

Course Information Document: Undergraduate

Academic Year 2021/22

1. Course Summary

Names of programme and award title(s)	BSc (Hons) Cell and Tissue Engineering BSc (Hons) Cell and Tissue Engineering with International Year
Award type	Single Honours
Mode of study	Full-time
Framework of Higher Education Qualification (FHEQ) level of final award	Level 6
Normal length of the programme	3 years; 4 years with the International Year between years 2 and 3
Maximum period of registration	The normal length as specified above plus 3 years
Location of study	Guy Hilton Research Centre Hospital - Medical Keele Campus
Accreditation (if applicable)	Not applicable.
Regulator	Office for Students (OfS)
Tuition Fees	<p>UK students:</p> <p>Fee for 2021/22 is £9,250*</p> <p>International/EU students:</p> <p>Fee for 2021/22 is £19,800**</p> <p>The fee for the international year abroad is calculated at 15% of the standard year fee.</p>

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.

* These fees are regulated by Government. We reserve the right to increase fees in subsequent years of study in response to changes in government policy and/or changes to the law. If permitted by such change in policy or law, we may increase your fees by an inflationary amount or such other measure as required by government policy or the law. Please refer to the accompanying Student Terms & Conditions. Further information on fees can be found at <http://www.keele.ac.uk/studentfunding/tuitionfees/>

** 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. What is a Single Honours programme?

The Single Honours programme described in this document allows you to focus more or less exclusively on this subject. In keeping with Keele's commitment to breadth in the curriculum, the programme also gives you the opportunity to take some modules in other disciplines and in modern foreign languages as part of a 360-credit Honours degree. Thus it enables you to gain, and be able to demonstrate, a distinctive range of graduate attributes.

3. Overview of the Programme

The BSc (Hons) Cell and Tissue Engineering is an innovative undergraduate programme and will be the first of its kind that fully focuses on cell and tissue engineering in the UK. The programme aims to attract aspiring bioengineers to Keele creating a specialised workforce that will respond to the future demands for regenerative drugs. The programme will equip students with a transdisciplinary biomedical know-how, laboratory skills and lexicon that will allow them to work on research, discovery and production of regenerative medicines.

Key innovative elements of this programme include: novel modules in stem cell biology, tissue engineering and regenerative medicine in Year 2 and 3 to meet the career aspirations of students, year-long laboratory series in Year 1 and 2 to ensure students acquire appropriate laboratory skills, an intensive 12 week research project in Year 3 to provide a real laboratory experience for students and the availability of elective opportunities in modern languages and optional credits in computer science across the three years. An optional international year will be available and preliminary discussions and agreements to facilitate this are in place (University of Napoli and the Centre for Regenerative Medicine in Barcelona).

The BSc in Cell and Tissue Engineering is a single honours degree that will educate students in fundamentals of the biological processes essential to understand the fine relation between stem cells and differentiation, cells and the extracellular environment, tissue structure and function and to explore the critical challenges of cell, tissue and organ regeneration.

Over the course of the programme, students will choose 270 credits of core disciplines of which 90 credits in Year 1 will be needed to create a solid foundation in biomedical disciplines. This foundation will equip students with the skills needed to complete the remaining 180 core credits related to the rapidly growing interdisciplinary field of cell and tissue engineering. The core modules in Year 2 and Year 3 will cover fundamentals of stem cell biology, tissue engineering, immunoengineering, drug delivery, and nanotechnology and introduce students to innovative approaches to treatment and diagnosis that take into consideration genetic variations of a patient, environment and lifestyle. An intensive 12-week research project in semester 1 followed by data analysis in semester 2 of Year 3 will allow students to gain hands-on experience applying this knowledge to open questions in human health and novel cell and tissue engineering technologies. These experimental projects will be delivered in the state-of-the-art research facilities of the Guy Hilton Research Institute and Robert Jones and Agnes Hunt (RJA) Orthopaedic Hospital in Oswestry.

The programme also includes laboratory/computer-based modules that will equip students with biomedical and biotechnology skills enabling them to experience the discovery potentials of high-throughput sequencing, bioreactor, genetic engineering and genome editing technologies; cutting-edge tools that are assisting in the significant acceleration of the biological research and transformation of medicine. Students will be also able to enrich their training by opting for a maximum of 90 optional credits during the course of the programme. These modules will give the opportunity to experience data mining, visualisation of scientific data and bioinformatics, improving their formative and professional experience.

To strengthen the Keele educative vision of making connections between traditionally separate subjects, the programme will enhance the student experience with elective credits to be chosen across the three years of study in international modern languages. Students will be able to choose between the languages courses available at the Keele Language Centre (<https://www.keele.ac.uk/study/languagecentre/>). If 60 credits of language learning as part of your programme is achieved, an additional recognition will be added on the degree, "with competency in [Chosen Language]" or "with advanced competency in [Chosen Language]", depending on the level which you achieve.

To support students to select the right elective or optional modules, an academic tutor in the School will work with students to guide them in their choice and ensure relevance of the choice toward the degree or their professional interest.

4. Aims of the programme

Cell and Tissue Engineering discipline integrates biochemical, molecular and cellular knowledge with engineering principles to design tissue engineered constructs to repair, replace and rejuvenate damaged or diseased tissues. While Cell Engineering looks at cell-related phenomena, tissue engineering covers a broad range of applications ranging from physiology to nanotechnology, from biochemistry to mechanobiology, placing more emphasis on the design of biocompatible scaffolds that promote desirable cell behaviour leading to replacement and remodelling of a whole tissue.

The broad aims of the Cell and Tissue Engineering BSc programme are to enable you to:

- develop a broad knowledge of molecular techniques and their applications to identify solutions for biological and medical problems.
- understand the critical potential of stem cells and reprogrammed pluripotent stem cells as pivotal source for engineered replacement of damaged tissues and cell therapies.
- learn the structural and mechanical properties of tissue to design proper biocompatible materials that make possible the construction of engineered scaffolds for cells.
- acquire a range of graduate skills related to the research and commercial development of cell and tissue engineering products that should facilitate your postgraduate career.

5. 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 - (K)

- Subject specific skills - (S)
- Key or transferable skills (including employability skills) - (E)
- Intellectual skills - (I)

Subject knowledge and understanding (K)

Successful students will be able to:

- K1 - describe the biochemical and molecular functions of cells and extracellular milieu;
- K2 - develop an understanding of the gross embryological, anatomical and physiological characteristics of the main systems of the human body;
- K3 - understand the sources and features of different types of human stem cells;
- K4 - evaluate the strategies to use stem cells as disease models and therapeutic tools;
- K5 - describe the physico-chemical properties of different biomaterials and nanomaterials that support tissue/organ growth, implantation and drug delivery;
- K6 - demonstrate familiarity with the concepts of genetic and genome engineering;
- K7 - discuss the concept of genomic medicine;

Subject specific skills (S)

Successful students will be able to:

- S1 - manage their own learning and utilise appropriate resources to the discipline;
- S2 - work safely and effectively in a scientific laboratory;
- S3 - collect, analyse and critically discuss scientific data relevant to the discipline;
- S4 - communicate confidently on topics related to the degree;
- S5 - understand the limits and ethical issues of the discipline and the need for codes of practice;

Key or transferable skills (including employability skills) (E)

Successful students will be able to:

- E1 - Effectively participate and work as a team or professional group.
- E2 - Constructively use feedback and take evidence-informed decisions.
- E3 - Identify and manage appropriate resources to solve problems.
- E4 - Confidently communicate information, ideas, problems and solutions to peers or professionals of the field of practice.

Intellectual skills (I)

Successful students will be able to:

- I1 - Think independently and inventively by demonstrating understanding of recent advances in the area of practice.
- I2 - Construct complex arguments to assert positions and solve problems with original approaches.
- I3 - Critically consider aspects of contrasting theories in the area of practice and take intellectual risks.
- I4 - Gather and evaluate information, data, assumptions to make reasoned decisions and formulate innovative solutions.

Keele Graduate attributes

Engagement with this programme will enable you to 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. Our educational programme and learning environment is designed to help you to become a well-rounded graduate who is capable of making a positive and valued contribution in a complex and rapidly changing world, whichever spheres of life you engage in after your studies are completed.

Further information about the Keele Graduate Attributes can be found here: <http://www.keele.ac.uk/journey/>

6. How is the programme taught?

The School of Pharmacy and Bioengineering is a nationally recognised leader for the innovative blended approach to teaching and learning that brings together three main teaching activities: synchronous classroom - based (face-to-face or online) experience; online learning materials and independent study using learning materials provided by the teacher to strengthen knowledge and develop skills. The School has developed spiral curriculum that used multiple forms of active learning including flipped-classrooms, audience response systems and technology enhanced learning complemented with authentic assessments and synoptic group tasks.

Learning and teaching methods used on the programme vary according to the subject matter and level of the module. They include the following:

- traditional **lectures, workshops**, science and computer **laboratories** (individual or in group), **problem-based learning activities, journal clubs, virtual sessions**.
- **seminars** by scientists, clinicians or industry experts that are nationally and internationally recognised experts of the field.
- a **research project** that will be supervised by an academic of the School of Pharmacy and Bioengineering and expose the student to active research.

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 Personal Tutors or module lecturers on a one-to-one basis.

These learning and teaching methods enable students to achieve the learning outcomes of the programme in a variety of ways. For example:

- **Lectures, workshops** and **virtual sessions** expose students to the principles of Cell and Tissue Engineering and its related disciplines and give the opportunity to students to present their own ideas, discussing them with academics and their fellow students.
- **Seminars, presentations** and **journal clubs** allow students to gain knowledge from the most recent discoveries in Cell and Tissue Engineering and ask questions about the subjects to experts of the field.
- **Problem Based Learning** sessions encourage students to critically consider the important challenges that scientists are facing in the field of Cell and Tissue Engineering to bring to the clinics novel experimental engineered tools.
- **Laboratory sessions** test practical skills, team working, organisational skills, initiative and expose students to some of the most used techniques relevant to biomedical discipline and Cell and Tissue Engineering.
- **Research Projects** help students to gain research experience by joining one of the research active laboratories of the School of Pharmacy and Bioengineering.

7. Teaching Staff

The programme of Cell and Tissue Engineering has brought together pharmacists, scientists and physicians to develop this research-led educative programme that will instruct students in the multiple aspects of translational medicine and bioengineering. The School will provide an outstanding and inspiring environment for students, connecting them with research active academics that have world-leading expertise in the field of Cell and Tissue Engineering.

The academic staff contributing to the programme will include lecturers, senior lecturers and professors from multiple fields of expertise ranging from molecular biology to regenerative medicine with extensive expertise in teaching undergraduate and postgraduate academic programmes. The staff group, who serves on the programme, conducts highly interdisciplinary world-leading research on subjects related to the field of Cell and Tissue Engineering, publishing in well recognized international scientific journals. Many of our staff sit on international and national committees, highlighting the recognition of our work at the highest level.

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.

8. What is the structure of the Programme?

The academic year runs from September to June and is divided into two semesters. The number of weeks of teaching will vary from programme to programme, 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 three 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;
- Elective modules - a free choice of modules that count towards the overall credit requirement but not the number of subject-related credits.

A summary of the credit requirements per year is as follows, with a minimum of 90 subject credits (compulsory plus optional) required for each year.

For further information on the content of modules currently offered, including the list of elective modules, please visit:

<https://www.keele.ac.uk/recordsandexams/modulecatalogue/>

Year	Compulsory	Optional		Electives	
		Min	Max	Min	Max
Level 4	90	0	30	0	30
Level 5	90	0	30	0	30
Level 6	90	0	30	0	30

Module Lists

Level 4

Compulsory modules	Module Code	Credits	Period
Molecular Biology and Genetics	PHA-10026	30	Semester 1-2
Human Anatomy and Physiology	PHA-10028	30	Semester 1-2
Biochemistry & Cell Biology	PHA-10030	30	Semester 1-2

Optional modules	Module Code	Credits	Period
Introduction to Data Science I	CSC-10058	15	Semester 1
Introduction to Data Science II	CSC-10060	15	Semester 2

Level 4 Module Rules

Introduction to Data Science I is a prerequisite to select Introduction to Data Science II. No other prerequisites or restrictions apply to the selection of other modules for the Level 4 students of the programme.

Elective Modules from the Language Centre.

Level 5

Compulsory modules	Module Code	Credits	Period
Stem Cells and Regenerative Medicine	PHA-20026	30	Semester 1
Molecular Biotechnology	PHA-20028	15	Semester 1
Immunology & Immunotherapy	PHA-20020	15	Semester 2
Biomaterials and Tissue Engineering	PHA-20024	30	Semester 2

Optional modules	Module Code	Credits	Period
Visualisation for Data Science	CSC-20069	15	Semester 1
Current Topics in Regenerative Medicine	PHA-20022	15	Semester 1-2

Level 6

Compulsory modules	Module Code	Credits	Period
Precision Medicine	PHA-30033	30	Semester 1
Cell and Tissue Engineering Research Project	PHA-30035	30	Semester 1-2
Translational Regenerative Medicine	PHA-30031	15	Semester 2
Nanomedicine	PHA-30037	15	Semester 2

Optional modules	Module Code	Credits	Period
Bioinformatics	CSC-30022	15	Semester 1
Biomedical Engineering	LSC-30055	15	Semester 1

9. Final and intermediate awards

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

Honours Degree	360 credits	You will require at least 120 credits at levels 4, 5 and 6 You must accumulate at least 270 credits in your main subject (out of 360 credits overall), with at least 90 credits in each of the three years of study, to graduate with a named single honours degree in this subject.
Diploma in Higher Education	240 credits	You will require at least 120 credits at level 4 or higher and at least 120 credits at level 5 or higher
Certificate in Higher Education	120 credits	You will require at least 120 credits at level 4 or higher

International Year option: in addition to the above students must pass a module covering the international year in order to graduate with a named degree including the 'international year' wording. Students who do not complete, or fail the international year, will be transferred to the three-year version of the programme.

10. 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 assessment strategy that is adopted in the programme aims to develop critical thinking and problem solving skills. The assessments for the course can either take the form of an unseen exam at the end of each semester, lab reports, problem-based studies, dissertation, presentations or essays to be handed in.

These summative assignments (they will contribute to the final degree) will allow students to consolidate their knowledge on the subjects and develop ability to apply this knowledge in a structured and focused way, carry out bibliographic research, communicate ideas, analyse primary research data and work effectively as part of a group. Formative feedback will be provided on each assessment after three weeks from submission and will help students to understand the quality of their submission and how to improve their future performance.

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

11. Contact Time and Expected Workload

This contact time measure is intended to provide you with an indication of the type of activity you are likely to undertake during this programme. The data is compiled based on module choices and learning patterns of students on similar programmes in previous years. Every effort is made to ensure this data is a realistic representation of what you are likely to experience, but changes to programmes, teaching methods and assessment methods mean this data is representative and not specific.

Undergraduate courses at Keele contain an element of module choice; therefore, individual students will experience a different mix of contact time and assessment types dependent upon their own individual choice of modules. The figures below are an example of activities that a student may expect on your chosen course by year stage of study. Contact time includes scheduled activities such as: lecture, seminar, tutorial, project supervision, demonstration, practical classes and labs, supervised time in labs/workshop, fieldwork and external visits. The figures are based on 1,200 hours of student effort each year for full-time students.

Activity

	Scheduled learning and teaching activities	Guided independent Study	Placements
Year 1 (Level 4)	26%	74%	0%
Year 2 (Level 5)	27%	73%	0%
Year 3 (Level 6)	26%	74%	0%

12. Accreditation

At this stage the course is not accredited. However, we aim to achieve an interim accreditation by the Royal Society of Biology (RSB) and submit a letter of intent for an accreditation on Molecular Aspect of Biology as soon as our first cohort of students starts in 2021. If the interim accreditation is awarded, full accreditation will be submitted when the first cohort of students will graduate (2024). We will keep students informed on the progress of this application.

13. 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'.

14. Other Learning Opportunities

Study Abroad (International Year)

A summary of the International Year, which is a potential option for students after completion of year 2 (Level 5), is provided in the Annex for the International Year.

Other opportunities

15. 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.

16. Annex - International Year

BSc in Cell and Tissue Engineering with International Year

International Year Programme

Students registered for this Single Honours programme may either be admitted for or apply to transfer during their period of study at Level 5 to the International Year option. Students accepted onto this option will have an extra year of study (the International Year) at an international partner institution after they have completed Year 2 (Level 5) at Keele.

Students who successfully complete both the second year (Level 5) and the International Year will be permitted to progress to Level 6. Students who fail to satisfy the examiners in respect of the International Year will normally revert to the standard programme and progress to Level 6 on that basis. The failure will be recorded on the student's final transcript.

Study at Level 4, Level 5 and Level 6 will be as per the main body of this document. The additional detail contained in this annex will pertain solely to students registered for the International Year option.

International Year Programme Aims

In addition to the programme aims specified in the main body of this document, the international year programme of study aims to provide students with:

1. Personal development as a student and a researcher with an appreciation of the international dimension of their subject
2. Experience of a different culture, academically, professionally and socially

Entry Requirements for the International Year

Students may apply to the 4-year programme during Level 5. Admission to the International Year is subject to successful application, interview and references from appropriate staff.

The criteria to be applied are:

- Academic Performance (an average of 60% across all modules in Semester 1 at Level 5 is normally required. Places on the International Year are then conditional on achieving an average mark of 54% across all Level 5 modules with no module fails. Where no Semester 1 marks have been awarded performance in 1st year marks and ongoing 2nd year assessments are taken into account)
- General Aptitude (to be demonstrated by application for study abroad, interview during the 2nd semester of year 2 (Level 5), and by recommendation of the student's personal tutor, 1st and 2nd year tutors and programme director)

Student Support

Students will be supported whilst on the International Year via the following methods:

- Phone or Skype conversations with Study Abroad tutor, in line with recommended Personal Tutoring meeting points.
- Support from the University's Global Education Team

Learning Outcomes

In addition to the learning outcomes specified in the main text of the Programme Specification, students who complete a Keele undergraduate programme with International Year will be able to:

1. Describe, discuss and reflect upon the cultural and international differences and similarities of different learning environments
2. Discuss the benefits and challenges of global citizenship and internationalisation
3. Explain how their perspective on their academic discipline has been influenced by locating it within an international setting.
4. Experience laboratory and research activities within an international environment.

These learning outcomes will all be assessed by the submission of a satisfactory individual learning agreement, the successful completion of assessments at the partner institution and the submission of the reflective portfolio element of the international year module.

Regulations

Students registered for the International Year are subject to the programme-specific regulations (if any) and the University regulations. In addition, during the International Year, the following regulations will apply:

Students undertaking the International Year must complete 120 credits, which must comprise *at least 40%* in the student's discipline area.

This may impact on your choice of modules to study, for example you will have to choose certain modules to ensure you have the discipline specific credits required.

Students are barred from studying any module with significant overlap to the Level 6 modules they will study on their return. Significant overlap with Level 5 modules previously studied should also be avoided.

Additional costs for the International Year

Tuition fees for students on the International Year will be charged at 15% of the annual tuition fees for that year of study, as set out in Section 1. The International Year can be included in your Student Finance allocation, to find out more about your personal eligibility see: www.gov.uk

Students will have to bear the costs of travelling to and from their destination university, accommodation, food and personal costs. Depending on the destination they are studying at additional costs may include visas, study permits, residence permits, and compulsory health checks. Students should expect the total costs of studying abroad be greater than if they study in the UK, information is made available from the Global Education Team throughout the process, as costs will vary depending on destination.

Students studying in Erasmus+ destinations may be eligible for grants as part of this programme. Students studying outside of this programme may be eligible income dependent bursaries at Keele.

Students travel on a comprehensive Keele University insurance plan, for which there are currently no additional charges. Some Governments and/or universities require additional compulsory health coverage plans; costs for this will be advised during the application process.

The School of Pharmacy and Bioengineering has already nominated a tutor for the International Year that will help students in identifying and securing the right opportunity for their career. The School has signed agreements with the University of Napoli "Federico II" and the Centre for Regenerative Medicine in Barcelona to host students of the programme in their taught courses or laboratories. We are in discussion with multiple other international partners regarding the mutual exchange of students. These Institutions are at the forefront of the regenerative medicine research and therefore visiting their laboratories will be a unique professional experience for the students.

Version History

This document

Date Approved: 06 April 2021

Previous documents

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