Programme Specification: Undergraduate

For students starting in Academic Year 2018/2019

1. Course Summary

Names of programme(s) and award title(s)	BSc (Hons) Pharmaceutical Science, Technology & Business
Award type	Single Honours
Mode of study	Full time
Framework of Higher Education Qualification (FHEQ) level of final award	Level 6
Duration	3 years
Location of study	Keele University – main campus
Accreditation (if applicable)	Accreditation is currently being sought from the Academy of Pharmaceutical Sciences and the Royal Society of Chemistry for this programme. Initial contact has been made with both organisations and students will be informed of the processes as appropriate.
Regulator	Office for Students
Tuition Fees	**UK/EU students:** Fee for 2018/19 is £9,250* **International students:** Fee for 2018/19 is £17,000**
Additional Costs	Refer to section 18

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.*

2. What is a Single Honours programme?

The Single Honours programme described in this document allows you to focus more or less exclusively on Pharmaceutical Science, Technology & Business. In keeping with Keele's commitment to breadth in the curriculum, the programme also gives you the opportunity to take some modules outside the core

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pharmaceutical science content, 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.

The BSc in Pharmaceutical Science, Technology & Business currently has one optional module: at Year 1 of study (FHEQ Level 4) students can take a 15-credit language module offered by the Keele Language Centre. This emphasises the international nature of the programme and also offers the opportunity for support, as appropriate, in English language.

3. Overview of the Programme

The global pharmaceutical industry has experienced substantial change in recent years. Industry leaders must now understand how discoveries in science and technology translate to business opportunities within the pharmaceutical industry, whether in discovery, manufacturing, marketing and medicines supply and control. The employment market is becoming more challenging and this programme meets the need of the industry by producing graduates who are well-qualified in all aspects of the relevant applied sciences, who have well-developed key employability skills, and who also have significant knowledge and understanding of and insight into business and management – so you get more than just training in the core pharmaceutical sciences.

This course covers the main aspects of pharmaceutical discovery and development, product formulation, manufacture and quality assurance assessment, and explains how such pure and applied sciences fit into global business, legal and regulatory frameworks. This includes elements of clinical development and the role of the pharmaceutical scientist within the industry team that take a drug from research to the clinic.

As part of the preparation to enter the global pharmaceutical industry, in the first year you will take a language module in English (business or academic orientated depending on fluency levels) or a modern foreign language for those fluent in English. This will ensure you have both a language and cultural understanding of nations outside your home country. For modern languages (not English language modules) you may wish to pursue a pathway through the programme that will provide you with recognition of this on your degree certificate. There will be opportunities at years two and three of the programme, depending on entry level to your chosen language and availability, to take up to 60 credits of language learning on this programme. If you achieve 60 credits of language learning as part of your programme you will have added to your degree certificate the additional recognition of having achieved “with competency in [Chosen Language]” or “with advanced competency in [Chosen Language]”, depending on the level which you achieve. You can also take language modules as non-credit extracurricular study throughout your programme – further details can be obtained from the Language Centre.

The principal aim of the programme is to develop knowledge and skills in a wide variety of disciplines by demonstrating the linkages between seemingly disparate topics in science and technology that underpin all subsequent learning, and which are central to the successful delivery of new medicines to global markets.

4. Aims of the Programme

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

- Develop the key scientific skill that, in an integrated context, underpin the clinically relevant development of pharmaceutical products
- Understand the structures and frameworks in which the pharmaceutical industry operates, both nationally and globally

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

- Subject specific skills
- Key or transferable skills (including employability skills)

Subject knowledge and understanding

Successful students will be able to:

- Understand the core principles of the pharmaceutical sciences as they are applied to the development, licencing and marketing of pharmaceutical products

Subject specific skills

Successful students will be able to:

- Understand the nature of pharmaceutical development, both in the laboratory and in the business environments, and to use this knowledge in the development of new strategies to develop clinically relevant approaches to disease management and treatment

Key or transferable skills (including employability skills)

Successful students will be able to:

- Appreciate and understand how the core chemical and biological sciences integrate to underpin the successful development of pharmaceutical products, a core skills base which is directly applicable to a number of other industries (e.g. cosmetics, foods)

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?

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

- Lectures, tutorials, workshops, problem-solving sessions, interactive and immersive 3D teaching in the Health Cinema, laboratory work (individual and group exercises) and integrated 'synoptic' assessments which integrate the differing science subjects with the business aspects of the programme to develop clinically relevant products for patients.

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:

- The use of a wide range of assessment skills allow us to focus on different aspects of the challenges faced in pharmaceutical development; for example, this might include the use of individual or group-based activities, oral presentation sessions or student-led workshops where decision making is both collective and led by students; research projects may also give students the ability to work on a major piece of novel research not only by themselves but in collaboration with students taking similar projects

and within the setting of research groups with the School of Pharmacy.

7. Teaching Staff

The staff who deliver this course are based predominately within the School of Pharmacy and have expertise in the core aspects of the pharmaceutical sciences: pharmacology, physiology, medicinal and organic chemistry and formulation and drug delivery. In addition, several members of the School's academic staff have previously worked in the pharmaceutical (and related) industry and who can frame their academic work within the context of their previous roles.

The BSc programme also makes significant use of expert external speakers who are, or have worked, in the pharmaceutical industry or related industries. This includes a range of business-focused roles and addresses with real world examples subjects as diverse as clinical development, marketing and branding of pharmaceutical products, the role of healthcare systems in the context of pharmaceutical sales and regulatory affairs.

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 course to course, 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.

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.

Year	Compulsory	Optional		Electives	
		Min	Max	Min	Max
1	90	15	15	0	0
2	90	30	30	0	0
3	90	30	30	0	0

Module lists

Year 1 (Level 4)

Compulsory modules	Credits	Optional modules	Credits
PHA-10015 Essential Topics in Pharmaceutical Sciences	30	Language Centre modules (modules as available from the Language Centre's current portfolio of 15-credit modules, or an appropriate English language module if required)	15

PHA-10016 Core Topics in Pharmaceutical Sciences I	30		
PHA-10017 Core Topics in Pharmaceutical Sciences I	30		
PHA-10018 The Business of Drug Discovery	15		

Year 2 (Level 5)

Compulsory modules	**Module Code**	**Credits**	**Semester**
Applied Pharmaceutical Science 1	PHA-20016	30	1
Applied Pharmaceutical Science 2	PHA-20018	30	2
Pharmaceutical Analysis and Quality Control	PHA-20014	30	1 – 2
Optional modules	**Module Code**	**Credits**	**Semester**
Language modules (in foreign languages or English, the latter as appropriate to support students)	Various	15	1 or 2 (depending on module selected)
Business modules delivered by the Keele Management School	Various	15	1 or 2 (depending on module selected)

Module rules:
A maximum of 30 credits of optional modules must be taken.
Available language modules (modern foreign languages) are listed subject to availability and compatibility with the School of Pharmacy timetable for compulsory modules. The choice of English language modules provided is available only to those students for whom English is a second language. For information the full list of currently available language modules is listed above; students would be expected to take a follow-on language module at the next level, i.e. if a student took SPN-90001 or SPN-90002 at Level 4 then they would be expected to continue by taking SPN-90003 or SPN-90004.

Available business modules are listed subject to availability and compatibility with the School of Pharmacy timetable for compulsory modules.

- MAN-20053 – Operations and Quality Management
- MAN-20055 – Organisational Behaviour

Year 3 (Level 6)

Compulsory modules	**Module Code**	**Credits**	**Semester**
Pharmaceutical Sciences Research Project	PHA-30025	30	1-2
The Pharmaceutical Industry at the Cutting Edge	PHA-30021	30	1-2
Advanced Topics in Pharmaceutical Science	PHA-30023	30	1-2
Optional modules	**Module Code**	**Credits**	**Semester**
Current Developments in Pharmaceutical Science	PHA-30019	30	1 – 2
Current Developments in Pharmaceutical Science II	PHA-30017	15	1 – 2
Applied Regenerative Medicine	LSC-30068	15	1
Language modules (in foreign languages or English, the latter as appropriate to support students)	Various	15	1 or 2 (depending on module selected)

Module rules:
A maximum of 30 credits of optional modules must be taken.

Available language modules (modern foreign languages) are listed subject to availability and compatibility with the School of Pharmacy timetable for compulsory modules. The choice of English language modules provided is available only to those students for whom English is a second language. For information the full list of currently available language modules is listed above; students would be expected to take a follow-on language module at the next level, i.e. if a student took SPN-90003 or SPN-90004 at Level 5 then they would be expected to continue by taking SPN-90005 or SPN-90006.

For further information on the content of modules currently offered, including the list of elective modules, please visit: www.keele.ac.uk/recordsandexams/az

Learning Outcomes

The table below sets out what students learn in each year of the Programme, the modules in which that learning takes place, and the main ways in which students are assessed on their learning. In Year 1 (Level 4) and Year 2 (Level 5) these learning outcomes are achieved in the compulsory modules which all students are required to take. Some of these outcomes may also be achieved or reinforced in elective modules together with other outcomes not stated here. In Year 3 (Level 6) the stated outcomes are achieved by taking any of the modules offered in each semester.

Year 1 (Level 4)

Subject Knowledge and Understanding		
Learning Outcome *Successful students will be able to:*	**Module in which this is delivered**	**Principal forms of assessment (of the Level Outcome) used**
Appreciate the pivotal role played by the gene in living organisms and discuss the molecular aspects of chromosome and gene structure, replication, expression and regulation.	PHA-10015 Essential Topics In Pharmaceutical Science	Examination, practical assessments and laboratory-based coursework exercises
Appreciate and describe the main patterns of inheritance in humans, the nature of interactions between genes and the influence of gene interaction on inheritance patterns.		
Demonstrate understanding of the dynamic nature of genes in populations and understand how changes in gene frequency serve as a mechanism of evolution.		
Apply a knowledge of examples and possible causes of inherited and acquired genetic diseases to describe the importance of genetics in the study of human disease.		
Demonstrate an appreciation of the opportunities to target specific cell structures and processes for the treatment of disease		
Describe the general mechanisms by which various molecules are recognised and transported across biological membranes		
Outline the structures and roles of common biological molecules and describe their		

chemical and physical properties		
Demonstrate knowledge and understanding, at a basic level, of the main scientific and technological principles supporting selected areas of biology and biomedicine.		
Understand and describe the principles of structure and bonding which affect the 3-dimensional shape of molecules and assign appropriate stereochemical descriptions to organic and biological molecules		
Describe the basic architecture and cellular diversity of prokaryotic and eukaryotic (plant and animal) cells, making comparisons and distinctions between them.		
Recognise and understand how the structural features, stereochemistry and functional groups responsible for chemical and physical properties can influence the biological activity of molecules and, hence, the drug design process.		
Identify common organic molecular structures and functional groups and write suitable reaction mechanisms for their interconversion		
Demonstrate understanding of the general importance of compartmentalisation to cellular function in eukaryotes, and explain some of the principal roles of cellular organelles		
Describe the cellular and molecular interactions involved in the formation of tissues		
Describe the structure and fundamental properties of biological membranes, distinguishing the roles played by the lipid and protein components of the membrane		
Describe the general mechanisms by which various molecules are recognised and transported across biological membranes		
Understand and demonstrate knowledge of the central role of metabolism in homeostasis, the key molecules involved and the thermodynamics controlling it	PHA-10016 Core Topics In Pharmaceutical Science I	Examination, practical assessments and laboratory-based coursework exercises
Understand and describe the progress and control of key catabolic and anabolic metabolic pathways involving carbohydrates, fatty acids and amino acids.		
Recognise and understand how the		

structural features, stereochemistry and functional groups responsible for chemical and physical properties can influence the biological activity of molecules and, hence, the drug design process.		
Identify common organic molecular structures and functional groups and write suitable reaction mechanisms for their interconversion		
Describe the basic mechanisms by which proteins are targeted to the secretory pathway and cytoplasmic pathway in eukaryotic cells		
Understand and describe the integration of metabolic processes in the maintenance of homeostasis and the consequences of errors in metabolism		
Describe the normal anatomy and physiology of various systems within the human body and understand the causes and outcomes of the main types of pathology affecting these systems		
Understand and demonstrate knowledge of the basic thermodynamic principles that govern the progress of chemical reactions both in vitro and in vivo		
Understand the kinetics of a chemical or biological process, and describe and apply methods for determining the rate of that process both in vitro and in vivo		
Demonstrate an appreciation of the opportunities to target specific cell structures and processes for the treatment of disease		
Understand and describe biopharmaceutics in terms of the relationship between dosage form and interaction of the drug substance with patient physiology		
Understand and describe the basic aspects of formulation science related to drug distribution and drug action that are important in drug design and development		
Describe the normal anatomy and physiology of various systems within the human body and understand the causes and outcomes of the main types of pathology affecting these systems	PHA-10017 Core Topics In Pharmaceutical Science II	Examination, practical assessments and laboratory-based coursework exercises
Understand and describe the process of drug discovery and development, from		

target disease to the design and isolation of a pure lead compound for formulation to provide a medicinal product.		
Demonstrate an appreciation of the opportunities to target specific cell structures and processes for the treatment of disease.		
Recognise and understand how the structural features, stereochemistry and functional groups responsible for chemical and physical properties can influence the biological activity of molecules and, hence, the drug design process		
Identify common organic molecular structures and functional groups and write suitable reaction mechanisms for their interconversion.		
Describe the general mechanisms by which various molecules are recognised and transported across biological membranes.		
Describe the underlying principles of quantitative pharmacology in relation to small organic molecules and biomolecules as therapeutic agents, and its relationship to biological processes and pharmaceutical products.		
Understand and describe the basic aspects of formulation science related to drug distribution and drug action that are important in drug design and development		
Describe why a variety of dosage forms are necessary, and the relative merits and demerits of the available forms		
Understand and describe the structure of the global pharmaceutical industry – past, present and future	PHA-10018 The Business of Drug Discovery	Written report, examination (essay-based) and synoptic group exercise (group project and individual interview)
Explain in detail the role of strategic partnering and business development in the current global pharmaceutical environment		
Understand and describe the elements and terminology of corporate strategy in the global pharmaceutical industry.		
Outline the team-based processes from drug discovery and commissioning (including financial structures and requirements), through scientific and clinical development, to marketing and post-market surveillance		
Understand and describe the drug discovery		

and product development cycle		
Understand the legal (i.e. intellectual property) and regulatory framework for the global pharmaceutical industry		
Develop and employ a high level of experimental, analytical and reporting skills in the successful completion of appropriate manipulative practical exercises, including the extraction, isolation, synthesis and characterisation of pharmaceutically-relevant organic compounds.	PHA-10015 Essential Topics In Pharmaceutical Science PHA-10016 Core Topics In Pharmaceutical Science I PHA-10017 Core Topics In Pharmaceutical Science II PHA-10018 The Business of Pharmacy	Examination, practical assessments and laboratory-based coursework exercises; for PHA-10018 only this will also involve report-writing and the synoptic exercise (group report / individual interview)
Acquire data from experiments, analyse and manipulate it using appropriate techniques, and apply methods for the presentation of data, including statistical analysis and choosing an appropriate method of presentation		
Be able to use a range of IT facilities to research, perform calculations and present data and written assessments in an appropriate style		
Understand and apply the appropriate levels of numeracy and IT skills requisite for further study in pharmaceutical science at all Levels to perform common scientific calculations with precision and accuracy		
Communicate complex concepts effectively, both orally and in writing, in a manner that reflects professional practice		

Key or Transferable Skills (graduate attributes)		
Learning Outcome *Successful students will be able to:*	**Module in which this is delivered**	**Principal forms of assessment (of the Level Outcome) used**
Develop an open and questioning approach to ideas, demonstrating curiosity, independence of thought and the ability to appreciate a range of perspectives on the natural and social worlds		
Develop an appreciation of the development and value of your chosen subjects of study, awareness of their contexts, the links between them, and awareness of the provisional and dynamic nature of knowledge		
information literacy: the ability to locate, evaluate and synthesise large amounts of frequently conflicting information, ideas and data		

the ability creatively to solve problems using a range of different approaches and techniques, and to determine which techniques are appropriate for the issue at hand	PHA-10015 Essential Topics in Pharmaceutical Science PHA-10016 Core Topics in Pharmaceutical Science I PHA-10017 Core Topics in Pharmaceutical Science II PHA-10018 The Business of Pharmacy	Examination (both MCQ and essay-based, depending on the module); practical and laboratory-based coursework assessments including online tests.
an appreciation of the social, environmental and global implications of your studies and other activities, including recognition of any ethical implications		
the ability to communicate clearly and effectively in written and verbal forms for different purposes and to a variety of audiences		
the knowledge, skills, self-confidence and self-awareness actively to pursue your future goals		
the ability and motivation to participate responsibly and collaboratively as an active citizen in the communities in which you live and work		
a professional and reflective approach, including qualities of leadership, responsibility, personal integrity, empathy, care and respect for others, accountability and self-regulation		
the flexibility to thrive in rapidly changing and uncertain external environments and to update skills and knowledge as circumstances require.		

Year 2 (Level 5)

Subject Knowledge and Understanding		
Learning Outcome *Successful students will be able to:*	**Module in which this is delivered**	**Principal forms of assessment (of the Level Outcome) used**
Explain the processes involved in the quality control of all aspects of pharmaceutical drug development, formulation and the manufacturing process.	PHA-20014 Pharmaceutical Analysis and Quality Control	Laboratory-based assessments, synoptic assessment and examination
Describe in detail analytical techniques employed to assure quality and safety during the drug development process and the quality, safety and efficacy of the finished drug product.		
Explain the common techniques used in the analysis of biological data to arrive at safe		

and appropriate drug selection for a patient.		
Describe the role of pharmaceutical analysis and quality assurance methods in the context of national and international standards and regulatory processes.		
Describe the processes involved in the quality assurance of all aspects of pharmaceutical drug development, formulation and the manufacturing process, and how they are applied to the development and production of medicines.		
Explain the relationship between absorption, distribution, metabolism and elimination of drugs and their physicochemical properties and formulation.		
Compare and evaluate the efficiency and safety of different routes of drug administration.		
Demonstrate the relationship between the design of drug product formulation, properties of the formulation, in vitro behaviour and in vivo performance.		
Demonstrate competence in pharmaceutical calculations related to pharmaceutical quality assurance and quality systems.		
Demonstrate competence in the performance of laboratory techniques in the pharmaceutical sciences and the analysis of data generated therein.		
Demonstrate knowledge of and apply an integrated approach towards patient care which links pharmaceutical science and pharmaceutical business development.	PHA-20016 Applied Pharmaceutical Science I	Practical- and laboratory-based assessments; examinations.
Explain how physiological patient factors affect the choice of pharmacological agents to treat disease states based upon absorption, distribution, metabolism and excretion data.		
Explain how drug resistance and drug interactions have consequences for pharmaceutical development and patient care.		
Explain the underpinning concepts in		

physical chemistry and materials science which underpin drug formulation.		
Evaluate and select processes and formulations appropriate to the manufacture of specified drug products.		
Describe the relevance of microbiology within healthcare practice, and the challenges presented by infection in the context of pharmaceutical development and patient care.		
Describe in detail the metabolic interrelationships of the various tissues and organs of the human body, including the role of hormones in the integration of metabolism and the maintenance of homeostasis.		
Demonstrate competence in pharmaceutical calculations related to pharmacology and pharmaceutics.		
Demonstrate knowledge of and apply an integrated approach towards patient care which links pharmaceutical science and pharmaceutical manufacturing.	PHA-20018 Applied Pharmaceutical Science II	Practical- and laboratory-based assessments; examinations.
Explain how patient physiology and pathophysiology affect the drug choice in the context of absorption, distribution, metabolism and excretion (ADME) models.		
Explain the role of drug resistance and drug interactions in pharmaceutical development.		
Explain the underpinning concepts in physical chemistry and materials science which underpin the formulation of parenteral, solid and semi-solid dosage forms.		
Evaluate and select processes and formulations appropriate to the manufacture and testing of specified parenteral, solid and semi-solid dosage forms.		
Describe the relevance of microbiology within the context of medicinal product quality.		

Describe in detail the metabolic interrelationships of the various tissues and organs of the human body, including the role of hormones in the integration of metabolism and the maintenance of homeostasis.		
Demonstrate competence in pharmaceutical calculations related to pharmacology and pharmaceutics including a focus on parenteral, semi-solid, solid and particulate dose forms, with reference where appropriate to pharmacopoeial standards.		
Recognise the role of the skin in percutaneous absorption, including dermal and transdermal delivery.		

Key or Transferable Skills (graduate attributes)

Learning Outcome *Successful students will be able to:*	**Module in which this is delivered**	**Principal forms of assessment (of the Level Outcome) used**
Develop an open and questioning approach to ideas, demonstrating curiosity, independence of thought and the ability to appreciate a range of perspectives on the natural and social worlds	PHA-20014 Pharmaceutical Analysis & Quality Control PHA-20016 Applied Pharmaceutical Science I PHA-20018 Applied Pharmaceutical Science II	Examination (both MCQ and essay-based, depending on the module); practical and laboratory-based coursework assessments including online tests; synoptic assessment (in PHA-20014).
Develop an appreciation of the development and value of your chosen subjects of study, awareness of their contexts, the links between them, and awareness of the provisional and dynamic nature of knowledge		
Acquire information literacy: the ability to locate, evaluate and synthesise large amounts of frequently conflicting information, ideas and data		
Develop the ability creatively to solve problems using a range of different approaches and techniques, and to determine which techniques are appropriate for the issue at hand		
Develop an appreciation of the social, environmental and global implications of your studies and other activities, including recognition of any ethical implications		
Develop the ability to communicate clearly and effectively in written and verbal forms for different purposes and to a variety of		

audiences		
Acquire the knowledge, skills, self-confidence and self-awareness actively to pursue your future goals		
Develop the ability and motivation to participate responsibly and collaboratively as an active citizen in the communities in which you live and work		
Foster a professional and reflective approach, including qualities of leadership, responsibility, personal integrity, empathy, care and respect for others, accountability and self-regulation		
Develop the flexibility to thrive in rapidly changing and uncertain external environments and to update skills and knowledge as circumstances require.		

Year 3 (Level 6)

Subject Knowledge and Understanding		
Learning Outcome *Successful students will be able to:*	**Module in which this is delivered**	**Principal forms of assessment (of the Level Outcome) used**
Demonstrate a comprehensive understanding of research techniques and self-management skills in order to plan a programme of research at a professional level Demonstrate a comprehensive understanding of research techniques and self-management skills in order to plan a programme of research at a professional level	PHA-30025 Pharmaceutical Science Research Project	Research report and research presentation
Critically evaluate current research and advanced scholarship relevant to the chosen research area		
Demonstrate comprehensive knowledge at the forefront of the project area		
Demonstrate the ability to select and develop a research strategy appropriate to the chosen research area		
Accurately undertake data acquisition in the chosen project area		
Show self-direction and originality in tackling and solving problems		
Produce a document detailing the research carried out and a critical appraisal of the findings, and any conclusions drawn and recommendations or hypotheses made as a		

consequence		
Communicate progress reports and conclusions on the work carried out to specialist and non-specialist audiences		
Communicate complex concepts effectively, both orally and in writing, in a manner that reflects professional work		
Critically evaluate current research and advanced scholarship and practice in selected specialist topics within the pharmaceutical sciences	PHA-30019 Current Developments in Pharmaceutical Science PHA-30017 Current Developments in Pharmaceutical Science II	A range of assessment types, depending on the specific subject studied, but including reports, essays, presentations and poster presentations.
Communicate complex concepts effectively, both orally and in writing, in a manner that reflects professional practice		
Understand systematically and critically appraise the clinical development of pharmaceutical products in the context of global (and hence, harmonisation) marketing, life-cycle management, post-market surveillance and in planning for future products / product extensions	PHA-30021 The Pharmaceutical Industry at the Cutting Edge	Written reports, group project, oral presentation / interview, examination
Demonstrate an in-depth understanding of global pharmaceutical manufacturing in the context of the total global supply chain, including global and local sourcing strategies, supply operations, outsourcing and supply agreements		
Demonstrate a systematic understanding and apply knowledge of leading edge topics in global product commercialisation with regard to its principles, limitations, key marketing and promotion principles, (legal and regulatory) codes of conduct and product termination, underpinned by a knowledge and understanding of the application of global patents and protection of intellectual property		
Demonstrate a systematic understanding and apply the principles of management training in facilitating successful pharmaceutical product development		
Demonstrate a systematic knowledge of concepts from the forefront of the arena of global pharmaceutical product development, from the key underpinning science to the applied and regulatory context		
Synthesise, evaluate and contextualise the key scientific, legal and business information to generate business proposals and product		

submission dossiers		
Demonstrate a systematic understanding of and practice the concepts of working within the complex team-based and inter-disciplinary global pharmaceutical industry		
Demonstrate an in-depth understanding of the principles of leadership within management teams and practise the application of these concepts within the complex team-based and inter-disciplinary global pharmaceutical industry		
Communicate complex concepts effectively, both orally and in writing, in a manner that reflects professional work		
Demonstrate a systematic understanding of the actions of drugs in terms of their interactions with physiological systems	PHA-30023 Advanced Topics In Pharmaceutical Science	Written reports, laboratory reports, oral presentation (individual / group), examinations.
Demonstrate a detailed knowledge of the use of drugs to correct disorders of physiological systems		
Describe and critically evaluate the role of pharmacotherapy in the management of disease		
Demonstrate detailed knowledge of the physicochemical properties of advanced and cutting-edge drug delivery systems		
Demonstrate a systematic understanding of the relationship between in vitro properties of drug delivery systems to their in vivo behaviour		
Select, with detailed rationale, appropriate drug delivery systems for specific patients to maximise the therapeutic benefits		
Review, consolidate, and extend knowledge and understanding of the properties and applications of current and emerging drug delivery systems		
Apply established techniques to acquire laboratory data and critically evaluate data from the literature about the properties of drug delivery systems		
Interpret complex data obtained through experiments to formulate conclusions about the actions of drugs in physiological systems		
Critically evaluate current research and advanced scholarship in pharmaceutical sciences relevant to the chosen research area		

Demonstrate an in-depth understanding of analytic and literature evaluation techniques		
Critically appraise published clinical and experimental data using a structured approach, in order to assess its quality and validity		
Communicate complex concepts effectively, both orally and in writing, in a manner that reflects professional work		

Key or Transferable Skills (graduate attributes)		
Learning Outcome *Successful students will be able to develop:*	**Module in which this is delivered**	**Principal forms of assessment (of the Level Outcome) used**
An open and questioning approach to ideas, demonstrating curiosity, independence of thought and the ability to appreciate a range of perspectives on the natural and social worlds	PHA-30025 Pharmaceutical Science Research Project PHA-30019 Current Developments in Pharmaceutical Science (30 credits) or PHA-30017 Current Developments in Pharmaceutical Science II (15 credits) PHA-30021 The Pharmaceutical Industry at the Cutting Edge PHA-30023 Advanced Topics In Pharmaceutical Science	PHA-30025 Research report Research presentation
An appreciation of the development and value of your chosen subjects of study, awareness of their contexts, the links between them, and awareness of the provisional and dynamic nature of knowledge		PHA-30019 & PHA-30017: Current Developments in Pharmaceutical Science Depending on the option topic chosen, but normally: written report; oral presentation or group workshop; or a combination thereof.
Information literacy: the ability to locate, evaluate and synthesise large amounts of frequently conflicting information, ideas and data		
The ability creatively to solve problems using a range of different approaches and techniques, and to determine which techniques are appropriate for the issue at hand		PHA-30021 The Pharmaceutical Industry at the Cutting Edge Written examination, written reports, group report (written / oral components), individual oral presentation.
An appreciation of the social, environmental and global implications of your studies and other activities, including recognition of any ethical implications		PHA-30023 Advanced Topics In Pharmaceutical Sciences Written exam; coursework (written research reports)
The ability to communicate clearly and effectively in written and verbal forms for different purposes and to a variety of audiences		
The knowledge, skills, self-confidence and self-awareness actively to pursue your		

future goals		
The ability and motivation to participate responsibly and collaboratively as an active citizen in the communities in which you live and work		
A professional and reflective approach, including qualities of leadership, responsibility, personal integrity, empathy, care and respect for others, accountability and self-regulation		
The flexibility to thrive in rapidly changing and uncertain external environments and to update skills and knowledge as circumstances require		

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 Pharmaceutical Science, Technology & Business (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 BSc (Hons) Pharmaceutical Science, Technology & Business. In addition, students whose credits include 60 credits for modules provided by the language centre can, depending on the CEFR-level of those modules, be additionally awarded the notation on their degree certificate of "with competency" or "with advanced competency" in their chosen language.
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

10. How is the Programme assessed?

The wide variety of assessment methods used within BSc (Hons) Pharmaceutical Science, Technology & Business 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 within BSc (Hons) Pharmaceutical Science, Technology & Business:

- The assessments used in this programme reflect a wide range of academic practice and are also designed to be relevant to the needs of the industry. For example, the synoptic assessment collates and integrates learning across science and business at Level Five of the programme, whilst the use of batch record sheets in laboratory sessions reflect practice in industry (pharmaceutical and otherwise). The main modes of assessment are examinations (essay-based, short-answer questions and multiple choice

questions), laboratory practical exercises (with associated report-writing and documentation completion, as well as physical sample preparation and analysis), workshops (including pharmaceutical calculations), group and individual presentations and synoptic exercises.

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	Year 1 (Level 4)	Year 2 (Level 5)	Year 3 (Level 6)
Scheduled learning and teaching activities	34%	34%	34%
Guided independent Study	66%	66%	66%
Placements	0%	0%	0%

12. Accreditation

This programme is not currently accredited by an external body. However, discussions have begun with the Academy of Pharmaceutical Sciences and The Royal Society of Chemistry to begin the process of accreditation by both those bodies. Students will be updated as appropriate to any changes in the status of these processes.

13. 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/

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

Subject	A-level	Subjects not included	International Baccalaureate	BTEC	Access to Higher Education Diploma	GCSE requirements
Pharmaceutical Science, Technology & Business	BBB / ABC to include Biology or Chemistry. A pass in at least one Science Practical will be required** ** Science practical only required from	Dual award Applied Science, Critical Thinking, General Studies, Maths and Further Maths in combination. Media Studies	32 points to include Higher Level Chemistry or Biology at 5.	DDM in Level 3 Applied Science Extended. You must have taken specific units, please contact School of Pharmacy for	60 credit Access to Higher Education Diploma with 30 Level 3 credits at Distinction and 15 Level 3 credits at Merit or above. 30 credits are required in Biology and/ or Chemistry. Please	Maths at C (or 4). Level and English Language at C (or 4) or above

	applicants taking reformed A level Biology, Chemistry or Physics in England.	only accepted with both Chemistry and Biology		further advice on pharmacy@keele.ac.uk	contact School of Pharmacy for further advice on pharmacy@keele.ac.uk	

Applicants who are not currently undertaking any formal study or who have been out of formal education for more than 3 years and are not qualified to A-level or BTEC standard may be offered entry to the University's Science Foundation Year (SFY) programme. Progression from the SFY to the first year of the BSc (PSTB) requires students to achieve a minimum of 60% overall and in each module studied.

Applicants for whom English is not a first language must provide evidence of a recognised qualification in English language. The minimum score for entry to the Programme is Academic IELTS 7.0 overall, with a minimum of 6.5 in each sub-component, or equivalent.

Please note: All non-native English speaking students are required to undertake a diagnostic English language assessment on arrival at Keele, to determine whether English language support may help them succeed with their studies. An English language module may be compulsory for some students during their first year at Keele.

Accreditation of Prior Learning (APL) 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:
http://www.keele.ac.uk/qa/accreditationofpriorlearning/

15. How are students supported on the programme?

Keele Online Learning Environment

New students will be assigned a username and password that provides access to the main University network, email and the Internet. Keele Learning Environment (KLE) – The KLE is used by Keele to provide every student and member of staff with a personal teaching and learning workspace that can be accessed through the internet. This is where you will find all the teaching materials that are associated with the course. You will also find copies of all the BSc (PSTB) guidance documents and a section where you can access careers support information, as well as the teaching materials for the BSc course.

You should regularly access the KLE, ideally on a daily basis, since it provides the most accurate and up-to-date information with regard to your course. Online help for the KLE can be found here: http://www.keele.ac.uk/klehelp. New students will be provided with log-in details and an introductory session on the use of the KLE soon after registration.

Communication with Students

The School of Pharmacy and other University services will contact you intermittently with important information related to your studies. The primary channel for communication will be your Keele email address. It is expected that you will check your Keele email regularly, and you are responsible for reading University emails and taking action if appropriate. The secondary channel for communication is through the post so please ensure that you keep your address details up-to-date on SCIMS. This information may include details of assessments and notification of changes to teaching sessions. The School of Pharmacy will not send information to any personal email addresses.

Sources of help and advice

You will find that all staff associated with the School of Pharmacy – for both the MPharm and BSc programmes – are friendly and approachable, and you should not feel worried or inhibited about going to see them at any time. Please do not hesitate to contact your Personal Tutor, your Year Tutor, the Director of Learning and Teaching for the BSc or MPharm or, if you prefer, any other member of staff if you require help or advice on any matter that affects your academic progress or any other aspect of your life at Keele.

Personal tutors

Your Personal Tutor is a first point of contact for general guidance on academic and career development and, in consultation with yourself, may refer you to specialist academic support services within the University. Your Personal Tutor can also provide advice, support and general guidance on non-academic issues or, again, in consultation with yourself refer you to pastoral support services within the University, where necessary. Your Personal Tutor will be a member of staff associated with the School of Pharmacy.

It is important that you inform your personal tutor or the year / module tutor of any circumstances, medical or otherwise, that may affect your academic work.

Your Personal Tutor may have particular office hours or you may have to arrange an appointment; you should contact your Personal Tutor by telephone or email if you wish to discuss a particular issue but do not hesitate to approach your Tutor immediately if there is a problem that you wish to discuss urgently. If you cannot contact your Personal Tutor, you may contact the Senior Tutor, Dr Gary Moss, Programme Director,, who oversees the personal tutoring system for the BSc programme. You can find the University's Code of Practice for Personal Tutoring at:
https://www.keele.ac.uk/policyzone/viewbyowner/studentandacademicservices/name,157128,en.php

Reference requests
You should always give the name and contact details of your Personal Tutor if you are asked to provide a contact for references when applying for jobs. It is courteous always to let your tutor know each time that you give their contact details to someone, so that they are aware that they may be approached.

Your first point of contact should always be your Personal Tutor, but you may also approach other members of the academic staff to write a reference for you but only if more than one academic reference is required. In these circumstances you must ask the permission of that person in advance. In addition to being a professional courtesy, this is to ensure that staff members are aware that they may be approached by employers.

Your tutor or other referees will ensure that it is as accurate as possible and will familiarise themselves with both your academic performance and the levels of application and professionalism that you have demonstrated during your time on the course. Please note that if your attendance record is poor or if you have been found guilty of academic misconduct or unprofessional behaviour then this may be reflected in your reference, and hence may jeopardise your chance of success with your application. You should note that nowadays employers routinely ask whether students have been subject to fitness to practise investigations.

Progress interviews with your personal tutor
If you are new to the programme you will be introduced to your Personal Tutor in your second week.

All students will meet regularly with Personal Tutors throughout their time at Keele. There will be reminders in your timetable when the meetings are due throughout the year. The meetings are to give feedback on your academic progress, and to give you the opportunity to raise any matters of concern.

Meetings with your Tutor are treated in confidence. A note of the meeting will be kept on your personal record but access to this is limited. If it is necessary to keep details of sensitive information, such as medical conditions relating to missed assessments, then access to this type of information is strictly limited.

Additional help and Guidance
Additional information relating to student welfare and support can be found through:

Advice and Support at Keele – ASK
Located on the ground floor of KeeleSU (the Students' Union), ASK delivers independent advice on a whole range of issues, including academic, health, family, wellbeing, accommodation, finance, legal, international and employment. The advice and support that ASK offers is free, confidential, non-judgemental and impartial. Our trained Education and Welfare Advisors are here to help, just ASK. For more information, please visit www.keelesu.com/advice or come and see us between Mon-Fri 10.00am to 12.30pm and 1.00pm to 4.00pm.

16. Learning Resources

The PC suite in the Atrium of the Lennard-Jones laboratories is available during normal working hours and evenings. The PCs run a variety of programs relevant to the Pharmacy programme and you can access the Internet and email, but please show consideration for other users and don't spend excessive periods on social activities. You can also print lecture notes and laboratory scripts from these computers. You must not eat, drink or use a mobile telephone in the PC suite. Photocopiers for student use are available in the University Library.

The University Library

The University Library's mission is to provide effective access to all forms of academic information in support of the University's teaching, learning and research. We have two Library sites, the main Campus Library and the Health Library at the Royal Stoke Hospital. We offer over 1,100 study spaces and extensive opening hours - the Campus Library is open 24/7 during semester and the Health Library seven days a week all year (except bank holidays). Students can work in a variety of study environments, ranging from group to silent study, and can also book rooms for either purpose. There's also a refreshment area in the Campus Library, and Wi-Fi access is available on both our sites. Our academic collections are provided both online and in print. We subscribe to around 20,000 e-journals, 300,000 e-books and have over 600,000 items on our shelves. Students can access many reading lists online, and our "Catalogue Plus" service can be used to find relevant information both in print and online via a single easy-to-use web catalogue. Books can normally be borrowed for two weeks, one week or one day, depending on demand for the title. Students can get help from our staff at the Library's InfoPoint, and throughout the year. Liaison Librarians provide an extensive range of training tailored to help students with their research and information skills. Find out more about our services from our website: http://www.keele.ac.uk/library/. Accessing e-journals off campus - Access to Keele's e-resources is through your Keele username and password. When you reach the journal home page look out for a link called "institutional log-in" or "Shibboleth log-in", select the UK Federation and then Keele University and log in using your IT Account username and password (the log-in you use to access the Campus network) when you reach the usual yellow Keele log-in screen. Visit http://www.keele.ac.uk/library/support/access/ for more information, including our Off-campus Access Step by Step guide and a series of short you-tube videos to assist with off-campus log-ins to each individual publisher.

Please note that past examination papers from the BSc Pharmaceutical Science, Technology & Business programme are currently not made available via the library, or from any other source. While it is important that you are familiar with the format of exams and assessments, when it comes to passing it is much more important that you understand the material that you have learned in the module. Sample questions and / or sample exam papers will be made available via the KLE where appropriate to ensure that students are familiar with the style of questions used in any given exam paper. If you have any comments concerning the provision of materials in the University Library you should ask your representative on the SSLC to raise the matter at a BSc (PSTB) Course Committee meeting.

IT Services

IT Services are responsible for your IT systems and networks throughout the University. The services include the wireless network, printing service, IT Suite and Labs, Laptop Loan and Laptop repair service. They provide help and advice on using Keele Systems such as the Keele Learning Environment, eVision, Office software or Google Mail and apps and advice when connecting to the wireless network (eduroam). Eduroam is now available at the Royal Stoke Hospital site, enabling student access to the internet whilst on placement.

The IT Service Desk is the first point of call for anything IT related. It is based in the Campus Library and IT Services building and is open 7 days per week throughout the Semester. For further information regarding IT Services, or to report a problem or seek advice please visit www.keele.ac.uk/it.

Within the School of Pharmacy there is a team of IT technicians who are responsible for the day-to-day IT needs of the School, including network issues and more specialised software used by the School. They can be contacted at pharmacy.it@keele.ac.uk

Remember when using Keele University IT systems that you are bound by the IT Conditions of Use, a link which can be found at: www.keele.ac.uk/it. It is important that you familiarise yourself with these to ensure that you use the systems within the terms of the Acceptable Use Policy.
Keep yourself safe whilst online:

- Make sure that before connecting to the network your antivirus, web browser and operating system are all up to date.
- Protect your personal information. Secure your account by changing your password to something that is memorable but secure, a combination of capital and lowercase letter.
- Ensure that your online presence, particularly in social media, has the security set to a level you are comfortable with.
- If you receive an email or message that sounds too good to be true you are probably best deleting it. Do not give out personal information to a non-accredited website or link.

If in doubt about staying safe whilst online, check with someone you can trust like IT Services.

17. Other learning opportunities

Study abroad (semester)

Students on the BSc (Hons) Pharmaceutical Science, Technology & Business programme have the potential opportunity to spend a semester abroad in their second year studying at one of Keele's international partner universities.

Exactly which countries are available depends on the student's choice of degree subjects. An indicative list of countries is on the website (http://www.keele.ac.uk/studyabroad/partneruniversities/); however this does not guarantee the availability of study in a specific country as this is subject to the University's application process for studying abroad.

No additional tuition fees are payable for a single semester studying abroad but students do 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 to 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

Whilst students are studying abroad any Student Finance eligibility will continue, where applicable students may be eligible for specific travel or disability grants. Students studying in Erasmus+ destinations may be eligible for grants as part of this programme. Students studying outside of this programme may be eligible for 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.

18. Additional costs

These costs have been forecast by the University as accurately as possible but may be subject to change as a result of factors outside of our control (for example, increase in costs for external services). Forecast costs are reviewed on an annual basis to ensure they remain representative. Where additional costs are in direct control of the University we will ensure increases do not exceed 5%.

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 undergraduate programme.

19. Quality management and enhancement

The quality and standards of learning in BSc (Hons) Pharmaceutical Science, Technology & Business are subject to a continuous process of monitoring, review and enhancement.

- The Learning and Teaching Committee of the School of Pharmacy is responsible for reviewing and monitoring quality management and enhancement procedures and activities across the School.
- Individual modules and the BSc (Hons) Pharmaceutical Science, Technology & Business Programme as a whole are reviewed and enhanced every year in the annual course 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 Internal Quality Audit (IQA) process.

Student evaluation of, and feedback on, the quality of learning on every BSc (Hons) Pharmaceutical Science, Technology & Business 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 the annual review process.
- Findings related to the BSc (Hons) Pharmaceutical Science, Technology & Business Programme from the annual National Student Survey (NSS), 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 in all three years of the BSc (Hons) Pharmaceutical Science, Technology & Business Programme is considered and acted on at regular meetings of the Programme's 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/

20. The principles of programme design

The BSc (Hons) Pharmaceutical Science, Technology & Business 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

21. Document Version History

Date of first approved version (v1.0): 5th October 2017

Revision history

Version number[1]	Author	Date	Summary of and rationale for changes
2	Gary Moss	27th February 2019	Major revision based on realignment of content, not delivery of new content, to reflect changes to the external environment that might affect the shared nature of the

[1] 1.1, 1.2 etc. are used for minor changes and 2.0, 3.0 etc. for major changes (as defined in the University's Guidance on processes supporting curriculum changes).

			MPharm and BSc programmes in the School of Pharmacy. Removal of 45 credit modules to enhance student retention and to better align with other university programmes. Increased choice in business modules and the adoption of the language pathway for competency / advanced competency in a chosen language. In summary: (1) Greater divergence in BSc and MPharm programmes in the last few years, even greater differences will emerge in the next 3 – 5 years. (2) Greater alignment with university programmes (content, qualifying marks, module choice) notably in FNS. (3) Strengthening the language pathways with further credit to allow "with competency" or "with advanced competency" to be added to the final degree award. (4) Removal of 45-credit modules from Year Two. LSC-30068 Applied Regenerative Medicine added following email from Gary Moss 25/3/19