whole are reviewed and enhanced every year in the annual programme review which takes place at the end of the academic year.
- The programmes are run in accordance with the University's Quality Assurance procedures and are subject to periodic reviews under the Revalidation process.

Student evaluation of, and feedback on, the quality of learning on every module takes place every year using a variety of different methods:

- The results of student evaluations of all modules are reported to module leaders and reviewed by the Programme Committee as part of annual programme review.
- Findings related to the programme from the annual Postgraduate Taught Experience Survey (PTES), and from regular surveys of the student experience conducted by the University, are subjected to careful analysis and a planned response at programme and School level.
- Feedback received from representatives of students on the programme is considered and acted on at regular meetings of the Student Staff Voice Committee.

The University appoints senior members of academic staff from other universities to act as external examiners on all programmes. They are responsible for:

- Approving examination questions
- Confirming all marks which contribute to a student's degree
- Reviewing and giving advice on the structure and content of the programme and assessment procedures

Information about current external examiner(s) can be found here:
http://www.keele.ac.uk/qa/externalexaminers/currentexternalexaminers/

18. The principles of programme design

The programme described in this document has been drawn up with reference to, and in accordance with the guidance set out in, the following documents:

a. UK Quality Code for Higher Education, Quality Assurance Agency for Higher Education:
http://www.qaa.ac.uk/quality-code
b. Keele University Regulations and Guidance for Students and Staff: http://www.keele.ac.uk/regulations

19. Annex - Programme-specific regulations

Programme Regulations: [Programme Name]

Final Award and Award Titles	MSc Medical Engineering - Biomedical Engineering MSc Medical Engineering - Cell and Tissue Engineering for Regenerative Medicine MSc Medical Engineering -Design & Innovation
Intermediate Award(s)	Postgraduate Diploma Postgraduate Certificate
Last modified	n/a
Programme Specification	https://www.keele.ac.uk/qa/programmespecifications

The University's Academic Regulations which can be found on the Keele University website (https://www.keele.ac.uk/regulations/)[1] apply to and regulate the programme, other than in instances where the specific programme regulations listed below over-ride them. These programme regulations list:

- *Exemptions* which are characterised by the omission of the relevant regulation.
- *Variations* which are characterised by the replacement of part of the regulation with alternative wording.
- *Additional Requirements* which set out what additional rules that apply to students in relation to this programme.

The following **exemptions, variations** and **additional requirements** to the University regulations have been checked by Academic Services and have been approved by the Faculty Education Committee.

A) EXEMPTIONS

The clause(s) listed below describe where an exemption from the University's Academic Regulations exists:

For the whole duration of their studies, students on this Programme are exempt from the following regulations:

- **No exemptions apply.**

B) VARIATIONS

The clause(s) listed below describe where a variation from the University's Academic Regulations exists:

Variation 1: Module compensation

This programme varies from Regulation D5.4.

A variation of Regulation D5.4 Module Compensation on Taught Postgraduate Programmes and Regulation C7.11.4 will be run on these courses, in which compensation will be applied to modules, which, after all assessment attempts have been taken, have a mark above 45% (i.e. not limited to 45-49%).

On IPEM accredited courses, this will apply to a maximum of 20 credits, provided that a mark of at least 55% in one or more modules at least equivalent to the credit value of the failed module/s being compensated, is attained. Dissertation modules or equivalent final project modules cannot be compensated.

The intention of the variation is to enable students who have not reached the pass mark in all qualifying components, thereby resulting in a Qualified Fail, to be compensated in the above scenario.

As such, in accordance with Regulation D1.12 Reassessment, where a student achieves a fail in a Qualifying

Component, hence resulting in a Qualified Fail for a module, the student will be allowed reassessment procedures as defined in the regulations.

AHEP 4 Mapping

For accreditation purposes our programme modules are mapped against the Accreditation of Higher Education Programmes (AHEP) framework (fourth version) from the Engineering Council (https://www.engc.org.uk/media/3464/ahep-fourth-edition.pdf)

Compulsory modules	Module Code	Credits	AHEP 4
Experimental Research Methodology	MTE-40039	15	M1,M4,M7,M8, M9, M11, M16, M18
Project-Medical Technology	MTE-40015	60	M1,M2,M4,M5,M6,M8, M13, M17, M18

Optional modules	Module Code	Credits	Period
Human Physiology and Anatomy	MTE-30001	15	M12, M17
Engineering for Medical Applications	MTE-30003	15	M1,M2,M6
Bioreactors and Growth Environments	MTE-40022	15	M12
Biomechanics (15 credit module)	MTE-40023	15	M1,M2, M12
Human Physiology and Anatomy	MTE-40024	15	M12, M17
Physiological Measurements	MTE-40026	15	M1, M6, M12, M13, M16, M17
Stem Cells: Types, Characteristics & Applications	MTE-40028	15	M12, M17
Medical Equipment and Technology Services Management	MTE-40029	15	M9, M15, M17
Nanomagnetics in Nanomedicine	MTE-40030	15	M12, M17
Biomedical Signal Processing and Analysing	MTE-40031	15	M1,M2,M3,M12,M17
Cell and Tissue Engineering	MTE-40033	15	M12, M17
Biomaterials	MTE-40036	15	M7, M12, M17
Medical Devices Design: Design Control Methodologies	MTE-40045	15	M2, M3, M5, M11, M13, M14, M15, M16, M17, M18
Medical Devices Design: Advanced Materials and Manufacturing	MTE-40047	15	M2, M3, M5, M7, M12, M13, M15, M16, M17, M18
Medical Devices Design: Regulatory Frameworks	MTE-40049	15	M4, M8, M9, M10, M15, M16, M17, M18
Medical Devices Design: Quality by Design	MTE-40051	15	M1, M2, M5, M6, M9, M12, M13, M14, M15, M16, M17, M18
Disease Modelling & Therapy for Regenerative Medicine	MTE-40055	15	M12, M17
Biotechnology and Omics	PHA-40236	15	M12, M17
Green IT	ESC-40047	15	M7, M17
Case Studies in Sustainability	ESC-40095	30	M7, M17
Clean and Green Technologies	ESC-40097	30	M7, M17
Cancer Bioengineering	LSC-40133	15	M12, M17

[1] References to University Regulations in this document apply to the content of the University's Regulatory Framework as set out on the University website here https://www.keele.ac.uk/regulations/.

Version History

This document

Date Approved: 17 January 2025

What's Changed

Minor modifications

- To include restructure, now under the School of Life Sciences

- To include a new optional module LSC-40133 Cancer Bioengineering and associated change for inclusion in different sections (sections B19, C3, C9, E3)

Previous documents

Version No	Year	Owner	Date Approved	Summary of and rationale for changes