

BSc (Hons) Clinical Technology Programme Specification

<https://www.bradford.ac.uk/courses/ug/clinical-technology-bsc/>

Academic Year:	2022/23
Degree Awarding Body:	The University of Bradford
Target Degree Award:	Bachelor of Science with Honours in Clinical Technology [Framework for Higher Education Qualifications (FHEQ) Level 6]
Interim/exit Awards:	BSc (Hons) Engineering (Clinical Technology); BSc Clinical Technology [FHEQ Level 6]; Diploma of Higher Education Clinical Technology [FHEQ Level 5]; Certificate of Higher Education Clinical Technology [FHEQ Level 4]
Programme Admission:	September
Programme Modes of Study:	3-years full time (<u>UCAS H900</u>); 4-years full time with 'sandwich' placement year (<u>UCAS H901</u>)
Subject Benchmark Statement:	Engineering (QAA 2015)
Programme Accrediting Body:	IET – The Institution of Engineering and Technology

Please note: This programme specification has been published in advance of the academic year to which it applies. Every effort has been made to ensure that the information is accurate at the time of publication, but changes may occur given the interval between publishing and commencement of teaching. Any change which impacts the terms and conditions of an applicant's offer will be communicated to them. Upon commencement of the programme, students will receive further detail about their course and any minor changes will be discussed and/or communicated at this point.

Minor Modifications Schedule

1. April 2016: Renewed Programme Specification following academic portfolio review
2. March 2017: Codified waivers to assessment regulations
3. March 2018: Programme Learning Outcomes re-written
4. March 2019: Modification to curriculum structure
5. March 2020: Annual changes for 2020 academic year. Introduction of core module at level 5 from the Faculty of Health Studies.
6. October 2020: Specification reformatted and made accessible
7. October 2021: ENG6004-B Integrated Design and MHT6019-B Rehabilitation and Prosthetics added as core modules.
8. July 2022: Annual changes for 2022 academic year. Inclusion of IET and Engineering Council accreditation requirement to assessment regulations.

Introduction

The National Health Service, together with the associated medical services industry, needs skilled and qualified graduates to provide vital technical support in hospitals. These graduates require a multidisciplinary skills profile, including elements of engineering, life sciences and health studies. The BSc in Clinical Technology course aims to provide this skill base, equipping students for careers in a range of health-related technology disciplines. The programme is run in collaboration with local hospitals, adding a clinical perspective to the teaching.

Designed for the next generation of engineers

Our programmes have been designed as part of the CDIO educational framework for producing the next generation of engineers. This will provide a learning experience that stresses the engineering fundamentals set within the context of Conceiving-Designing-Implementing-Operating (CDIO) real-world systems and products. This framework has been developed by universities across the globe and benefits from the ongoing collaborative experience of engineers and educationalists. This will mean that students learning will reflect the real world, their work in teams to solve real-world problems and in the process they will develop professional skills alongside technical skills.

We also recognise that the future for engineers is one where they will be working in interdisciplinary teams to solve new, complex and evolving problems that will require innovative solutions. Student's ability to work across engineering disciplines and collaboratively with experts in other specialist fields will be crucial to creating the solutions of tomorrow. We have designed our programmes to encourage and experience interdisciplinary working, to develop breadth as well as depth of skills and knowledge, and in this way we believe students will be ideally equipped to be successful and employable. All our engineering students begin with an interdisciplinary year which ensures that all students have a good understanding of the breadth of what is encompassed by the word 'engineer'. This year provides students with the fundamental skills and knowledge as well as specific projects that they will work on with other students in their discipline and a final project which will be on interdisciplinary project working with a range of engineers from different disciplines.

Faculty strategic objectives

The University of Bradford has four key strategic objectives: excellence; internationalisation; equality and diversity; and sustainability. We believe in doing research and teaching to deliver career opportunities for our students as well as for economic development and job creation.

The Faculty of Engineering and Informatics strongly believes that each programme subscribes to these four objectives through the three key streams of the University vision:

1. The creation of knowledge through fundamental and applied research.
2. The dissemination of knowledge by teaching students from all backgrounds.
3. The application of knowledge for the prosperity and wellbeing of people.

The Faculty welcomes and celebrates the diverse cultural and national backgrounds of our students. We are committed to an educational experience that is inclusive of the diversity of the students and staff, and that addresses attainment gaps within our student body, particularly those between BME and white students. The University holds Bronze Athena Swan accreditation from AdvanceHE.

Students will have many opportunities to contribute to their Higher Education Achievement Report (HEAR) whilst with us. Students can gain HEAR accreditation for becoming student

representative for their course, by becoming a student ambassador, helping with open days and applicant experience days, or by being a PAL leader. The peer assisted learning scheme or PAL is where students in stages two and three support new students of the University. The PAL scheme has been very successful, providing guidance on all aspects of being a student of Bradford. PAL leaders become mentors and role models for new students. We support people to become PAL leaders but we also recognise their contribution through the HEAR.

Learning with and as part of a research community

The Faculty places emphasis on both teaching and research. Lecturers at Bradford are active researchers in their fields of expertise producing peer-reviewed knowledge through publications in journal articles and books. This research permeates to their teaching practice giving students access to world leading professionals, equipment and ideas within the University's academic themes of Innovative Engineering, Advanced Healthcare and Sustainable Societies.

We have particular research strengths in biomedical engineering (design of implants, scaffolding for tissue replacement, and prosthetics); biomaterials (including the creation of complex components from powders, composites, and polymers); computer modelling and design (human movement, virtual testing, and rapid prototyping).

We conduct this research jointly with many companies including Johnson & Johnson, Smith & Nephew, Siemens Medical and others and this work shapes and informs our undergraduate programmes. Each year students will engage in enquiry-based projects allowing learning through research. Participating in programmes of study including research that include an emphasis on application, experiential learning and real-world engagement will make a major contribution to students developing skills and attributes for enhanced employability.

We recognise that society benefits from the talents of all, and that the development of creative, collaborative engineers, skilled in communication and teamwork is vital. Diverse engineering teams are known to be more innovative. We help students to contribute to and learn from the varied perspectives of their tutors and peers. We want to equip our graduates with the knowledge and skills to respond to the many different needs of our businesses and communities.

The Bradford Graduate

Upon graduation students will be able to join the world of work as clinical technologist within the NHS and healthcare industries. They will have the capacity for professional growth to continue the path to Chartered Engineer (CEng) status. However, unlike graduates from many other universities they will have high-level professional and interpersonal skills built from learning which has been developed through a team-based environment. An education where students have spent their time conceiving, designing, implementing and operating solutions to problems that they have tackled as part of a learning team. Students will be adept at working with complex value-added engineering

systems, they will be familiar with experimentation, system thinking and have a solid understanding of the business and enterprise context. We value sustainability at Bradford and to that end we have embedded sustainable development across all of our programmes. In a future where sustainability is to become increasingly important students will have sound understanding of the challenges and the potential for solutions in a world where the actions of human industry is creating new pressures on resources.

All our programmes are designed to provide three progression routes for graduates. Upon graduation students will be equipped to be employed as a clinical technologist. If this is their goal, they should seriously consider a placement year as this will be invaluable. Alternatively, students could pursue a research career, they will have highly developed research skills and their personal tutor can help them identify postgraduate research opportunities here at Bradford. The third route open to students on graduation is to develop their own business. As a Bradford clinical technologist graduate, students will have the skills to design and develop healthcare products, processes, or systems that could have serious commercial potential. We have a long track record of supporting and developing new companies and helping students on those first steps as an entrepreneur.

The ability of a clinical technologist to think clearly, logically and ethically is widely appreciated by many other professions and studies at Bradford may well be a stepping-stone to many alternative careers other than NHS or healthcare industries. As a clinical technologist graduate from Bradford students have a real foundation for life and for a lifetime of learning.

Programme Aims

The programme is intended to:

- A1. Develop graduates with a solid grounding in engineering and healthcare technology fundamentals and experience of interdisciplinary working.
- A2. Help students to develop a firm foundation in the engineering, science, design and technology of healthcare.
- A3. Provide the educational requirements to permit progression to careers in Clinical Technology within the National Health Service and related industries.
- A4. Provide the educational requirements (in compliance with UK-SPEC) to permit progression to Chartered Membership of the Institute of Engineering and Technology as well as registration with ECUK as a Chartered Engineer.

Programme Learning outcomes

To be eligible for the FHEQ Level 4 award of Certificate of Higher Education, students will be able to:

1. Select and apply physical principles to describe fundamental engineering and technology processes.
2. Select and correctly apply quantitative methods to analyse the performance of engineering and healthcare technology components and systems.

3. Select and use appropriate and relevant materials, equipment, tools, processes, or products.
4. Apply simple computational techniques to simulate and visualise the solution to specified engineering problems.
5. Apply skills in problem solving, working with others, information retrieval, and effective use of general IT facilities, and communicate work to technical and non-technical audiences.
6. Exercise personal and professional responsibility, which may be as a team member, and include evidence of safe and effective workshop and lab practice.

Additionally, to be eligible for the FHEQ Level 5 award of Diploma of Higher Education, students will be able to:

7. Understand the essential concepts, principles and theories of clinical technology.
8. Select mathematical and statistical methods necessary to underpin the engineering discipline and proficiently apply tools and notations in the modelling, analysis, solution, and evaluation of engineering problems.
9. Apply analytical and computational methods to solve and visualize problems in the engineering discipline and to implement appropriate action.
10. Apply problem-solving skills, technical knowledge and understanding to create/adapt and evaluate design solutions that are fit for purpose (inc. operation, maintenance, reliability etc.).
11. Apply relevant practical and laboratory skills to obtain accurate data to evaluate system performance and/or validate system models.
12. Plan and apply safe methods of construction and manufacture to semi-open projects, deriving solutions that consider technical, regulatory, and client requirements.
13. Work effectively as a specialist within in a multidisciplinary team towards a shared objective.

Additionally, to be eligible for the FHEQ Level 6 Ordinary Degree award, students will be able to:

14. Generate innovative designs for products, systems, components or processes to fulfil new needs.
15. Select, apply, and evaluate quantitative tools and data collection methods to underpin the engineering and clinical technology discipline, and apply a range of tools and notations proficiently and critically in the analysis and solution of engineering problems.

16. Select, apply and effectively integrate knowledge of other engineering disciplines to support study and evaluation of the engineering discipline.
17. Apply principles of organisation and management (project management, change management, health and safety, self-management) to achieve engineering and technology objectives.

Additionally, to be eligible for the FHEQ Level 6 Degree award with Honours, students will be able to:

18. Demonstrate comprehensive knowledge and understanding of the concepts, principles and theories underpinning Clinical Technology.
19. Apply engineering principles to critically analyse problems to create innovative process and product designs, with systematic appreciation of key aspects of field of study, including acquisition of coherent and detailed knowledge informed by characteristics of the engineering and technology discipline.
20. Plan and implement an individual programme of work, monitoring and adjusting where appropriate in an on-going basis, utilising research skills to critically evaluate and report on technical literature and newly developed data, and reflect on personal and professional development to improve their performance
21. Describe and work effectively and collaboratively in different roles within a team, and evidence responsibility of healthcare technologists and engineers to consider environmental and socio-economic aspects in the development of sustainable solutions.
22. Use appropriate discipline software packages in the modelling, simulation, analysis, design, and critical performance evaluation of composite engineering systems in the discipline.
23. Correctly identify and use codes of practice and industry standards.

Learning and Teaching Strategy

The teaching and learning strategy takes into consideration the learning outcomes that need to be achieved, progression through the levels of study, and the nature of the subject. One of the goals of Higher education is that students develop lifelong learning skills and are increasingly able to take greater responsibility for their own learning as they progress through the programme.

Our strategy begins with the end in mind. We want students to become great engineers; that means great problem solvers, great team-workers with an inquisitive and curious mind. This should mean that by the end of their study with us they can move seamlessly into the world of work, academic research or become an entrepreneur.

The teaching and learning methods have been selected to engage students in developing their knowledge and understanding of engineering fundamentals, through formal learning opportunities such as lectures and tutorials, experiential learning through practical classes

and lab sessions and informal and social learning through team-working in projects and competitions.

Study with us will include on-line and face-to-face teaching. Online lectures (including those from Visiting Lecturers) may be pre-recorded, so you can watch them at your convenience, or live interactive webinars. Tutorials and seminars will often be in smaller groups and highly interactive. We want to develop students' understanding of the vast array of opportunities open to healthcare science professionals and therefore we look to incorporate aspects of real world problems and solutions where possible. To this end we make use of case studies, practical demonstrations, and provide lots of opportunities for students to design their own solutions.

As part of our focus on building a learning experience which will prepare students for the world of work our curriculum has been developed using the CDIO framework. This means that our learning strategy will be to encourage students to work in teams to Conceive potential solutions, Design new products processes or services, Implement (or model) and test those designs, and Operate the product or solution. In line with the CDIO philosophy students will have numerous opportunities to be an active learner, to work as an engineer on real-world projects.

Students will be involved in project work from the start of their time with us and these projects will become more complex and challenging as their skills and knowledge develop. At Levels 5 and 6 students will engage with practical work on biomedical engineering devices, movement analysis and physiological measurement in purpose built modern and up to date electronics and physiological laboratories. Students will design and manufacture biomedical equipment using standard procedures and use control and measuring techniques in a supportive and collaborative environment with their supervisors.

The University of Bradford is well known for attracting students from a wide variety of backgrounds, experiences and countries. The university encourages and supports women in engineering. Female staff and students are an integral part of Faculty of Engineering and Informatics. The University of Bradford's modus operandi, Making Knowledge Work, is embedded in the philosophy of this programme

Assessment Strategy

In the same way that our teaching and learning strategy is designed to prepare students for the world of work, academic research or entrepreneurship, our assessment methods incorporate a wide range of different methods designed to meet the needs of industry, the accrediting bodies as well as prepare students for a potential academic research career.

Assessment is a key part of the learning process, it is only through challenging themselves to express what they have learned or put it to practical use, that students can complete the learning journey and assess for themselves if they have understood what they have been taught and are able to apply and use those skills and that knowledge.

There are two forms of assessment – formative and summative. Formative assessment provides an opportunity for our staff will give students feedback during their learning. This feedback is designed to help and guide learning. All the modules will have some

formative assessment and this may be in various forms including discussions or questioning from the supervisor, tests, practical activities, et cetera. These formative activities are crucial if students are to make best use of their learning experience and they are designed to prepare students for their summative assessment.

Summative assessment is how we grade the work on a module and the details of this assessment will be available from the beginning of the module so that students understand how their grade will be determined. A main method of assessment (common on all professional engineering degree programmes) is by formal written examinations. The methods of assessment of transferable skills are built in the structure of these examinations, case studies, laboratory demonstrations and the 'Design Project' work.

Many of the other assessments will be tailored to the most efficient ways to test the learning outcomes for students. For example, project work will often be assessed on the basis of the quality of the product produced as part of the project. We use practical tests to assess practical skills and written reports to show the depth of understanding of concepts and ideas. Practical skills are often assessed via individual and group technical reports with the laboratory work linked with the taught modules.

Placement and/or Study Abroad

This programme provides the option for students to undertake a work placement or period of study abroad in the penultimate year. Students wishing to take this option may do so on application or can be transferred to the placement year route during Stage 2.

- On successful completion of the ENG5002-Z placement, students will be eligible for the additional **University Diploma** award of **Industrial Studies**.
- On successful completion of the ENG5004-Z study abroad, students will be eligible for the additional **University Diploma** award of **Industrial Studies (International)**.

For further information about study abroad opportunities, including shorter opportunities available to all students, please refer to <https://www.bradford.ac.uk/study/abroad/>

Curriculum

The BSc Clinical Technology curriculum is organised into modular units studied across the "Academic Year" of September to May or discretely in a single Semester.

Stage 1 Modules (Level 4/CertHE)

Study Period	Code	Title	Credits	Level	Type
Academic Year	ENB4002-B	Computer Aided Engineering	20	FHEQ 4	Core
Academic Year	MHT4006-B	Design, Build and Test (Biomedical)	20	FHEQ 4	Core
Academic Year	ELE4013-B	Electronics and Mechanics	20	FHEQ 4	Core
Academic Year	ENM4005-B	Mathematics for Clinical Technologists	20	FHEQ 4	Core
Semester 1	MHT4004-B	Clinical Instrumentation and Imaging	20	FHEQ 4	Core
Semester 2	MHT4005-B	Radiology and Radiation Engineering	20	FHEQ 4	Core

At the end of stage 1, students will be eligible to exit with the FHEQ Level 4 award of **Certificate of Higher Education** if they have successfully completed at least 120 credits and achieved the award learning outcomes 1-6. This is not an award accredited by IET.

Stage 2 Modules (Level 5/DipHE)

Study Period	Code	Title	Credits	Level	Type
Academic Year	HWS5017-B	Applied Epidemiology	20	FHEQ 5	Core
Academic Year	MHT5007-B	Cell and Tissue Biology	20	FHEQ 5	Core
Academic Year	MHT5011-B	Clinical Movement Analysis	20	FHEQ 5	Core
Academic Year	ELE5016-B	Embedded Electronics	20	FHEQ 5	Core
Academic Year	MHT5014-B	Functional Anatomy and Human Physiological Measurements	20	FHEQ 5	Core
Academic Year	MHT5005-B	Healthcare Technology Project	20	FHEQ 5	Core

At the end of stage 2, students will be eligible to exit with the FHEQ Level 5 award of **Diploma of Higher Education** if they have successfully completed at least 240 credits and achieved the award learning outcomes 1-13. This is not an award accredited by IET.

For stage 3, students study 100 core credits and select 1 of 2 available optional modules.

Stage 3 Modules (Level 6/BSc)

Study Period	Code	Title	Credits	Level	Type
Academic Year	ENG6003-D	Individual Research Project	40	FHEQ 6	Core
Academic Year	MHT6020-B	Medical Ethics and Quality Management	20	FHEQ 6	Core
Academic Year	MHT6013-B	Biomaterials with Implant Design and Technology	20	FHEQ 6	Option
Academic Year	MHT6014-B	Renal Technology	20	FHEQ 6	Option
Semester 1	ENG6004-B	Integrated Design	20	FHEQ 6	Core
Semester 2	MHT6019-B	Rehabilitation and Prosthetics	20	FHEQ 6	Core

Please note: The curriculum may change, subject to the University's programme approval, monitoring and review procedures.

At the end of stage 3, students may exit with a FHEQ Level 6 **Ordinary Degree** award of Bachelor of Science in Clinical Technology, if they have achieved learning outcomes 1-17 and successfully completed at least 300 credits including 120 credits in both Level 4 and 5 and 60 credits at level 6. This is not an award accredited by IET.

At the end of stage 3, students may be awarded the FHEQ Level 6 **Honours Degree** award of **Bachelor of Science in Engineering (Clinical Technology)** if they have successfully completed 360 credits and achieved award learning outcomes 1-23 but not met the criteria for an IET accredited award.

At the end of stage 3, students may be awarded the target FHEQ Level 6 **Honours Degree** award of **Bachelor of Science in Clinical Technology** if they have achieved the award learning outcomes 1-23, successfully completed at least 360 credits and met the programme specific assessment regulations for an IET accredited award.

Assessment Regulations

This Programme conforms to the standard University Undergraduate Assessment Regulations which are available at the link: <https://www.bradford.ac.uk/regulations/>

However, there are some variations to these regulations on this programme:

- To gain an accredited BSc (Hons) award, students must achieve 30% or more in assessment components of 30% or more.
- Students who achieve a mark of 40% or more for a module, but fail to achieve 30% in a qualifying component, will be permitted supplementary assessment in line with the University Undergraduate Assessment Regulations.
- Compensation is only permitted in a maximum of 20 credits across the whole programme with a mark no lower than 30%.
- If the above requirements are not met, but the University's undergraduate regulations are otherwise complied with, then a non-accredited Honours degree may be awarded: BSc (Hons) Engineering (Clinical Technology)

Admission Requirements

We take into consideration a number of factors when assessing your application. Entry is not just about your grades; we take the time to understand your personal circumstances and make decisions based on your potential to thrive at university and beyond. Consideration of applications will be based on a combination of formal academic qualifications and other relevant experience.

All applicants are required to have Maths and English GCSEs at Grade 4/C or above or equivalent. Other RQF Level 2 qualifications such as Key Skills are acceptable. Students whose first language is not English should check the standard University language requirements at: <https://www.bradford.ac.uk/international/entry-requirements/>

A typical offer for a student applying to Stage 1 through UCAS would be **112 points**. Upon completion of a UCAS form students will be invited to the Faculty for an Open Day and interview where they will have the opportunity to meet staff, view the facilities and discuss "the Bradford experience" with current students. Students will be made aware of the range of engineering programmes available within the Faculty together with a Foundation Year (Stage 0) attracting offers of 88-72 UCAS points.

Access and Recognition of Prior Learning

Applications are welcome from students with non-traditional qualifications, and/or significant personal/professional experience. For such applicants, evidence of their interests and any work experience would be required and this would likely take the form of a portfolio of work and/or an interview with the programme.

The University of Bradford has always welcomed applications from disabled students. To discuss adjustments or to find out more about support and access, you may wish to contact Disability Services before you apply online: www.bradford.ac.uk/disability/before

Applications are particularly welcomed from adult learners (those aged 21+ at the start of the programme), armed forces families, carers and care leavers, estranged or orphaned learners, refugees and asylum seekers, and Romani or Traveller families. To find out more about the University of Bradford Progression Scheme, visit the webpage:

<https://www.bradford.ac.uk/applicants/progression-scheme/>

If applicants have prior certificated learning or professional experience which may be equivalent to parts of this programme, the University has procedures to evaluate and recognise this learning in order to provide applicants with exemptions from specified modules or parts of the programme. For more details on RPL, visit the webpage:

<https://www.bradford.ac.uk/teaching-quality/prior-learning/>

Please note: This information is relevant to the contemporary recruitment cycle and therefore may be different now to when this document was originally published. The current UCAS tariff for the programme, as well as accepted equivalent qualifications, is published online at the course page:

<https://www.bradford.ac.uk/courses/ug/clinical-technology-bsc/>
