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 Natural Sciences specialising in Biology

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	Yes
	Year Abroad Please select Y/N	Yes

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

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

Programme leadership and programme team

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

Jason Levesley (Ch. BoS), Roddy Vann (Prog. Director), Camilla Speller (Arch), Bryce Beukers-Stewart (Env), Gareth Evans (Bio), Andy Parsons & Glenn Hurst (Chem), Laurence Wilson (Phys)

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 which 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 being 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 Natural Science student who specialises in biology studies life. From the chemical boundaries of single molecules to understanding how populations of different species respond to changes in the environment. Driven by cutting-edge technologies, we now live in an era where medicines can be tailored to individuals and whole genomes of novel organisms can be sequenced in less than a day. An explosion of discoveries relating to how cancer develops, predicting the effects of climate change and harnessing the biotechnological potential of organisms to produce fuels, food and novel medicines makes biosciences one of the most exciting and relevant subjects of the 21st century.

As a Natural Sciences student specialising in Biology you will spend the majority of your time studying in The Department of Biology. A department which is consistently ranked as one of the best departments in the UK, and has an outstanding global reputation underpinned by cutting edge research and excellent facilities. There you will move through the stages from the foundations of Biology in Stage 1, all the way to a final year research project which will enable you to practice and hone your research skills as you work with active research scientists in cutting edge research labs. All the while being able to utilise your experiences of other scientific disciplines and their interactions with Biological sciences.

As a student on the MSci programme you will achieve all the above, but your skills will be developed even further and to a deeper level as you undertake an extended final year research project that will move you towards the research frontier in Biology, giving you the expertise, skills and experience necessary to pursue graduate level research in Biology 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	Provide thorough explanations that demonstrate a deep understanding of the principles, concepts and theories on the origin, evolution, structure, function, development, and distribution of living organisms, through critical evaluations of the primary scientific literature in Biology
1 MSci	Provide systematic explanations that demonstrate a deep understanding of key Biological principles, concepts and theories taken from the origin, evolution, structure, function, development, and distribution of living organisms through critical evaluations of the scientific literature. at the forefront of Biological research
2 BSc	Formulate hypotheses, design and execute experiments for the collection, analysis and modelling of biological data, that tests biological systems and produce figures, graphs and tables that are explained in comprehensive laboratory report
2 MSci	Formulate hypotheses, design and execute experiments for the collection, analysis and modelling of experimental biological data, primarily for testing current understanding of biological systems, to produce figures, graphs and tables explained in comprehensive research reports. Use such skills across disciplines.
3 BSc	Thoroughly evaluate experimental, analytical and quantitative techniques and methodologies, and first-hand practical experience and training in laboratories or the field, to demonstrate an awareness and appreciation of the application of these approaches in tackling the major global challenges in Biology of the 21st century
3 MSci	Thoroughly evaluate experimental, analytical and quantitative techniques and methodologies, and first-hand practical experience and training in laboratories or the field, to demonstrate an awareness and appreciation of the application of these approaches in tackling the major global challenges in Biology of the 21st century
4 BSc	Evaluate the effectiveness of your work systematically, as an individual, in teams and in collaborative groups, by applying logical reasoning and lateral thinking to solve biological problems, and develop and deploy safe, ethical, sustainable and socially responsible solutions that would benefit humankind
4 MSci	Evaluate the effectiveness of your work systematically, as an individual, in teams and in collaborative groups, by applying logical reasoning and lateral thinking to solve biological problems, and develop and deploy safe, ethical, sustainable and socially responsible solutions that would benefit humankind
5 BSc	Communicate and interpret complex information with clarity and precision through critical reviews in written, oral and other explanations, questioning dogma and demonstrating impact at the forefront of Biology in real-world and global issues to expert, professional, business, industrial and lay audiences
5 MSci	Communicate and interpret complex information with clarity and precision through critical reviews in written, oral and other explanations, questioning dogma and demonstrating impact at the forefront of Biology in real-world and global issues to expert, professional, business, industrial and lay audiences
6 BSc	Demonstrating independence, originality, and a deep understanding of cutting-edge practice and technology in Biology, apply numerical, quantitative, and computer-based transferable skills to a range of working environments including laboratories, fieldwork, education, industry, business, health services, policy, government, and media
6 MSci	Demonstrating independence, originality, and a deep understanding of cutting-edge practice and technology in Biology, apply numerical, quantitative, and computer-based transferable skills to a range of working environments including laboratories, fieldwork, education, industry, business, health services, policy, government, and media

7 BSc	Exploit the synergies between biological science and other science-based disciplines by using the principles themes, concepts and methodologies of Biology as appropriate to a Natural Scientist.
7 MSci	Exploit the synergies between biological science and other science-based disciplines by using the principles themes, concepts and methodologies of Biology as appropriate to a Natural Scientist.
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.

PLO3. Thoroughly evaluate experimental, analytical and quantitative techniques and methodologies, and first-hand practical experience and training, and during a placement year in a relevant industry, in laboratories or the field, to demonstrate an awareness and appreciation of the application of these approaches in tackling the major global challenges in Biology of the 21st century.

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.

PLO3. Thoroughly evaluate experimental, analytical and quantitative techniques and methodologies, and first-hand practical experience and training, and during a placement year abroad, in laboratories or the field, to demonstrate an awareness and appreciation of the application of these approaches in tackling the major global challenges in Biology of the 21st century.

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?

To fully meet the PLOs given a student will need to meet the PLOs commensurate with those of a single subject Biologist whilst studying upto two other sciences in Stages 1 & 2. This will ensure that a Nat Sci Biologist has all the expertise of a single subject student in the type of biology most appropriate to interdisciplinary science, all backed up by first hand experience of other sciences and how biology is used across subject boundaries.

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

The PLOs above will allow a Nat Sci student who specialises in Biology to benefit from many of the aspects of a single subject biologist as articulated in the Biology single subject statement, an editted version of which follows; " The PLOs have been designed to demonstrate that students can develop a deep understanding of Biology and how life works.
The PLOs also highlight training in the methods, techniques and approaches that the next generation of Biologists will require. These include teamwork and collaboration, as well as a wide range of skills in communication that can be practiced and honed during the degree. This broad range of skills will be extremely important, especially since Biological Science has the capacity to deliver solutions to many of the global challenges the world is facing. Biologists have numerical, quantitative and an increasingly number of computational skills that are relevant to a broad spectrum of potential careers. Training for all these scientific, transferable and communication skills should be embedded in our programmes.".
The PLOs presented above are designed to fit into the ethos, but also to enrich the overall experience by exposing students to other disciplines in the early stages of their degree.

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)?

As a Natural Science student who specialises in Biology spends the majority of their time studying in the department of Biology it is natural that such a student will develop the digital literacy skills embedded in the various Biology programmes. An editted version of the Biology statement follows to support this claim; "All Biology lectures are recorded. All modules have a VLE site where lecture materials and other online resources are made available. All lecturers are asked to provide formative questions via the VLE for each lecture they give. Increasingly students are required to produce online work including videos and other presentations for assessments.
The new teaching facilities in Biology provide ways to increase digital literacy and technology-enhanced learning in our programmes. Primarily this will happen through our new group learning laptop classroom and our collaborative learning suite. Both these environments will facilitate and stimulate the use of technology and digital literacy.".
Further, a Nat Sci student who specialises in Biology will benefit from exposure to teaching in other departments during Stages 1 and Stage 2 and any digital literacy skills that are embedded in those department's teaching will naturally enhance the skill set of a Nat Sci student on this programme.

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 off all feedback and quality control mechanisms that the department offers.

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

As stated in the Biology programme information:
"The department has had research-led philosophy for its teaching for a number of years. More recently this has been development by using our world leading researchers to contribute to first year modules. This happens in a number of ways. All stage 1 modules start with introductory lectures from our top researchers providing the wider context of the subject of the module. In some modules synoptic content is also provided at the end of modules by leading researchers that ""sets the scene"" for modules in stage 2 and stage 3. The stage 1 module Animal and Plant Biology module has ""Grand Challenge"" lectures that highlight global issues in Biology that are researched in Department, and also ""Signpost"" lectures that highlight are research collaborations can bridge diverse disciplines in Biosciences.
Stage 1 students also carry out group research mini-projects in their scientific skills module, and there is also a focus on the research process and training on how research reports are completed. Students practice these research skills in stage 2 in tutorials, laboratory and professional skills and some research topics in stage 2 modules. Research skills are further developed in the scientific skills modules where students complete a group project, and select a "bioscience techniques" course that provides them with hands-on experience in specially designed set of interlinked research practicals.
Stage 3 modules reflect the research strengths of the department. Following the decision to the restructure the the programme, it is planned that each academic member of staff will contribute to one stage 3 module. Four or five academics will collaborate to design a module that reflects their shared research interests. Some of the these modules may provide deep insight into a particular discipline, whereas other may give a broad understanding of a more diverse set of topics that are linked to a common approach to research, or a shared set of techniques and methods."

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:			*Developed core learning strategies for each of the disciplines studied in Stage 1. Have been introduced to and worked with the core concepts that underpin all three disciplines. Be familiar with the foundational material and practices of each of the disciplines.*				
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:	*The more focussed Stage 2 will have further developed the knowledge base of the student, giving them more sophisticated tools with which to address more demanding problems in their two chosen disciplines. Technical facility will be improved by exposure to more advanced concepts.*

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:	*A stage 3 student will now be a fully fledged specialist and will have satisfied all the PLOs for the BSc programme. They will be equipped to progress onto a more research focussed final stage.*

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
10	BIO0007C	Genetics	S										EA																			
10	BIO0009C	Genetics & Evolution												S													EA	A	A			
20	BIO0004C	Molecular Biology & Biochemistry	S										A														EA	A	A			

20	ARC00006C	Introduction to Archaeological Science												S							E		A								
20	ENV00002C	Ecological Principles for the Environment	S							A								A				E					A	A	A			
20	CHE00010C	Chemistry for Natural Sciences 1	S					A		A	A		EA																			
20	CHE00012C	Chemistry for Natural Sciences 2												S			A	A	A							EA	A	A	A			
20	MAT00007C	Mathematics for the Sciences I	S										EA																			
10	PHY00026C	Introduction to Quantum Physics												S												EA	A	A	A			
20	PHY00020C	Electromagnetism, Waves and Optics												S												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	BIO00051I	Molecular Biology, Biotechnology & Bioinformatics	S																								EA					
20	BIO00056I	Genes, Genomes, Evolution & Population	S																								EA					
20	BIO00053I	Ecology of Animals, Plants & Microbes	S																								EA					
20	BIO00054I	Biochemical Reactions and Interactions	S														A										EA					
20	BIO00011I	Cell Biology	S																								EA					
20	ARC00018I, ARC00050I, ARC00055I, ARC00020I	World Archaeology I (Option list A)		S							E		A																			
20	ARC00005I, ARC00028I, ARC00004I	Practical Skills (Option list B)												S								EA										
20	ARC00009I, ARC00029I, ARC00013I	Team Project (Option list B)																					S			E			A			
20	CHE00014I	Chemistry for Natural Sciences 3	S						A			A	EA																			
20	CHE00015I	Chemistry for Natural Sciences 4												S						A			A	A			EA	A	A			

20	CHE00025I	Chemistry for Natural Sciences 5												S													EA	A	A			
10	ENV00016I	Environment Systems Project (option)	S				A					EA																				
10	ENV00020I	Biogeography											S									EA										
10	ENV00012I	Geographical Information Systems	S									EA																				
10	ENV00001I	Ocean Management and Conservation											S									E					A	A	A			
10	ENV0002I	Climate Change (option)											S								A	E										
20	ENV00024I	Ecosystems Processes	S										A					A				E					A	A	A			
20	PHY00039I	Thermodynamics & Quantum Physics	S									E	A																			
10	PHY00020I	Experimental Laboratory	S									A										EA										
20	PHY00002I	Electromagnetism & Optics												S												E	A	A	A			
10	PHY00035I	Mathematics for Natural Sciences II	S										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
20	[new]	Advanced topics in Evolution and Genetics in Ecology [new]	S																								EA					
20	[new]	Advanced topics in Molecular Biology [new]	S																								EA					
20	[new]	Advanced topics in Neuroscience [new]	S																								EA					
20	[new]	Advanced topics in Biotechnology [new]	S																								EA					
20	[new]	Advanced topics in Cell Biology [new]	S																								EA					
20	[new]	Advanced topics in microbiology [new]	S																								EA					
20	[new]	Genes and Development [new]	S																								EA					
20	[new]	Advanced topics in Ecology [new]	S																								EA					

20	[new]	Cancer Cell and Molecular Biology [new]	S																								EA					
20	[new]	Conservation, Climate Change and Biodiversity [new]	S																								EA					
20	[new]	Human and Medical Genetics [new]	S																								EA					
20	[new]	Immunology and Infectious Disease (20c)	S																								EA					
20	[new]	Molecular Recognition [new]	S																								EA					
20	[new]	Ecology field course [new]	S																								EA					
40	BIO00028H	Research project (40 credits)	S																A			EA										
40	[new]	Research group project [MSci]	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
80	BIO00057M	Research project	S																				A				EA					
20	BIO00056M	Critical analysis	S															A				EA										
20	BIO00058M	Data analysis	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
World Archaeology I & II: Mummification	Practical Skills and Team project: Biomolecular Archaeology	A BSc student in Stage 3 will do BIO00028H & then make a choice of 80 credits from the listed modules in Stage 3 subject to prerequistes and module availability.					
World Archaeology I & II: Conflict	Practical Skills and Team project: Animal Bones	An MSci in Stage 3 will do the Research Group Project and then make a choice of 80 credits worth of module from those listed in Stage 3 subject to prerequisties and module availability.					
World Archaeology I & II: The Archaeology of South America	Practical Skills and Team project: Human Bones						
World Archaeology I & II: The Emergence of Mediterranean civilisations	Practical Skills and Team Project: Environmental Archaeology						

new modules will be added as they are developed	Practical Skills and Team project: Experimental Archaeology						
	new modules will be added as they are developed						

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	PLO7

			Provide systematic explanations that demonstrate a deep understanding of key scientific principles, concepts and theories taken from the origin, evolution, structure, function, development, and distribution of living organisms through critical evaluations of the scientific literature at the forefront of scientific research	**Formulate hypotheses, design and execute experiments for the collection, analysis and modelling of experimental biological & other scientific data, primarily for testing current understanding of biological & other systems, to produce figures, graphs and tables explained in comprehensive research reports. Use such skills across disciplines.**	**Thoroughly evaluate experimental, analytical and quantitative techniques and methodologies, and first-hand practical experience and training in laboratories or the field, to demonstrate an awareness and appreciation of the application of these approaches in tackling the major global challenges in Biology of the 21st century**	**Evaluate the effectiveness of your work systematically, as an individual, in teams and in collaborative groups, by applying logical reasoning and lateral thinking to solve biological & other scientific problems, and develop and deploy safe, ethical, sustainable and socially responsible solutions that would benefit humankind**	**Communicate and interpret complex information with clarity and precision through critical reviews in written, oral and other explanations, questioning dogma and demonstrating impact at the forefront of Biology and other sciences in real-world and global issues to expert, professional, business, industrial and lay audiences**	**Demonstrating independence, originality, and a deep understanding of cutting-edge practice and technology, apply numerical, quantitative, and computer-based transferable skills to a range of working environments including laboratories, fieldwork, education, industry, business, health services, policy, government, and media**	**Exploit the synergies between biological science and other science-based disciplines by using the principles themes, concepts and methodologies of Biology as appropriate to a Natural Scientist.**
			BSc Programme Learning Outcomes						
			PLO1	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**	**PLO7**

			Provide thorough explanations that demonstrate a deep understanding of the principles, concepts and theories on the origin, evolution, structure, function, development, and distribution of living organisms, through critical evaluations of the primary scientific literature	**Formulate hypotheses, design and execute experiments for the collection, analysis and modelling of scientific data, that tests scientific systems and produce figures, graphs and tables that are explained in comprehensive laboratory report**	**Thoroughly evaluate experimental, analytical and quantitative techniques and methodologies, and first-hand practical experience and training in laboratories or the field, to demonstrate an awareness and appreciation of the application of these approaches in tackling the major global challenges in science of the 21st century**	**Evaluate the effectiveness of your work systematically, as an individual, in teams and in collaborative groups, by applying logical reasoning and lateral thinking to solve scientific problems, and develop and deploy safe, ethical, sustainable and socially responsible solutions that would benefit humankind**	**Communicate and interpret complex information with clarity and precision through critical reviews in written, oral and other explanations, questioning dogma and demonstrating impact at the forefront of science in real-world and global issues to expert, professional, business, industrial and lay audiences**	**Demonstrating independence, originality, and a deep understanding of cutting-edge practice and technology in science, apply numerical, quantitative, and computer-based transferable skills to a range of working environments including laboratories, fieldwork, education, industry, business, health services, policy, government, and media**	**Exploit the synergies between biological science and other science-based disciplines by using the principles themes, concepts and methodologies of Biology as appropriate to a Natural Scientist.**
Stage 1 - BIO / CHEM / PHYS									
Stage 1	Chemistry for Natural Sciences I	Progress towards PLO		Development of core laboratory skills and understanding of key safety practices. Aspects of planning and experimental design.	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, periodicity, acids & bases, separations science & mass spectrometry and reactivity.

		By working on (and if applicable, assessed through)		Lab	Lab				Exam and assessed workshop
Stage 1	Chemistry for Natural Sciences II	Progress towards PLO		Development of core laboratory skills and understanding of key safety practices. Aspects of planning and experimental design.	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.
		By working on (and if applicable, assessed through)		Lab	Lab				Exam and assessed workshop
Stage 1	Maths for the Sciences I	Progress towards PLO	competently use relevant standard mathematical methods				present clear and concise solutions to exercises		
		By working on (and if applicable, assessed through)	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 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	Introduction to Quantum Physics	Progress towards PLO	Solve foundational numerical problems by application of relevant mathematical and physical principles						Gain an understanding of the core importance of quantum mechnics to the science of measurement.
		By working on (and if applicable, assessed through)	Regular independent assignments (PPQs), small-group problem solving in problem classes, tailored small-group sessions (tutorials), formal examination.						Engaging with teaching materials and links to other modules.

Stage 1	Genetics	Progress towards PLO	By engaging with core prinicipals of classical and molecular genetics that will be built upon in future modules and Stages.		Gain experience of core techniques such as gel electrophoresis and microscopy	Problem solving exercises to develop understanding of genetics. Students can work individually or in groups.			
		By working on (and if applicable, assessed through)	Lectures, pre-recorded material on the VLE, worksheets and set reading. 1 hour closed exam		Three x 3 hr practicals	By multiple pen + paper workshop sessions spread throughout the term. 1 hour closed exam			
Stage 1	Molecular Biology & Biochemistry	Progress towards PLO	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.	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.	Problem solving workshops to solve basic chemistry-based problems (molarity, conversion of units, etc.), and more advanced problems such as energy calculations and the rate of metabolism. The enzyme kinetics practical requires incorporating theories related to enzymology with hands-on practice.			

		By working on (and if applicable, assessed through)	2x 1.5-hour long exams (Start of Spring term and mid-Summer term)	Worksheets and practical protocols. An open assessment of problems, graphs, calculations, and conclusions relating to the practical work on enzyme kinetics.					
Stage 1	Intro to Arch Sci	Progress towards PLO					Students will gain an appreciation of how scientific techniques are used within archaeology to explore key issues and some of the potentials and limitations of these methods		students will begin to understand the role that various biological scientific techniques play in archaeological research
		By working on (and if applicable, assessed through)					by being introduced to a range of scientific techniques used in archaeology in lectures, learning to read scientific articles in seminar workshops and writing a journal article critique for the formative and summative assessment		by being introduced to a range of scientific techniques used in (bio) archaeology in lectures and learning to read scientific articles in seminar workshops

Stage 1	Eco Principles for the Environment	Progress towards PLO	Practice in finding and using sources	Practice in primary data collection	Practice in data handling and statistical analysis				Develops awareness of the importance of interdisciplinarity
		By working on (and if applicable, assessed through)	Independent study: finding sources on ecological theories in preparation for scientific report assessments	Lecturer-defined practicals: primary data are collected on ecology-based field studies	Statistics: Analysis and interpretation of ecological data (assessed in scientific report)				Lectures and practicals on ecological problems and how society can manage and affect these (assessed by scientific reports)
Stage 1	Genetics and Evolution	Progress towards PLO	Learning and developing an understanding about the principles of genetic analysis, the evolution of genes and genomes, and an introduction to evolutionary and population genetics	Practising the principles of genetic analysis in experimental design and hypothesis testing		By practising the principles of genetic analysis, and evolutionary and population genetics in problem solving exercises.			
		By working on (and if applicable, assessed through)	Listening and engaging with lectures and reading slected chapters in textbooks. Completing a number of VLE based exercises and quizzes that test and direct student learning.. 1 hour closed exam	Practising teachniques and approahces in genetic analysis in problem solving sessions		Participating in problem solving workshops and practiciing the skills required by a Geneticist in lateral thinking and problem solving. 1 hour closed exam			

Stage 2	Thermodynamics & Quantum Physics	Progress towards PLO	Use a range of mathematical tools and physical principles to evaluate physics problems of increasing complexity, and be able to articulate the real-world implications of this. Demonstrate the use of quantum mechanics for solving problems in other areas of physics and beyond.						
		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.						

Stage 2	Experimental Laboratory	Progress towards PLO			Apply content from lecture modules to conceptually challenging practical situations, while understanding how the choice of methodology and tools governs the reliability of the scientific data collected.	Understand and discuss the implications and limitations of various experimental approaches, with an emphasis on errors			
		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.	Discussion of experiment in assessed laboratory notebooks, discussion in formal reports.			

Stage 2	Electromagnetism & Optics	Progress towards PLO	Use a range of mathematical tools and physical principles to evaluate physics problems of increasing complexity. Understand the wide-ranging applicability of electromagnetism to solving problems from a variety of other fields of physics and beyond.						
		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.						

Stage 2	Mathematics for Natural Sciences II	Progress towards PLO	Be able to select and apply a range of mathematical tools to evaluate suitable physics 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 suported problem-solving sessions (maths practicals), formal examination.						

Stage 2	Chem for Nat Sci 3	Progress towards PLO		Develop intermediate skills required for synthetic inorganic and organic chemistry including handling air and water-sensitive materials and pyrophorics. Working safely in the laboratory	Develop intermediate skills required for synthetic inorganic and organic chemistry including handling air and water-sensitive materials and pyrophorics. Working safely in the laboratory				Developing an understanding of advanced chemical principles of retrosynthetic analysis, solutions and mixtures, symmetry and group theory, organic synthesis with enolate equivalents, metal-ligand and metal-metal bonding, coordination chemistry and quantum mechanics.

		By working on (and if applicable, assessed through)		Experiments within the Advanced synthesis practical. Safety lecture course and assessment highlights good working practice. Core and advanced laboratory skills are formatively assessed during the Skills exercise then summatively assessed on a weekly basis principally through in-lab assessments during the first half of term.	Experiments within the Advanced synthesis practical. Safety lecture course and assessment highlights good working practice. Core and advanced laboratory skills are formatively assessed during the Skills exercise then summatively assessed on a weekly basis principally through in-lab assessments during the first half of term.				Examination

Stage 2	Chem for Nat Sci 4	Progress towards PLO		Design and perform exepriments	Design and perform exepriments				Developing an understanding of advanced chemical principles of vibrational specroscopy, excited states and photochemistry, physical organic chemistry, organometallic chemistry, photoelectron spectroscopy and molecular orbital theory and heteroaromatic chemistry.
		By working on (and if applicable, assessed through)		Physcial organic chemistry lab / physical chemistry labs	Physcial organic chemistry lab / physical chemistry labs				Examination
Stage 2	Chem for Nat Sci 5	Progress towards PLO		Development of core laboratory skills and understanding of key safety practices. Aspects of planning and experimental design.	Development of core laboratory skills and understanding of key safety practices. Aspects of planning and experimental design.	Developing professional modes of behaviour, with respect to sharing resources, learning and adhering to standard laboratory practice, and working well with others	Development of communication skills		Developing an understanding of fundamental chemical principles of solid state chemistry, substitution and elimination and alkenes and alkynes.

		By working on (and if applicable, assessed through)		Team project work through Integrated Chemistry Practical (ICP). A mixture of mainly formative assessments (training) and selected summative assessments (proof of competence) drive the learning of key laboratory skills. Design of an experimental investigation applying analytical chemistry techniques is guided by laboratory staff and summatively assessed at the conclusion of ICP.	Team project work through Integrated Chemistry Practical (ICP). A mixture of mainly formative assessments (training) and selected summative assessments (proof of competence) drive the learning of key laboratory skills. Design of an experimental investigation applying analytical chemistry techniques is guided by laboratory staff and summatively assessed at the conclusion of ICP.	Group experiments in the integrated chemistry practicals and by working on practical experiments individually, in pairs, and in small groups; creative approaches to research strategy; summative assessment (ICP) involves team presentations.	Preparing outline written reports for weekly laboratory work - formatively and summatively assessed; team oral presentations and posters relating to project work; summatively assessed (ICP)		Examination
Stage 2	Biology Tutorials	Progress towards PLO			Collaborate or work individually to solve problems of a numerical or experimental nature.	Communicating about a topic in the biosciences using diverse approaches.	Acquiring a variety of transferable skills relating to problem solving, numerical and computational approaches, working in a team and criticality.	Learning about a bioscience topic chosen by the tutorial group. Learning how to read a scientific publication. Gain an understanding of referencing conventions.	

		By working on (and if applicable, assessed through)			Formative problem solving exercises set by the tutor relating to the tutorial topic.	Work individually or in a team to produce materials (eg. videos, presentation slides, written work) that will be presented and discussed in tutorial sessions.	Diverse tutorial activities set by the tutor.	Group discussions, presentations and journal clubs in tutorial sessions. Independent research of the literature and working on essays or other written communications that cite the literature.	
Stage 2	Cell Biology (20c)	Progress towards PLO	Acquire an understanding of key structural and functional elements of eukaryotic cells and relate these to cell behaviour.	Design and perform experiments to investigate mechanisms underlying cell motility.	Evaluate experimental and analytical techniques used to investigate cell biological processes in health and disease.	Group work in laboratory practicals and workshops to understand cell biology.		Integration of acquired understandings of cell biology principles and pathophysiologies. Logical thinking/crtitical analyses/ problem solving skills.	
		By working on (and if applicable, assessed through)	Lectures will provide knowledge on the concepts of cell biology and workshops will give applied examples. Assessed through a closed assessment.	Workshops and practicals. Assessed through a closed assessment.	Workhops and practicals. Assessed through a closed assessment.	Workhops and practicals. Assessed through a closed assessment.		Lectures, workshops and practicals. Assessed through a closed assessment.	

Stage 2	Biochemical Reactions and Interactions (20c)	Progress towards PLO	Acquire an understanding of the key physical and chemical concepts underlying advanced biochemical and biophysical techniques and their current applications through engagement with the relevant research literature.	Design experiments applying advanced analytical and quantitative techniques to address biological questions. Analyse multi-parameter data sets generated by these techniques and interpret in the context of a research hypothesis.	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.	Group work in problem-solving workshops to understand key concepts underlying techniques, their limitations and their applications in 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.	

		By working on (and if applicable, assessed through)	By applying concepts to biochemical and biophysical problems in formative workshop activities. Critical analysis of research articles in workshops. Assessed by 1.5 hr closed (open note) workshop in middle of Spring 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.	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.	Formative problem-solving activities in workshops and structured independent learning (engagement with 'flipped' lecture material).		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.	
Stage 2	Molecular Biology, Biotechnology & Bioinformatics	Progress towards PLO	Provides key concepts related to the mechanisms underlying structure, function and development of living organisms	Workshops require hypothesis construction. Block 2 practical requires experimental design and execution as well as data interpretation.	First hand execution of practical and analysis of quantitative transcriptomics data.	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.	
		By working on (and if applicable, assessed through)	Lectures and workshops throughout the module, private study. Closed exam	Workshops	Practicals	Practicals and workshops. Understanding and problem solving ability assessed in workshops. All blocks	By closed examination	All workshops and or practicals which involve some of the transferable skills listed above	

Stage 2	Genes, Genomes, Evolution & Population	Progress towards PLO	Core principles of evolution. Mechanisms of the change of allele frequencies. Interactions between processes. Effects on the genome, whole organisms and interacting species.	A major focus will be on the interpretation of data and some modelling approaches.	Evaluation of techniques including genomic techniques, evolutionary, population and behavioural modelling etc. and interpretation of data arising from these techniques	Individual and group problem-solving	discussing module related topics in workshops with peers and instructors. Participation in VLE discussion board.	research talk and discussions about careers with post-docs and PhD students	
		By working on (and if applicable, assessed through)	Lectures and workshops. Assessed in open exam through problem based questions and case studies, and in closed exam through problem-based questions.	Workshop on modelling selection and interpreting outcomes. Interpreting outcomes of genome wide analyses.	workshops	workshops focussing on population genetic principles, using simple models. Workshop on altruism, and workshop on macroevolution.	workshops, participation in VLE discussion forum	Participation in discussions	

Stage 2	Ecology of Animals, Plants & Microbes	Progress towards PLO	Acquire understanding of the key processes and theories that underpin function and response, across individuals and communities, of organisms within local and regional environments	Design and conduct experiments to understand underlying principles governing organism behaviour and function in a range of conditions/environments	Evaluate theory using observational, experimental evidence collected using basic laboratory techniques in lab practicals and field practical. Design functioning algorithm to test ecosystem and organism-appropriate hypotheses	Group work in lab and field practicals and algorithm workshop will develop their understanding of key module concepts and allow student to learn through peer assessment and instruction. Closed exam and open assessment in mid-term will focus on individual self-teaching and motivation.	Groups will present developed models with peer assessment and discussion	Algorithm/model development, practical-based skills	
		By working on (and if applicable, assessed through)	Lectures, practicals, workshops, reading of assigned material, open assessment and exam	Lab practicals and associated workshops, algorithm workshop, field practical	Lab practicals, practical workshops, algorithm workshop, closed exam, open assessment	Praciticals, workshops, exam and open assessment	Algorithm workshop presentations	practicals, workshops	
Stage 2	World Arch I	Progress towards PLO					students will practice the principles of communicating complex issues to a non-specialist audience		

		By working on (and if applicable, assessed through)					by being provided with worked examples online and producing an article on a chosen case study for a popular magazine for the summative assessment		
Stage 2	Practical Skills (Arch)	Progress towards PLO		students will develop good practice in practical skills relevant to their chosen option	Students will further build on criticality in their written work and recognise professional standards in report writing				
		By working on (and if applicable, assessed through)		by performing a range of practical and/or analytical techniques involved in data collection and interpretation and undertaking a practical test of data analysis for summative assessment	by completing written critiques of professional reports in formative and summative assessment				

Stage 2	Team Project (Arch)	Progress towards PLO		students will build on their knowledge of archaeological research design using specialist methodologies relevant to their chosen option			students will build on their knowledge of archaeological research design using specialist methodologies relevant to their chosen option		
		By working on (and if applicable, assessed through)		by matching recording and analytical methods to research aims and objectives and writing a specialist report on a dataset for the summative assessment with initial guidance during group meetings attended by staff			by matching recording and analytical methods to research aims and objectives and writing a specialist report on a dataset for the summative assessment with initial guidance during group meetings attended by staff		
Stage 2	Geographical Information Systems	Progress towards PLO	Develops knowledge, understanding and awareness	Develops skills in data collection and handling, and research project design			Develops skills in written comunication		Develops awareness of the importance of interdisciplinarity

		By working on (and if applicable, assessed through)	Undertaking a GIS project on one of three project topics (wind power; flood risk mapping; air pollution and health).Assessed in the scientific report.	Student-led project: There are many ways in which these multiple spatial datasets can be combined in carying out the project allowing new insights and knowledge to be created. Assessed in summative report.			Written: Reporting the project work in a summative scientific report.		Undertaking projects which call for the combination of physical science and socio-economic spatial datasest. Assessed in summative report.
Stage 2	Biogeography	Progress towards PLO	Develops knowledge, understanding and awareness	Develops skills in data collection and handling, and research project design	Develops data handling and analysis skills		Develops skills in oral, written and visual comunication		Develops awareness of the importance of interdisciplinarity
		By working on (and if applicable, assessed through)	Studying the patterns and process of temperate ecosystems. Assessed via scientific report.	Designing a field/ lab project as part of a group. Defining a research question, aim and objectives, sampling strategy, collecting data in the field/ lab, analysing the data and communicating the findings.	Statistics: Analysis of collected experimental data and presented in a summative report		Written: preparing a summatively assessed scientific report		Bringing together a range of information from the fields of ecology, environmental management and geography in a summative report.
Stage 2	Ocean Management and conservation	Progress towards PLO	Develops knowledge, understanding and awareness	Develops team-working skills	Develops data handling and analysis skills				Develops awareness of the importance of interdisciplinarity

		By working on (and if applicable, assessed through)	Lectures and practical on a wide range of topics of interest to ocean conservation and management (assessed by exam)	Groupwork: Lab practical offers opportunity for group work	Statistics: Practical requires data analysis and interpretation				Discussing environmental management problems which are invariability interdisciplinary
Satge 2	Ecosystems processes	Progress towards PLO	Practice in finding and using sources		Develops skills in data collection and handling, and research project design		Develops skills in written and oral comunication	Develops awareness of environmental problems and their solutions	Develops awareness of the importance of interdisciplinarity
		By working on (and if applicable, assessed through)	Independent study and in-class discussions: Literature search for summative lab reports and seminars on microbial, soil and plant ecology		Student-led research projects, groups: Design of research carried out in field/lab practicals on environmental control of microbial and plant growth (group work). Assessed by scinetific reports.		Written: Write-up of research results as summative scientific reports; Oral: Seminar discussions and presentation	Designing and undertaking field /laboratory experiments on impacts of land use change and propose management recommendations to improve plant community development. Assessed in summative scientific report on controls on plant growth.	Seminar preparation and discussions on current ecological topics
Stage 2	Climate Change (OPTION)	Progress towards PLO	Practice in finding and using sources			Practice in working as a group		Develops skills in scientific modelling	Develops awareness of the importance of interdisciplinarity

		By working on (and if applicable, assessed through)	Independent study: Scientific report is an independent piece of work that involves obtaining, synthesising and critically evaluating complex information on climate change from a wide range of reliable sources			Groupwork: Work responsibly as part of a team or as a team-leader to design and write an eye catching yet scientifically informing newspaper article on climate change		Modelling: For a report, they use quantitative data to make recommendations for emissions control in the future. This includes carrying out a set of model runs where it is possible to generate large amounts of data, so critical evaluation of the results to provide a coherent report is key.	Media seminar which involves students thinking about something other than the science of climate change and how the need to sell papers affects reporting. The scientific report involves working across disciplinary boundaries. As well as considering the scientific aspects behind climate change, students also consider the social, political and economic aspects.
Stage 2	Environment Systems Project (OPTION)	Progress towards PLO	Develops knowledge, understanding and awareness	Develops data handling and analysis skills	Develops skills in data collection and handling, and research project design		Devlops skills in oral and written comunication		

		By working on (and if applicable, assessed through)	Undertaking research for group project on the impacts of development on the environment (assessed in a summative verbal assessment and scientific report)	Statistics: Analysis of field/lab data. Use of SPSS. Independent design of data analysis. Assessed in summative assessments: verbal presentation of a research plan and scientific report.	Student-led research projects, groups: Designing a field/ lab project as part of a group. Defining a research question, aim and objectives, sampling strategy, collecting data in the field/ lab, analysing the data and communicating the findings. Assessed in verbal presentation of a research plan.		Oral: Individual presentation of a research plan; Written: Individual project write-up as a scientific report on data collected in group project. Reportincludes a technical summary for a non-specialist audience (University of York Estates).		

Stage 3	Advanced topics in Evolution and Genetics in Ecology (20 credits) (The module is in the process of being designed during 2018. The following is an indication of the content, which may change. The teaching is likely to include a combination of lectures, seminars or workshops.)	Progress towards PLO	Understanding and explaining the major theories underlying the field of evolutionary ecology in terms of underlying assumptions and predictions, Evaluating the strengths and weaknesses of those theories by reference to the empirical evidence, and reading, understanding and criticising the primary research literature from a range of topics in evolutionary ecology		Understanding a range of research techniques and approaches in evolutionary ecology, along with their limitations, and describe how they can be applied to particular problems* in rigorous investigations.		Explaining the major theories underlying the field of evolutionary ecology in terms of underlying assumptions and predictions, evaluating the strengths and weaknesses of those theories by reference to the empirical evidence		
		By working on (and if applicable, assessed through)	Lectures and associated workshops and following suggested reading. Closed examination short answer questions and essays		Lectures and associated workshops and following suggested reading. Closed examination methods questions and essays		Formative workshops, attempting past examination papers. Closed examination (written) short answer questions and essays		

Stage 3	Advanced topics in Molecular Biology (20 credits) (The module is in the process of being designed during 2018. The following is an indication of the content, which may change. The teaching is likely to include a combination of lectures, seminars or workshops.)	Progress towards PLO	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.		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.		Each of eight student-lead workshops deal with primary research papers. Each Figure from a paper is presented in detail to the rest of the class by individual students, followed by short Q+A periods to discuss and clarify.		
		By working on (and if applicable, assessed through)	Lectures, extra reading and independent study		Lecture content in which techniques, experimental design and data interpretation are discussed, along with extra reading and independent study.		Analysis of Figures from research papers.		

Stage 3	Advanced topics in Neuroscience (20 credits) (The module is in the process of being designed during 2018. The following is an indication of the content, which may change. The teaching is likely to include a combination of lectures, seminars or workshops.)	Progress towards PLO	Understanding the mechanisms of learning and memory in different animal models at the neurological, cellular and molecular level.		Criticise and design scientific studies into learning and memory, comparing different techniques and experimental paradigms used in different animal models.	Appreciate the ethical issues in using invasive technology to study the mammaliam brian and the contribution made by invertebrate model organisms to our understanding of mammalian learning and memory	Explain how changes in synaptic transmission are linked to learning and memory.		
		By working on (and if applicable, assessed through)	Lectures, VLE material and VLE discussion board, Workshops (x2) on scientific papers. Open examination based on a published scientific study		Workshops on scientific papers. Methods and data interpretation questions in open examination based on a published scientific study	Lectures and Workshops on scientific papers. Problem solving and experimental design questions in open examination based on a published scientific study	Workshops on scientific papers. Data interpretation and speculative questions in open examination based on a published scientific study		
Stage 3	Advanced topics in Biotechnology (20 credits) (The module is in the process of being designed during 2018. The following is an indication of the content, which may change. The teaching is likely	Progress towards PLO	Understand principles of crop performance.		Genetic engineering of plants. How to identify promising target genes. Analytical tools in crop genetics.			Gaining an informed view on latest approaches in plant biotechnology.	
		By working on (and if applicable, assessed through)	Lectures and scientific literature. Closed exam		Lectures and scientific literature. Closed exam			Lectures and scientific literature. Closed exam	

Stage 3	Advanced topics in Cell Biology (20 credits) (The module is in the process of being designed during 2018. The following is an indication of the content, which may change. The teaching is likely to include a combination of lectures, seminars or workshops.)	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.		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.	Considering the safety, ethical and social implications of regenerative medicine, particularly issues with the use of stem cells and human-derived material.		Knowledge and understanding of a fast-moving research area that has significant potential applications in healthcare advances	
		By working on (and if applicable, assessed through)	Lectures linked to the scientific literature with guidance given on specific publications		Lectures and primary publications	Lectures		Lectures linked to the scientific literature with guidance given on specific publications	
Stage 3	Advanced topics in microbiology (20 credits) (The module is in the process of being designed during 2018. The following is an indication of the content, which may change. The teaching is likely to include a	Progress towards PLO	Hearing and reading about concepts in infectious diseases caused by bacteria, bacterial features that faciliate virulence and experimental approaches that generate the knowledge.	Understanding experimental approaches that are used to derive insight on bacterial pathogenesis and key aspects of data analysis in the field.	Understanding experimental approaches that are used to derive insight on bacterial pathogenesis and key aspects of data analysis in the field.				

	combination of lectures, seminars or workshops.)	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 Q and essay Q in closed exam	Reading Primary research papers, reviews and gaining essential background knowledge, context and guidance in data analysis from lectures. short answer Q on experimental approach/data analysis in closed exam; opportunity to include aspect in essay Q in closed exam.	Reading Primary research papers, reviews and gaining essential background knowledge, context and guidance in data analysis from lectures. short answer Q on experimental approach/data analysis in closed exam; opportunity to include aspect in essay Q in closed exam.				

Stage 3	Genes and Development (20 credits) (The module is in the process of being designed during 2018. The following is an indication of the content, which may change. The teaching is likely to include a combination of lectures, seminars or workshops.)	Progress towards PLO	Acquiring deep understanding of a number of key topics in animal development. A major emphasis is placed on understanding methodologies employed in studying developmental biology and a critical evaluation of data in primary scientific literature. Acquiring understanding of the core principles of epigenetics followed by looking at epigenetic mechanisms in the context of development and disease. Content draws heavily on scientific research literature, both classic studies and current advances.		Acquiring detailed knowledge of and ability to critically assess a wide range of molecular, cellular and embryolgical methodogies. Students are introduced to core methodologies and experimental approaches in epigenetics research. These are discussed in the lectures and expanded upon in the problem solving workshop.	Acquiring detailed knowledge of approaches to solve problems in modern developmental biology. Current advancements in epigenetics research are included in all lectures with a focus on problem solving and consideration of ethical implications (stem cell biology, cloning, transgenerational responses)			

		By working on (and if applicable, assessed through)	Primary research literature and attending interactive lectures on key topics in modern developmental biology. A VLE-based discussion forum and end of module Q+A session are provided to support student learning. Open assessment. Lectures, a problem-solving workshop and extra reading		Primary research literature and detailed discussion during interactive lectures. Open assessment. Lecture content in which methods are discussed. Problem-based exercises.	Primary research literature and detailed discussion during interactive lectures. Critical analysis of research papers during lectures, VLE-based material and problem-based workshop. Open assessment			

Stage 3	Advanced topics in Ecology (20 credits) (The module is in the process of being designed during 2018. The following is an indication of the content, which may change. The teaching is likely to include a combination of lectures, seminars or workshops.)	Progress towards PLO	Understanding and explaining how animal behaviour affects the key decisions in an animal's life and the consequences of behaviour for conservation. Critically assessing the value and limitations of empirical studies, and of models of behaviour with reference to the empirical evidence.		Evaluating the strengths and weaknesses of recent technological advances for empirical study of animal behaviour. Critically assessing the value and limitations of a range of approaches to studying behaviour with reference to the empirical evidence.	Evaluating the strengths and weaknesses of empirical studies of animal behaviour. Designing empirical tests of underlying theory, within an ethical framework, taking into account conservation implications	Communicating complex information in written work		
		By working on (and if applicable, assessed through)	Primary research literature and detailed discussion during interactive lectures.		Primary research literature and detailed discussion during interactive lectures.	Group experimental design tasks during discussion parts interactive lectures, supported by lectures and by reading primary research literature	Workshop, attempting past examination papers, engaging with primary research literature.		

Stage 3	Cancer Cell and Molecular Biology (20 credits) (The module is in the process of being designed during 2018. The following is an indication of the content, which may change. The teaching is likely to include a combination of lectures, seminars or workshops.)	Progress towards PLO	The focus is on acquiring deep understanding of key concepts in cancer biology. Emphasis is placed on understanding how various mechanisms of cellular dysregulation interact to cause a normal cell to transition to a tumour, rather than on detailed recall of specific pathways. Acquiring deep understanding of how human genes are transcribed, how this is controlled, how it goes awry in cancer and how it can be targetted therapeutically. A major emphasis is placed on understanding methodologies and a critical evaluation of data in recently-published primary scientific literature.	Analysis of experimental design and data interpretation in primary literature.	Methodologies specific to cancer research not exist, with key technique covered in Cell Biology in stage 2. These are built on with introduction of advanced techniques used for probing genome organisation, stem cell biology, and imaging. Analysis of experimental techniques and interpretation in primary literature. Analysis of how manipulating transcription can be exploited therapeutically to tackle cancer.				

		By working on (and if applicable, assessed through)	Primary research literature and attending lectures on key topics in current cancer biology from three researchers who are engaged in laboratory based molecular cancer research at York. Primary research literature, experimental design and interpretation.		Primary research literature and detailed descriptons of their uses and limitations. Primary research papers with an emphasis on the data, how it was generated, interpretation of the results and the validity of any conclusions reached.				

Stage 3	Conservation, Climate Change and Biodiversity (20 credits) (The module is in the process of being designed during 2018. The following is an indication of the content, which may change. The teaching is likely to include a combination of lectures, seminars or workshops.)	Progress towards PLO	cover the causes of these major threats (including habitat destruction, invasive species, and overexploitation - and how these threats are compounded by climate change), and their impacts on biodiversity. discuss the gains as well as losses of diversity, and consider the implications of these changes both for humans and for the animals and plants that share our planet.	Integrate information from different sources in order to design new studies, experiments and research programmes for addressing the conservation of biodiversity. Describe a range of approaches employed in Anthropocene research, along with their strengths and limitations.		the received wisdom in ecology and conservation, and critique current approaches for conserving biodiversity. Evaluate the capacity of humans to manage the environment, and whether and when this is desirable	identify which threats have the most detrimental effects on species and ecosystems, and be able to discuss the problems conservationists face in terms of understanding the complexity of these threats.		
		By working on (and if applicable, assessed through)				through debates and group discussions and examination of case studies, evaluate	through debates and group discussions and examination of case studies, evaluate		

Stage 3	Human and Medical Genetics (20 credits) (The module is in the process of being designed during 2018. The following is an indication of the content, which may change. The teaching is likely to include a combination of lectures, seminars or workshops.)	Progress towards PLO	By acquiring knowledge on the human genome and its evolution, with an emphasis on the features that can explain the prevalence of certain diseases in modern day humans, and the use of pedigrees to estimate risks of unborn child or relatives developing a disease.		Critical evaluation of how technological advances are impacting on the human genetics field				
		By working on (and if applicable, assessed through)	Lecture material, primary research reading and problem solving activities on the VLE		Genome sequencing, related technologies, and promising new therapeutic approaches that are covered in recent, usually high profile, research papers, which are presented by the students to their peers in a seminar format followed by discussions.				

Stage 3	Specialised topics in infection and immunity (20c) (The module is in the process of being designed during 2018. The following is an indication of the content, which may change. The teaching is likely to include a combination of lectures, seminars or workshops.)"	Progress towards PLO	Hearing, reading, learning, and understanding in depth the core principles of and key concepts in immunology, including mechanisms of immunological tolerance, immune cell trafficking, inflammation, and autoimmunity.	Understanding of (i) experimental approaches used to gain insight into immunological mechanisms and (ii) key aspects of data analysis in the field.	Understanding of (i) experimental approaches used to gain insight into immunological mechanisms and (ii) key aspects of data analysis in the field.				
		By working on (and if applicable, assessed through)	Lectures. Reading primary research papers, reviews, and Janeway's Immunobiology textbook to gain essential background knowledge. VLE discussion board, synoptic lecture including Q+A session, specimen exam paper. Closed exam.	Critical reading of primary research papers and participation in discussions of these papers in lectures, with emphasis on experimental approaches, key findings, interpretation of results, validity of conclusions reaches, and whether there are any limitations of the study. Short-answer Q on experimental approach and/or data analysis in closed exam.	Critical reading of primary research papers and participation in discussions of these papers in lectures, with emphasis on experimental approaches, key findings, interpretation of results, validity of conclusions reaches, and whether there are any limitations of the study. Short-answer Q on experimental approach and/or data analysis in closed exam.				

Stage 3	Molecular Recognition (20 credits) (The module is in the process of being designed during 2018. The following is an indication of the content, which may change. The teaching is likely to include a combination of lectures, seminars or workshops.)	Progress towards PLO	Understanding and acquiring knowledge on advanced aspects of biological catalysis and how these biocatalysts are exploited in Nature for complex processes. Understanding how structure of enzymes and RNA relates to catalytic activity - a particular focus is placed on the use and engineering of enzyme systems for industrial biotechnology.		Understanding experimental approaches that are used to elucidate mechanisms of biocatalytic activity and how these can lead to improved industrial processes. To be able to critically evaluate state-of-the-art techniques to develop biocatalysts for biotechnological applications.			Gaining an understanding of how biocatalysts are used to solve real world problems in industrial biotechnology, environmental biotechnology and medicine.	
		By working on (and if applicable, assessed through)	By attending lectures and reading primary research papers and reviews. Closed exam.		By attending lectures and reading primary research papers and reviews. Closed examination short answer methods questions and essays.			By investigating real examples thrpugh material covered in lectures and primary research articles and reviews. Closed exam.	

Stage 3	Ecology field course (20 credits) (The module is in the process of being designed during 2018. The following is an indication of the content, which may change. The teaching is likely to include a combination of lectures, seminars or workshops.)	Progress towards PLO	Sample plant and animal populations and communities, and analyse and interpret the data.	Use principles of experimental design to plan research activities in the field. Use and apply the correct techniques to a variety of ecological questions that the students will devise.	Sample plant and animal populations, and analyse the data to identify spatial structure (plants) and abundance (plants and animals).	Work in teams to apply specific skills related to data gathering and analysis for ecological research.	Describe the constraints and opportunities provided by ecological fieldwork. Explain the specific conservation conerns in these areas.	Sample communities and use ordination methods to unravel the underlying structure of these communities. Calculate and interpret (wtih caution) community properties and use them for comparison. Demonstrate resilience to unexpected events during real and simulated fieldwork and when analysing field data.	
		By working on (and if applicable, assessed through)	Lectures. Practicals and group work. Closed exam.	Practicals (field and computer based). Group work sessions. Field course. Closed exam and open assessment	Practicals (field and computer based). Group work sessions. Lectures. Field course. Closed exam and open assessment.	Field course project (groups of 2-4 students) over the course of a week. Group presentation and questions (open assessment).	Field course project (groups of 2-4 students) over the course of a week. Group presentation and questions (open assessment).	Practicals (field and computer based). Group work sessions. Lectures. Field course. Closed exam and open assessment.	

Stage 3	Research project (40 credits)	Progress towards PLO	Critical understadning of an area of research developed over the course of the final year project	Testing hypotheses and executing experiments. Generating data, or analysing large datasets in the capstone final year project	Training in research methods, approaches and techniques relavant to the research project	Meetings with project director and supervision of research work	Communicating complex information in written work	Gaining more familiarity of the possible future opportunities in research and related areas where research skills are just as applicable	A presentational aspect to the project will be built in on a project day, where students will be tasked to present the findings of their research to their peers across their cohort. To enable students from different disciplines to understand their presentation, a student will need to appreciate th inter-disciplinary aspects of their subject and be able to effectively communicate to a general audience.

		By working on (and if applicable, assessed through)	The introduction to the research project report. Supported by small group journal club activities, for which students prepare and present on research papers.	Work through a substantial research project. Listening to a lecture on project work	Methods, techniques and approaches relevant to the research project	Carryout an indepenedent capstone research project and reflect upon the success and efficiency, as well as any ethical and saftey issues that may arise.	Preparation of research report. Lecture on writing skills included in taught element of course.	Listening to a lecture on data analysis. Listening to lectures about career possibilities, and routes for further study (masters and PhD). The project report includes the assessments of the presentation and analysis of data using numerical, quantitative and computer based skills taught in this module.	
Stage 3	Research group project (20 credits) [MSci]	Progress towards PLO	Critical reading of scientific papers relating to a defined research topic over the course of the preparation of the research project report.	Testing hypotheses and executing experiments. Generating data, or analysing large datasets	Training in reserach methods, approaches and techniques relavant to the group project	Meetings with group project director and supervision of research work. Assessing and reflecting on progress, evaluating the sucess and efficieny of group/team work.	Communicating complex information in written work	Gaining more familiarity of the possible future opportunities in research and related areas where research skills are just as applicable	

		By working on (and if applicable, assessed through)	Supported by small groupor research team activities and meetings	Work through research group project. Listening to a lecture on group project work	Methods, techniques and approaches relevant to the research project	Work as a member of a group or team in a research lab and carryout a research group project as instructed.	Preparation of research report. Lecture on writing skills included in taught element of course.	Listening to lectures about career possibilities, and routes for further study (masters and PhD). Listening to a lecture on data analysis	
Stage 4	Research project (80 credits)	Progress towards PLO	Systematic understanding of a defined area of research developed of the course of a substantial M level research project	Execute a fully formed M level research project over the course of the year	Training in research methods, approaches and techniques relavant to the M level research project	Meetings with project director and supervision of research work, and interaction with technicians, research students, and post-doctoral researchers	Communicate the capstone research project	Understand when cutting edge practice or technology, used by a Bioscientist is incorporated into an aspect of the research project, when data processing or analysis, or computation are used in the research process.	A presentational aspect to the project will be built in on a project day, where students will be tasked to present the findings of their research to their peers across their cohort. To enable students from different disciplines to understand their presentation, a student will need to appreciate th inter-disciplinary aspects of their subject and be able to effectively communicate to a general audience.

		By working on (and if applicable, assessed through)	Critical evaluations of the literature in area of the research project, and literature at the forefront of that topic exemplified in the introduction and dicussion in the written research report.	Design of experiments that yield data, or analyse large and complex datasets.	Methods, techniques and approaches relevant to the research project. And understanding how some of the approaches used are applicable to the current global challenges.	Carryout an indepenedent capstone research project at masters level and reflect upon the success and efficiency of their own work, as well as any ethical, saftey or societal issues that may arise.	Producing a conference style research poster, and an extensive research report	Working on a capstone M level project	
Stage 4	Critical Analysis (20 credits)	Progress towards PLO			Critically evaluate literature and presentations on research literature and on issues relating to the role of science.	Work within a small team to create, develop and critically review an interdisciplinary research proposal	Communicate scientific research		
		By working on (and if applicable, assessed through)			Seminar sized groups undertaking critical reviews of research literature. Each student within the seminar will present critique of two papers over the course of the module	Proposal of a research project (grant proposal) based on an area of interest to the students (group work)	Written and oral presentations		

Stage 4	Data Analysis (20 credits)	Progress towards PLO		Demonstrate the acquisition of skills in experimental design and data analysis		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	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)		Data analysis report		Reflective written assessment	Data analysis report		

Programme Map: Module Contribution to Programme Learning Outcomes

The information provided in this section should make clear why the students are doing the key activities of the programme, in terms of reaching the PLOs. You should use this section to provide commentary on the programme map and how current practice effectively propels student learning. Please indicate any changes that you plan to make to the programme linked to the pedagogic principles.

This section should capture reflections on the programmes and areas for development linked to the principles of the York pedagogy. Please provide an explanation of the programme and assessment design with reference to future enhancements aligned with the pedagogic principles.

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 Department of Biology. Therefore the relevant statements made in that department's respective submissions apply here. Note is also made to refer to the Arch, Chem, Enviro & Phys YP single subject documentation due to the splits in Stages 1 and 2.

ii. Changes to the existing programme that will be explored to affect this change; make references to the map to include module level change.

Some changes are expected due to the rollout of the YP in Biol & Chemistry. The Phys rollouts have already begun and have been incorporated into the current programme. All courses, this one included, are reviewed annually and feedback will be given to all contributing departments. Any further changes that may be necessary will naturally arise during this constant process of review.

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?

Again, we refer to the corresponding statements in the Biol, Chem & Maths enhancement plans for the reasons stated above.

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

Changes due roll out of the YP will be phased as they occur in the single subject rollout. Any changes will be phased in as and when they happen in the single subject degrees. Reference is made to the corresponding statements in the Arch, Bio, Chem, Env & Phys enhancement plans.

Due to the nature of all our specialisation programmes and the fact that the learning and teaching in Stages 1 & 2 is spread across multiple departments, there may be bottle necks for the students in terms of assessment. Currently this is handled on a report to the BoS basis and then escalted outwards after a BoS meeting to the Departments. This is a challenge for Natural Sciences and and a definite enhancement to the programmes will be some way of monitoring and controlling these bottlenecks. Currently the YP doesn't help as its level of detail is module assessment and that we have more control over. Its the intra-module assessment. We will carry on investigating ways in which we can manage this issue effectively for our students.

One thing that we have not yet being able to do is use any NSS returns to identify issues or good practice as we have yet to have a graduating cohort. Once this data comes in then we will of course incorporate the outcomes into our annual review processes.

(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 5; Nat Sci honours the pedagogical practices of our contributing departments whenever possible and this is certainly the case in summative assessment. The vast majority of the programme is built on modules from the single subject diet and the assessment modes used are judged best to assess the various learning outcomes on these modules.

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

As for item 12.

The final year project is a major component of all our degrees and is a chance for our students to show not only their skills and ability in a specialisim, but also to work in their specialism on a project that is interdisciplinary. Indeed this is seen at the most natural place to assess any PLOs which emphasise interdisciplinarity. The full process of running projects is currently under review and any changes/improvements will be incorporated into the programmes.

We need to figure out how to faithfully capture the interdisciplinarity of the programme when a lot of it isn't assessed e.g.
(a) the intentional juxtaposition of modules from different departments that cover complementary/similar topics
(b) Natural Sciences hour
The latter is especially important as its a unique feature of the Nat Sci programmes.

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/

Infrastructure: we look forward to the creation of a fully-functional programme & module catalogue which will enable:

- the efficient sharing of information between departments (& the ASO) e.g. module changes
- the shared usage of information for a variety of purposes (e.g. programme specs, admissions materials, student handbooks, website, ...)
- identification of issues like assessment bottlenecks & student workload

Nat Sci would like to give a particular note of thanks to David Gent, Cecillia Lowe, Katy Mann Benn & colleagues for their support when compiling this documentation and undergoing the process of making our programmes YP compliant. Their input has been invaluable.