Programme Information & PLOs

This document forms part of the Programme Design Document and is for use in the roll-out of the York Pedagogy to design and capture new programme statement of purpose (for applicants to the programme), programme learning outcomes, programme map and enhancement plan. Please provide information required on all three tabs of this document.

Title of the new programme – including any year abroad/ in industry variants

MSci & BSc Biophysical Science

Level of qualification

Please select:	Level 7

Please indicate if the programme is offered with any year abroad / in industry variants	**Year in Industry** Please select Y/N	No
	Year Abroad Please select Y/N	No

Department(s):
Where more than one department is involved, indicate the lead department

Lead Department	Natural Sciences
Other contributing Departments:	Biology, Chemistry, Physics, Mathematics

Programme leadership and programme team

Please name the programme leader and any key members of staff responsible for designing, maintaining and overseeing the programme.

Christoph Baumann (PL, Bio), Andy Parsons & Glenn Hurst (Chem) Eric Dykeman (Maths), Laurence Wilson (Phys), Jason Levesley (Ch. BoS), Roddy Vann (PD)

Particular information that the UTC working group should be aware of when considering the programme documentation (e.g. challenges faced, status of the implementation of the pedagogy, need to incorporate PSRB or employer expectations)

With few exceptions the modules that make up any of the Nat. Sci. programmes are drawn from the corresponding contributing single subject degree programmes. Local pedagogical practices and modes of assessment are honoured in Nat. Sci. unless there is evidence that such practices would not be pedagogically sound. Therefore, given the nature of the Nat. Sci. programmes parts of this document draw liberally from, or make reference to, the corresponding documentation from the contributing departments. This documentation should therefore be considered in parallel with the corresponding proforma for the single subject degree programmes of the contributing departments.

Who has been involved in producing the programme map and enhancement plan? (please include confirmation of the extent to which colleagues from the programme team /BoS have been involved; whether student views have yet been incorporated, and also any external input, such as employer liaison board)

The people listed in 14 item have primarily being responsible for the programme map and enhancement plan. At all stages the BoS has had free access to and been invited to comment on the documentation. Student input has been fed into the YP process in a focus group, through the SSLC and via the BoS.

Purpose and learning outcomes of the programme

Statement of purpose for applicants to the programme

Please express succinctly the overall aims of the programme as an applicant facing statement for a prospectus or website. This should clarify to a prospective student why they should choose this programme, what it will provide to them and what benefits they will gain from completing it.

All Natural Science programmes at the University of York aim to produce leaders in science, technology and industry who will have the interdisciplinary knowledge and skills to succeed in complex research and business environments. You will learn how science is conducted in different disciplines, how to operate within different methodological communities, and how to apply techniques and ideas across multiple disciplines.

A Biophysical Science student will experience a carefully constructed course that is built upon, and exploits the synergies that exist between, three of the core experimental sciences; Biology, Chemistry and Physics. You will experience first hand how these three fundamental subjects combine to give a unique approach to studying biological systems using the tools, techniques and philosophy of physics and chemistry. The York Biophysical Science programme combines modules from across the Departments of Biology, Chemistry and Physics that will bring these links to life, distinguishing a York Biophysical Science graduate as a truly interdisciplinary practitioner with a keen knowledge and appreciation of science that goes beyond the boundaries of any of the constituent subjects.

As a student on the MSci programme you will achieve all the above, but your skills and knowledge will be developed further and to a deeper level as you undertake an extended final year research project that will move you towards the research frontier in Biophysical Science, giving you the expertise, skills and experience necessary to pursue graduate level research both within and outside academia.

Programme Learning Outcomes

Please provide six to eight statements of what a graduate of the programme can be expected to do.

Taken together, these outcomes should capture the distinctive features of the programme. They should also be outcomes for which progressive achievement through the course of the programme can be articulated, and which will therefore be reflected in the design of the whole programme.

PLO	On successful completion of the programme, graduates will be able to:
1 BSc	Apply knowledge of relevant practice and technology in the biophysical sciences by using numerical, quantitative, and computer-based transferable skills to solve real world problems. [Problem Solving]
1 MSci	Apply comprehensive understanding of cutting-edge practice and technology in the biophysical sciences by using numerical, quantitative, and computer-based transferable skills to solve real world problems. [Problem Solving]
2 BSc	Identify, justify and apply appropriate mathematical, experimental and statistical methods, as used in biology, chemistry and physics, to a biophysical problem. [Experiment/Simulation]
2 MSci	Identify, justify and apply complex mathematical, experimental and statistical methods, as used in biology, chemistry and physics, to a multi-faceted biophysical problem. [Experiment/Simulation]
3 BSc	Explain fundamental biophysical concepts and techniques, including a critical understanding of the relevant scientific literature, and appreciate the synergies that exist between the physical, chemical and biological disciplines. [Subject Knowledge]
3 MSci	Explain fundamental biophysical concepts and techniques, including a rigorous critical understanding of the relevant scientific literature, and appreciate the synergies that exist between the physical, chemical and biological disciplines. [Subject Knowledge]
4 BSc	Communicate complex biophysical concepts to interdisciplinary, specialist and non-specialist audiences in a clear, concise and rigorous manner using a variety of media, demonstrating a fundamental multi-disciplinary breadth of knowledge. [Communication]
4 MSci	Communicate complex biophysical concepts to interdisciplinary, specialist and non-specialist audiences in a clear, concise and rigorous manner using a variety of media, demonstrating an in-depth multi-disciplinary breadth of knowledge. [Communication]
5 BSc	Identify and critically evaluate state-of-the-art experimental, analytical and quantitative techniques and methods from across the biophysical science discipline through knowledge and first-hand practical experience in laboratories, including the creation of comprehensive laboratory notebooks and reports. [Research Project]

5 MSci	Identify and critically evaluate state-of-the-art experimental, analytical and quantitative techniques and methods from across the biophysical science discipline through knowledge and first-hand practical experience gained in an extended independent research project, including the creation of comprehensive laboratory notebooks and reports. [Research Project]
6 BSc	Work effectively, both independently and within a group, in a cross-disciplinary environment to solve problems rooted in the biophysical sciences by applying logical reasoning, lateral thinking and interdisciplinary approaches to develop and implement safe, ethical and socially responsible solutions that benefit humankind. [Interdisciplinary]
6 MSci	Work effectively, taking the lead within their own project and collaborating on a group project, in a cross-disciplinary environment to solve problems rooted in the biophysical sciences by applying logical reasoning, lateral thinking and interdisciplinary approaches to develop and implement safe, ethical and socially responsible solutions that benefit humankind. [Interdisciplinary]
7 BSc	
7 MSci	
8 BSc	
8 MSci	

Programme Learning Outcome for year in industry (where applicable)

For programmes which lead to the title 'with a Year in Industry' – typically involving an additional year – please provide either a) amended versions of some (at least one, but not necessarily all) of the standard PLOs listed above, showing how these are changed and enhanced by the additional year in industry b) an additional PLO, if and only if it is not possible to capture a key ability developed by the year in industry by alteration of the standard PLOs.

NA

Programme Learning Outcome for year abroad programmes (where applicable)

For programmes which lead to the title 'with a Year Abroad' – typically involving an additional year – please provide either a) amended versions of some (at least one, but not necessarily all) of the standard PLOs listed above, showing how these are changed and enhanced by the additional year abroad or b) an additional PLO, if and only if it is not possible to capture a key ability developed by the year abroad by alteration of the standard PLOs.

NA

Explanation of the choice of Programme Learning Outcomes

Please explain your rationale for choosing these PLOs in a statement that can be used for students (such as in a student handbook). Please include brief reference to:

i) Why the PLOs are considered ambitious or stretching?

The Biophysical Science programme has been constructed to include three of the core experimental sciences Biology, Chemistry and Physics. This is an ambitious portfolio of modules due to the diversity of material that a student must master to successfully navigate their way through the programme. The PLOs require a student to master concepts across the three main disciplines. Apart from the theoretical aspects of the subject, there is a substantial component of experimental work. These experiments will take place in all three core subjects and will produce data that will require extensive data analytical skills and the facility to choose the correct tools for the job. This programme will produce students who can work at the interface of these three disciplines.

ii) The ways in which these outcomes are distinctive or particularly advantageous to the student:

There are well established links between all four disciplines that contribute to this programme. But this programme gives a student the unique opportunity of studying at the interface of all four. The PLOs ensure that a Biophysical Science student gets a fully featured skill set that encompasses aspects of experimental, computational and theoretical science.

iii) How the programme learning outcomes develop students' digital literacy and will make appropriate use of technology-enhanced learning (such as lecture recordings, online resources, simulations, online assessment, 'flipped classrooms' etc)?

Digital technologies are woven into the fabric of this programme and are developed and enhanced throughout the duration of the programme. The programme is littered with chances for a student to develop a highly digitally literate skill set. For example in producing lab reports, carrying out simulations which will require computing programming skills and data analysis skill. Each of the contributing departments has fully embraced technology in their teaching and assessment, and a successful student on the Biophysical Science programme will have a well featured digital skill set for a CV and their future careers after graduation.

iv) How the PLOs support and enhance the students' employability (for example, opportunities for students to apply their learning in a real world setting)?
The programme's employability objectives should be informed by the University's Employability Strategy:

http://www.york.ac.uk/about/departments/support-and-admin/careers/staff/

All the Nat. Sci. programmes have been designed with employability in mind. This is not only as a factor of the design of the programmes themselves, which have had engagement with the University's employability strategy as a given since the early design phases of the programme. But also as a factor of the embedded skills that the contributing departments have built into their modules. Modules which form the bulk of the teaching on this degree programme. Many of the skills listed in the PLOs are generic and will equip the student with a highly transferrable skill set.

vi) How will students who need additional support for academic and transferable skills be identified and supported by the Department?

Students who need support will generally self identify at admission or early in the Stage 1 and standard University protocols will then be followed. If this isn't the case and a student is identified as needing extra support later in the programme then the student will discuss the matter with their personal supervisor who will advise in accordance with University guidance. Students are assigned a supervisor in one of the contributing departments and have access to a subject facilitator in both contributing departments. The student can approach their supervisor for advice in accordance with University guidelines and seek more specialist advice on a particular discipline from the subject facilitator. Module level issues are handled with the department to which the module belongs and a student can avail themselves of all feedback and quality control mechanisms that the department offers.

vii) How is teaching informed and led by research in the department/ centre/ University?

There are research active members of staff across all three departments whose specialism is Biophysics or areas in which Biophysics plays a key role. This programme has been designed around these research interests and the student's degree experience will culminate in an interdisciplinary project which will utilise the knowledge and technical skills acquired over the previous years to work in these research areas.

Stage-level progression
Please complete the table below, to summarise students' progressive development towards the achievement of PLOs, in terms of the characteristics that you expect students to demonstrate at the end of each year. This summary may be particularly helpful to students and the programme team where there is a high proportion of option modules.

Note: it is not expected that a position statement is written for each PLO, but this can be done if preferred (please add information in the 'individual statement' boxes). For a statement that applies across all PLOs in the stage fill in the 'Global statement' box.

Stage 0 (if your programme has a Foundation year, use the toggles to the left to show the hidden rows)							
Stage 1							
On progression from the first year (Stage 1), students will be able to:			*Appreciate the interdisciplinary nature of Biophysical Science through exposure to the different disciplines which make up the programme and have developed the core learning strategies needed to work across different departments, have a solid grounding in the biological, chemical and physical foundations of Biophysical Science, have the core experimental skills necessary to progress further and have begun building a skill set that will allow a student to solve problems using appropriate tools and know how to effectively communicate their findings.*				
PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8
Individual statements							
Stage 2							
On progression from the second year (Stage 2), students will be able to:			*Developed further their understanding of Biophysical Science, expanded upon their knowledge base, have enhanced experimental and communication skill sets allowing them to solve increasingly difficult and challenging problems in Biophysical Science, have become more confident independent learners.*				
PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8
Individual statements							
Stage 3							
(For Integrated Masters) On progression from the third year (Stage 3), students will be able to:			*At this stage a Biophysical Science student will have the knowledge, skills and understanding to satisfy all the BSc PLOs and will be equipped to move forward into a more intensely research driven final year.*				
PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8
Individual statements							

Programme Structure

Module Structure and Summative Assessment Map

Please complete the summary table below which shows the module structure and the pattern of summative assessment through the programme.

‘Option module’ can be used in place of a specific named option. If the programme requires students to select option modules from specific lists these lists should be provided in the next section.

From the drop-down select 'S' to indicate the start of the module, 'A' to indicate the timing of each distinct summative assessment point (eg. essay submission/ exam), and 'E' to indicate the end of the module (if the end of the module coincides with the summative assessment select 'EA') . It is not expected that each summative task will be listed where an overall module might be assessed cumulatively (for example weekly problem sheets).

If summative assessment by exams will be scheduled in the summer Common Assessment period (weeks 5-7) a single ‘A’ can be used within the shaded cells as it is understood that you will not know in which week of the CAP the examination will take place.

Stage 0 (if you have modules for Stage 0, use the toggles to the left to show the hidden rows)

Stage 1

Credits	Module		Autumn Term										Spring Term										Summer Term									
	Code	Title	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
20	BIO00004C	Molecular Biology & Biochemistry	S										A														EA	A	A			
10	BIO00007C	Genetics	S										EA																			
20	CHE00012C	Chemistry for Natural Sciences II: Introduction to Analysis & Chemical Change												S			A	A	A							EA	A	A	A			
10	CHE00014C	Chemistry for Natural Sciences 1a: Introduction to Chemical Structure & Reactivity	S					A				E	A																			
20	MAT00007C	Mathematics for the Sciences I	S									EA																				
20	PHY00020C	Electromagnetism , Waves & Optics												S												E	A	A	A			
20	PHY00022C	Introduction to Thermal & Quantum Physics	S										A									E					A	A	A			

Stage 2

Credits	Module		Autumn Term										Spring Term										Summer Term									
	Code	Title	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10

20	PHY00031I	Thermodynamics and Solid State I	S																								EA					
20	PHY00009I	Experimental Laboratory II	S									A										EA										
10	PHY00035I	Mathematics II for Natural Sciences	S										EA																			
20	BIO00051I	Molecular Biology, Biotechnology and Bioinformatics	S																								EA					
20	BIO00011I	Cell Biology	S																								EA					
20	BIO00054I	Biochemical Reactions and Interactions	S									A															EA					
10	CHE00022I	Proteins: Architecture and Action												S								A					EA					
Stage 3																																
Credits	**Module**		**Autumn Term**										**Spring Term**										**Summer Term**									
	Code	**Title**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
40	NAT00001H	Natural Sciences Interdisciplinary Project (BSc only)	S																										EA			
20	BIO (core)	Molecular Machinery in Action																														
20	BIO (option)	Advanced Topics in Microbiology																														
20	BIO (option)	Advanced Topics in Molecular Biology																														
20	BIO (option)	Molecular Recognition																														
20	BIO (option)	Advanced Topics in Cell Biology																														
20	PHY00049H	Statistical Mechanics & Solid State II	S										A									E					A	A	A			
20	PHY00043H	Nanoscale and Magnetism												S												E	A	A	A			
20	PHY00027H	Advanced Experimental Laboratory (MSci only)												S								A				EA						
Stage 4																																

Credits	Module		Autumn Term										Spring Term										Summer Term									
	Code	Title	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
20	BIO00058M	Data Analysis	S									EA																				
20	PHY00033M	Biophysics		S									A									E					A	A	A			
80	NAT00001M	Natural Sciences Research Project	S																										EA			

Optional module lists

If the programme requires students to select option modules from specific lists these lists should be provided below. If you need more space, use the toggles on the left to reveal ten further hidden rows.

Option List A	Option List B	Option List C	Option List D	Option List E	Option List F	Option List G	Option List H

Please note: you need to complete information on all three tabs of this sheet before submitting to the UTC Strategy Working Group.

You are required to submit this information for all undergraduate programme by the 31 July 2016.

Programme Map: Module Contribution to Programme Learning Outcomes

Please complete the summary table below which shows how individual modules contribute to the achievement of programme learning outcomes.

Core modules should be mapped individually. If the programme offers multiple options that contribute to exactly the same PLOs you can group these, providing a statement that articulates how all of these contribute to the achievement of the programme learning outcomes. All modules, both core and optional, should be accounted for in the map.

The table maps the contribution to programme learning outcomes made by each module, in terms of the advance in understanding/ expertise acquired or reinforced in the module, the work by which students achieve this advance and the assessments that test it. This enables the programme rationale to be understood:

· Reading the table vertically illustrates how the programme has been designed to deepen knowledge, concepts and skills progressively. It shows how the progressive achievement of PLOs is supported by formative work and evaluated by summative assessment. In turn this should help students to understand and articulate their development of transferable skills and to relate this to other resources, such as the Employability Tutorial and York Award;

· Reading the table horizontally explains how the experience of a student at a particular time includes a balance of activities appropriate to that stage, through the design of modules.

Note: it is not expected that every module contributes directly to all PLOs, but every module should advance some of them.

All Stage 3 Biology modules are under construction and will be mapped once the content is finalised.

Stage	Module		MSci Programme Learning Outcomes					
			PLO1	PLO2	PLO3	PLO4	PLO5	PLO6

			Apply comprehensive understanding of cutting-edge practice and technology in the biophysical sciences by using numerical, quantitative, and computer-based transferable skills to solve real world problems. [Problem Solving]	**Identify, justify and apply complex mathematical, experimental and statistical methods, as used in biology, chemistry and physics, to a multi-faceted biophysical problem. [Experiment/Simulation]**	**Explain fundamental biophysical concepts and techniques, including a rigorous critical understanding of the relevant scientific literature, and appreciate the synergies that exist between the physical, chemical and biological disciplines. [Subject Knowledge]**	**Communicate complex biophysical concepts to interdisciplinary, specialist and non-specialist audiences in a clear, concise and rigorous manner using a variety of media, demonstrating an in-depth multi-disciplinary breadth of knowledge. [Communication]**	**Identify and critically evaluate state-of-the-art experimental, analytical and quantitative techniques and methods from across the biophysical science discipline through knowledge and first-hand practical experience gained in an extended independent research project, including the creation of comprehensive laboratory notebooks and reports. [Research Project]**	**Work effectively, taking the lead within their own project and collaborating on a group project, in a cross-disciplinary environment to solve problems rooted in the biophysical sciences by applying logical reasoning, lateral thinking and interdisciplinary approaches to develop and implement safe, ethical and socially responsible solutions that benefit humankind. [Interdisciplinary]**
			BSc Programme Learning Outcomes					
			PLO1	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**

			Apply knowledge of relevant practice and technology in the biophysical sciences by using numerical, quantitative, and computer-based transferable skills to solve real world problems. [Problem Solving]	**Identify, justify and apply appropriate mathematical, experimental and statistical methods, as used in biology, chemistry and physics, to a biophysical problem. [Experiment/Simulation]**	**Explain fundamental biophysical concepts and techniques, including a critical understanding of the relevant scientific literature, and appreciate the synergies that exist between the physical, chemical and biological disciplines. [Subject Knowledge]**	**Communicate complex biophysical concepts to interdisciplinary, specialist and non-specialist audiences in a clear, concise and rigorous manner using a variety of media, demonstrating a fundamental multi-disciplinary breadth of knowledge. [Communication]**	**Identify and critically evaluate state-of-the-art experimental, analytical and quantitative techniques and methods from across the biophysical science discipline through knowledge and first-hand practical experience in laboratories, including the creation of comprehensive laboratory notebooks and reports. [Research Project]**	**Work effectively, both independently and within a group, in a cross-disciplinary environment to solve problems rooted in the biophysical sciences by applying logical reasoning, lateral thinking and interdisciplinary approaches to develop and implement safe, ethical and socially responsible solutions that benefit humankind. [Interdisciplinary]**
Stage 1	Introduction to Thermal & Quantum Physics	Progress towards PLO	Gain an understanding of the core importance of quantum mechnics to the science of measurement.		Solve foundational numerical problems by application of relevant mathematical and physical principles			

		By working on (and if applicable, assessed through)	Engaging with teaching materials and links to other modules.		Regular independent assignments (PPQs), small-group problem solving in problem classes, tailored small-group sessions (tutorials), formal examination.			
Stage 1	Electromagnetism, Waves & Optics	Progress towards PLO	Apply problem solving techniques and apply them to weekly problems in an independent way.	Understand that wave mechanics can be used to understand parts of other larger problems beyond those taught explicitly in the course.				
		By working on (and if applicable, assessed through)	Regular independent assignments (PPQs), small-group problem solving in problem classes, examples given in lectures, tailored small-group sessions (tutorials), formal examination.	Engaging with teaching materials.				

Stage 1	Genetics	Progress towards PLO	Problem solving exercises to develop understanding of genetics. Students can work individually or in groups.	Gain experience of core techniques such as gel electrophoresis and microscopy	By engaging with core principals of classical and molecular genetics that will be built upon in future modules and stages.			Work effectively within a group in a cross-disciplinary environment to solve problems
		By working on (and if applicable, assessed through)	By multiple pen + paper workshop sessions spread throughout the term. 1 hour closed exam	Three x 3 h practicals	Lectures, pre-recorded material on the VLE, worksheets and set reading. 1 hour closed exam			Small-group problem solving in practicals
Stage 1	Molecular Biology & Biochemistry	Progress towards PLO	Practicing problem-solving and basic chemistry-based calculations together with hands-on practicals in enzymes kinetics and separation of macromolecules.	Exposure to several basic biochemical techniques (column chromatography, enzyme kinetics) through lectures and practicals.	Gaining an understanding of detailed chemistry and molecular aspects of biology starting from basic chemical building blocks of life to macromolecules and complex biological processes such as metabolism and photosynthesis.		Exposure to several basic biochemical techniques (column chromatography, enzyme kinetics) through lectures and practicals.	Work effectively within a group in a cross-disciplinary environment to solve problems
		By working on (and if applicable, assessed through)	Open assessment of practical through problem solving. Formative worksheets.	Open assessment of practical through problem solving. Formative worksheets.	2 x 1.5-h closed exams (Spring and Summer CAPs)		Open assessment of practical through problem solving. Formative worksheets.	Small-group problem solving in practicals

Stage 1	Chem for Nat Sci Ia	Progress towards PLO	Developing an understanding of core chemical principles of atomic structure, thermodynamics and reactivity.	Development of core laboratory skills and understanding of key safety practices. Aspects of planning and experimental design.	Developing an understanding of core chemical principles of atomic structure, thermodynamics and reactivity.	Development of core laboratory skills and understanding of key safety practices. Aspects of planning and experimental design.		
		By working on (and if applicable, assessed through)	Exam and assessed workshop	Lab	Exam and assessed workshop	Lab		
Stage 1	Chem for Nat Sci II	Progress towards PLO	Developing an understanding of core chemical principles of kinetics, thermodynamics, spectroscopy, transition metals and reactivity.	Development of core laboratory skills and understanding of key safety practices. Aspects of planning and experimental design.	Developing an understanding of core chemical principles of kinetics, thermodynamics, spectroscopy, transition metals and reactivity.	Development of core laboratory skills and understanding of key safety practices. Aspects of planning and experimental design.		
		By working on (and if applicable, assessed through)	Exam and assessed workshop	Lab	Exam and assessed workshop	Lab		
Stage 1	Maths for Sciences I	Progress towards PLO	Adapt the standard tools to problems slightly outside the standard format		Competently use relevant standard mathematical methods	Present clear and concise solutions to exercises		

		By working on (and if applicable, assessed through)	Exercises, with formative feedback through marked work and the seminars, and assessed by examination		Lecture material and exercises, with the support of seminars and formative feedback through marked work, and assessed by examination	Exercises, with the support of seminars and formative feedback through marked work		
Stage 2	Proteins: Architecture and Action	Progress towards PLO		Develop an understanding of biophysical characterisation techniques, the thermodynamics and stability of proteins together with an insight into their function and application in numerous biological systems	Understanding how chemical structure determines function and activity of biologically active molecules, and demonstration that biological events are initiated by binding reactions.			
		By working on (and if applicable, assessed through)		Examination and asssessed workshops	Structured independent online learning combined with interactive problem-solving workshop sessions			

Stage 2	Mathematics II for Natural Sciences	Progress towards PLO			Be able to select and apply a range of mathematical tools to evaluate suitable physical problems. Understand the foundational importance of mathematics in the study of physics and physical systems. Vector calculus component feeds very strongly into Stage 2 Electromagnetism and Optics (EMO).			
		By working on (and if applicable, assessed through)			Regular independent assessed assignments (PPQs), engaging with lecture material, independent supported problem-solving sessions (maths practicals), formal examination.			

Stage 2	Molecular Biology, Biotechnology and Bioinformatics	Progress towards PLO	Biological problems presented in a range of workshops with different formats where students will work alone or in different sized groups.	Understanding methods associated with transciptomics, manipulating and interpreting this type of data using bioinformatics skills.	Provides key concepts related to the mechanisms underlying structure, function and development of living organisms		First hand execution of practical and analysis of quantitative transcriptomics data.	
		By working on (and if applicable, assessed through)	Practicals and workshops. Understanding and problem solving ability assessed in workshops.	All workshops and or practicals which involve some of the transferable skills listed above	Lectures and workshops throughout the module, private study. Closed exam		Practicals	

Stage 2	Biochemical Reactions and Interactions	Progress towards PLO	Select and apply appropriate quantitative data analysis procedures to extract parameters describing binding equilibria and unseen enzyme/ribozyme mechanisms.	Integrate critical reading of the literature into experimental design, problem solving and quantitative data analysis as relates to enzyme/ribozyme mechanism and bio-molecular interactions.	Describe and differentiate common chemical reactions catalysed by enzymes, and explain the core chemical principles and characteristics of these reactions. Integrate general knowledge of chemistry and protein/nucleic acid biochemistry, and apply this to the description of unseen enzyme/ribozyme mechanism(s) and the identification of unknown binding partner(s). Understand and apply advanced approaches used to characterise protein-protein, protein-nucleic acid and protein-small molecule (enzyme-substrate) interactions in modern biochemical research.		Select an appropriate set of techniques to address a research question, then analyse and interpret the data acquired using these techniques. Gain an appreciation of the wider applicability of core biochemical and biophysical techniques in cross-disciplinary research through engagement with the published literature.	Evaluate key analytical and quantitative techniques used in a modern biochemistry lab by focusing on the appropriateness of the technique (s) to the biochemical question being addressed.

		By working on (and if applicable, assessed through)	Formative problem-solving activities in workshops and structured independent learning (engagement with 'flipped' lecture material). Assessed by 1.5 hr closed (open note) workshop in middle of Spring term. Understanding of enzyme/ribozyme mechanisms assessed in 1 hr closed exam in Summer term.	Design experiments to address biochemical and biophysical problems in formative workshops. Critical analysis of research articles in workshops. Assessed by 1.5 hr closed (open note) workshop in middle of Spring term. Understanding of enzyme/ribozyme mechanisms assessed in 1 hr closed exam in Summer term.	By applying concepts to biochemical and biophysical problems in formative workshop activities. Critical analysis of research articles in workshops and independent study. Assessed by 1 hr closed exam in Summer term. Understanding of enzyme/ribozyme mechanisms assessed in 1 hr closed exam in Summer term.		By applying numerical and quantitative skills in biochemical and biophysical problem-solving activities in formative workshops with opportunities to apply R. Critical analysis of research articles in workshops. Numerical and quantitative skills assessed by summative workshop-based exam.	By applying concepts to biochemical and biophysical problems in formative workshops. Assessed by 1.5 hr closed (open note) workshop in middle of Spring term.
Stage 2	Cell Biology	Progress towards PLO	Integration of cell biology principles and pathophysiology. Logical thinking/critical analyses/ problem solving skills.	Exposure to experimental approaches used in cell biology.	Acquire an understanding of key structural and functional elements of eukaryotic cells and relate these to cell behaviour.	Practical classes and workshops encourage communication and discussion of material.	Design and perform experiments to investigate mechanisms underlying cell motility.	Work effectively within a group in a cross-disciplinary environment to solve problems

		By working on (and if applicable, assessed through)	Lectures, workshops and practicals. Assessed through a closed assessment.	Workshops that focus on data analysis. Practicals that develop experimental design, execution and data analysis.	Lectures will provide knowledge on the concepts of cell biology and workshops will give applied examples. Assessed through a closed assessment.	Practicals and workshops	Workshops and practicals. Assessed through a closed assessment.	Analysing data and designing experiments as part of a small-group during practicals and workshops
Stage 2	Thermodynamics and Solid State I	Progress towards PLO	Apply and adapt a range of basic tools, models, and physical principles to evaluate physics problems of increasing complexity					Appreciate and be aware of the wider applications of thermodynamics and solid state physics as topics which underpin much of modern physics.
		By working on (and if applicable, assessed through)	Regular independent assignments (PPQs), small-group problem solving in problem classes, engaging with lecture material, formal examination.					Engaging with teaching materials

Stage 2	Experimental Laboratory II	Progress towards PLO		Apply content from lectures modules to conceptually challenging practical situations, while understanding how the choice of methodology and tools governs the reliability of the scientific data collected.		Keep lab book to an accepted and well-defined standard capturing an accurate and comprehensive account of methodologies and results, and effectively communicate results and ideas via formal reports. This is good preparation for the more extended and independent work in Stage 3.		Work effectively with another student on longer and more involved investigations to achieve a specified result. This is preparation for BSc projects (BSc students) and Stage 3 advanced laboratory (MSci students)
		By working on (and if applicable, assessed through)		Engaging with the underlying theory of experiments carried out. Working in pairs on experiments with pre-defined outputs. Independently writing formal reports for assessment.		Writing a formal scientific report, lab book record-keeping for assessment.		Working in pairs and independently to effectively conduct practical work.

Stage 3	Nat. Sci. Interdisciplinary Project	Progress towards PLO	Apply BSc-level understanding to an open-ended investigation requiring the following: development of a research plan to address specific project aim(s), experimental design, data analysis and data interpretation.	Choose an appropriate project methodology	Explain fundamental biophysical concepts and techniques, including a critical understanding of the relevant scientific literature	Explain the work of the project to their supervisor (s), an interdisciplinary research team, and both specialist and non-specialist members of wider research community	Apply advanced techniques from biophysical science to an open-ended problem	Design experiments using interdisciplinary research techniques, then successfully collect and analyse data. Work independently and in a research team to interpret data in the context of their research project aim(s) and the relevant published literature.
		By working on (and if applicable, assessed through)	Undertake project investigation	Write a project plan	Write introductory and discussion sections of project report	Lab meeting presentations, project report, performance in viva and poster presentation	Write labbook, project report, performance in viva and poster presentation	Acquire and interpret data to address aim(s) of their independent research project. Troubleshoot any problems encountered during their research project by interacting with their project supervisor, other researchers and the published literature.

Stage 3	Statistical Physics and Solid State II	Progress towards PLO			Understand the underlying energy distribution of systems containing many particles. Understand the different models involved describing the electron-electron and electron-lattice interactions in solids.			
		By working on (and if applicable, assessed through)			Regular independent assignments (PPQs), independent supported problem solving in problem classes, engaging with lecture material, formal examination.			

Stage 3	Nanoscale and Magnetism	Progress towards PLO	Understand the origin of contrast and resolution, and hence be able to design an appropriate scientific investigation on the relevant length scales and beyond.		Adapt and apply core and more advanced physics concepts to new and familiar situations. Compare the suitability of differing measurement techniques for different types of sample/measurement.	Describe and evaluate concepts in magnetism and measurement techniques clearly, quantitatively, and succinctly for a scientific audience. Understand the uses of nanoscale analysis techinques throughout a range of fields of physics and beyond.	Discriminate between and appropriately select techniques for both imaging and magnetic measurement.	
		By working on (and if applicable, assessed through)	Interpreting images from different microscopy techniques and calculating the associated errors. Discussing different magnetic measurement techniques in lectures. Assessed in essay format.		Regular independent assignments (PPQs), engaging with lecture material, formal examination, open-book magnetism assignment.	Open-book, independent assignments, writing for a scientific audience. Researching and writing solutions to an open-book summative assignment.	Interpreting images from different microscopy techniques and calculating the associated errors. Discussing different magnetic measurement techniques in lectures. Assessed in essay format.	

Stage 3	Molecular Machinery in Action	Progress towards PLO	Describe the bulk and single-molecule techniques used to probe the kinetics, energetics and mechanics of molecular machinery, and critically assess the data obtained using these techniques. Evaluate and appraise the primary literature as relates to molecular motors and machines, and their current applications in bionanotechnology.		Describe the physics of force generation and directed motion at the nanoscopic level. Compare and contrast the mechanisms used by molecular machines and motors to do mechanical work. Describe the structure and architecture of the macromolecular machines covered in the module. Explain how chemical energy is transduced into physical motion by exemplar molecular machines and motors.			

		By working on (and if applicable, assessed through)	Reading primary research papers, review articles and gaining essential background knowledge, context and guidance in data analysis from lectures. Preparing assessed open essay.		Reading primary research papers, review articles, and gaining essential background knowledge from lectures. Preparing assessed open essay.			
Stage 3	Advanced Topics in Microbiology	Progress towards PLO		Understanding experimental approaches that are used to derive insight on bacterial pathogenesis and key aspects of data analysis in the field.	Hearing and reading about concepts in infectious diseases caused by bacteria, bacterial features that faciliate virulence and experimental approaches that generate the knowledge.			

		By working on (and if applicable, assessed through)		Reading Primary research papers, reviews and gaining essential background knowledge, context and guidance in data analysis from lectures. Short answer questions on experimental approach/data analysis in closed exam; opportunity to include aspects in essay question in closed exam.	Reading Primary research papers, reviews and gaining essential background knowledge, context and guidance in data analysis from lectures. Short answer questions and essay questions in closed exam			
Stage 3	Advanced Topics in Molecular Biology	Progress towards PLO	Analyze, interpret and make conclusions from novel data from research articles and use this knowledge to add detail to your understanding of gene expression pathways	Devise experimental strategies to address questions related to gene expression. Select experimental evidence that supports key developments in the field of eukaryotic gene expression.	Explain molecular mechanisms by which eukaryotic gene expression can be controlled and discuss how they are inter-connected			

		By working on (and if applicable, assessed through)	Lecture and workshop content in which techniques, experimental design and data interpretation are discussed, along with extra reading and independent study. Assessed in closed exam.	Lecture and workshop content in which techniques, experimental design and data interpretation are discussed, along with extra reading and independent study. Assessed in closed exam.	Lectures, extra reading and independent study. Assessed in closed exam.			

Stage 3	Molecular Recognition	Progress towards PLO		Students are introduced to common molecular, biochemical and biophysical techniques for the study of DNA-protein and RNA-protein interactions in vitro and in vivo, and the interpretation of the data obtained using these techniques. These techniques are discussed in the lectures using exemplar studies of prokaryotic and eukaryotic gene expression.	Students acquire an understanding of the structural basis of sequence-specific and sequence-independent DNA and RNA recognition by proteins, and the facilitated diffusion mechanisms used by these proteins to find their target sites. Content is research literature based, covering both classic studies and recent advances, and uses exemplar studies of gene expression control to illustrate key concepts.			
		By working on (and if applicable, assessed through)		By attending lectures and reading primary research papers and reviews. Closed examination short answer methods questions and essays.	By attending lectures and reading primary research papers and reviews. Closed exam.			

Stage 3	Advanced Topics in Cell Biology	Progress towards PLO			Developing broad understanding of regenerative medicine and tissue engineering principles and deep understanding in specific disease areas. This is a new a growing area, which often relies on new developments and recent publications in the scientific literature which feature strongly in the module.	Considering the safety, ethical and social implications of regenerative medicine, particularly issues with the use of stem cells and human-derived material.		The subject requires a multi-disciplinary approach, which is emphasised from a biological perpective and examples provided. Understanding and evaluating new techniques (such as genome editing in recent years) are core and relate clearly to the major global challenge of age-related degenerative disease.
		By working on (and if applicable, assessed through)			Lectures linked to the scientific literature with guidance given on specific publications	Lectures		Lectures and primary publications

Stage 3	Advanced Experimental Laboratory	Progress towards PLO	Investigate an area of experimental physics in a systematic way using appropriate techniques. Search and review the scientific literature to understand current approaches and the problems addressed in the labs.		Experience how appropriate design and methodologies lead to reliable and repeatable scientific investigations. Experience and elucidate how the changing of parameters on a physical system can lead to different qualitative and quantitative outcomes.		Creatively select and apply as appropriate a wide range of appropriate advanced experimental and analytical tools, techniques, and methodologies to make specific experimental measurements, and make critical judgements on the effects of these techniques upon the quality and fidelity of the final result. This will feed directly into MSci project work.	Collaborate effectively with partners and, where applicable, interact with other groups and staff in the course of extended, complex experiments.
		By working on (and if applicable, assessed through)	Completing open-ended experimental activities in laboratory sessions.		Engagement with practical or computational experiments and the analysis of measurements		Completing open-ended experimental activities, assessed through laboratory notebooks and formal written reports.	Working in pairs on complex experiments, often using research-grade equipment, consulting scientific literature when necessary.

Stage 4	Natural Sciences Extended Research Project	Progress towards PLO	Apply MSci-level understanding to an open-ended investigation requiring the following: development of a research plan to address specific project aim(s), experimental design, data analysis and data interpretation.	Choose an appropriate project methodology	Explain fundamental biophysical concepts and techniques, including a rigorous critical understanding of the relevant scientific literature	Explain the work of the project to their supervisor (s), an interdisciplinary research team, and both specialist and non-specialist members of wider research community	Apply advanced techniques at the research frontier from biophysical science to an open-ended problem	Design experiments using interdisciplinary research techniques, then successfully collect and analyse data. Work independently and in a research team to interpret data in the context of their research project aim(s) and the relevant published literature.
		By working on (and if applicable, assessed through)	Undertake project investigation	Write a project plan	Write introductory and discussion sections of project report	Lab meeting presentations, project report, performance in viva and poster presentation	Write labbook, project report, performance in viva and poster presentation	Acquire and interpret data to address aim(s) of their independent research project. Troubleshoot any problems encountered during their research project by interacting with their project supervisor, other researchers and the published literature.

Stage 4	Data Analysis	Progress towards PLO	Apply the skills learned to address novel bioscience problems. Reflect on: how the skills learned could be applied in other work at all stages of research, and evaluate their impact on outputs; how the skills might be extended, and how the skills gained might be useful in life after graduation	Demonstrate the acquisition of skills in experimental design and data analysis			Evaluate the usefulness of the skills learned for bioscience research at all stages from experimental design to the communication of results	
		By working on (and if applicable, assessed through)	Reflective written assessment	Data analysis report			Data analysis report	
Stage 4	Biophysics	Progress towards PLO	Solve complex problems, partly working in a group within a small-group teaching environment.	Creatively adapt and apply core and advanced physics concepts to new situations.	Explain and critically assess biophysical concepts and techniques, and interdisciplinary research in the relevant scientific literature.	Appreciate that physical principles are used to solve familiar and unfamilar problems related to biological systems. Communicate how a physics approach can be immensely powerful to solving problems from disparate fields of research.		Work effectively, both independently and within a group, in a cross-disciplinary environment to solve problems

		By working on (and if applicable, assessed through)	Working in groups in problem classes.	Regular independent assignments.	Engaging with lecture material and formal examination.	Engaging with teaching materials and working in groups to discuss problems		Small-group problem solving sessions and independent assignments

Biophysical Science Enhancement Plan/ Programme Map: Module Contribution to Programme Learning Outcomes
Contact with staff **Please explain how the programme's design maximises the value of students' contact time with staff (which may be face-to-face, virtual, synchronous or asynchronous), including through the use of technology-enhanced learning. An example might be giving students resources for their independent study which then enables a class to be more interactive with a greater impact on learning.** **You should include:**
i. An explanation of how contact with staff in the future programme will be designed to propel student learning
The vast majority of the programme is made up of modules from the departments of Biology, Chemistry and Physics. Therefore the relevant statements on staff contact time and how it propels learning have already been made in these department's respective submissions. The principles therein, hold just as true in the Biophysical Science programme. Thus a Biophysical Science student is naturally exposed to the different departments learning culture and practices.
ii. Changes to the existing programme that will be explored to affect this change; make references to the map to include module level change.
Significant structural changes have already been made to the existing programme due to changes made in all contributing departments. The 20 credit module has become the norm and there has been some reduction in optionality in Stage 2 and hence in Stages 3 and 4. This is entirely in line with all the other programmes in Nat. Sci. and the new programme structure is cleaner and more focussed without sacrificing any of the LOs stated in the original programme specs.
Students' independent study and formative work **Please outline key features of how independent study and formative work has been designed to support the progressive achievement of the programme learning outcomes. (For example, the use of online resources, which may also incorporate formative feedback; opportunities for further learning from work-based placements).** **You should include:**
i. An explanation of how students' independent study and formative work has been designed in the future programme to propel student learning?

Independent study and formative work depends on the various principles and practices of the department in which the specific module is taken. There is a range of different modes of assessment used in the Biophysical Science programme and this is appropriate given the interdisciplinary nature of the subject. Reference is again made to the corresponding section of the individual single subject proforma for details of local enhancements that will necessarily flow into the learning experience of a Biophysical Science student.

ii. Changes to the existing programme to affect this change; make reference to the programme map to indicate module level change

As stated above, nearly all changes are structural and student study expectations and assessment follow those of the contributing departments. Reference is therefore made to the enhancement plans of the contributing departments and the sections therein which pertain to this aspect of the pedagogy.

(c) Summative Assessment

Please outline how summative assessment within and across modules has been designed to support and evidence the progressive achievement of the programme learning outcomes. (For example, the use of different assessment methods at the 'introduction' stage compared to those used to evaluate deeper learning through the application of skills and knowledge later in the programme).

You should include:

i. An explanation of how formative and summative assessment has been designed in the future programme to propel student learning?

As in Item 10 and we again make reference to the corresponding enhancement plans for the contributing departments. This is appropriate as the PLOs will naturally be met as the student progresses through the various stages. For example PLO1, in the early stages the computing skills will be foundational and often introductory. As the student progresses the depth of problems that they are faced with will increase and this will require a more sophisticated tool box. It should be noted that in the initial design phase of all the Nat. Sci. programmes a great deal of work was done with UTC to ensure an appropriate and diverse set of assessment tools was built into our programmes.

ii. Changes to the existing programme to affect this change; make reference to the programme map to indicate module level change

Changes due to the Physics restructuring are mostly in place. For changes that are not already in place, these will roll out as they do in the contributing department. Any potential change in structure of the programme (as discussed above) will obviously include assessment modes appropriate for the modules introduced or changed by the restructuring and the departmental enhancement plan once again holds sway. The main impact to Biophysical Science is similar to that of all the other Nat. Sci. programmes, a more restricted pathway in Stage 2 and thereafter a more focussed Stage 3 and Stage 4.
Support with implementing programme enhancements **Support services will be able to provide guidance on enhancing programmes for example changing assessment and feedback practice, developing students' digital literacy capabilities and technology enhanced learning, employability etc. Please indicate in the space below if you would like additional guidance to implement you enhancements and what support you would require. For more information on the types of support that is available across the University please see the website:** https://www.york.ac.uk/staff/teaching/support/