

Programme Specification: Undergraduate

For students starting in Academic Year 2018/2019

1. Course Summary

Names of programme(s) and award title(s)	BSc (Hons) Natural Sciences BSc (Hons) Natural Sciences with International Year (see Annex A for details)
Award type	Single Honours
Mode of study	Full time
Framework of Higher Education Qualification (FHEQ) level of final award	Level 6
Duration	3 Years 4 years with International Year
Location of study	Keele University – main campus
Accreditation (if applicable)	Not applicable
Regulator	Office for Students (OfS)
Tuition Fees	UK/EU students: Fee for 2018/19 is £9,250* International students: Fee for 2018/19 is £15,480** The fee for the international year abroad is calculated at 15% of the standard year fee
Additional Costs	Refer to section 18

How this information might change: Please read the important information at <http://www.keele.ac.uk/studentagreement/>. This explains how and why we may need to make changes to the information provided in this document and to help you understand how we will communicate with you if this happens.

2. What is a Single Honours programme?

The Single Honours programme described in this document allows you to focus more or less exclusively on Natural Sciences. In keeping with Keele's commitment to breadth in the curriculum, the programme also gives you the opportunity to take some modules outside Natural Sciences, in other disciplines and in modern foreign

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

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languages as part of a 360-credit Honours degree. The Natural Sciences programme described in this document is highly interdisciplinary, drawing on the expertise of scientists in the fields of Biology, Mathematics, Psychology, Forensic Science, Chemistry, Physics, Computer Science, Environmental Science, Earth Science, and Physical Geography. It is in keeping with Keele's commitment to offer a broad undergraduate degree programme, whilst providing opportunity for students to develop increased specialisation, or to maintain a broad science-based portfolio, within the structure of a Single Honours programme. Thus it enables students to gain, and be able to demonstrate, a distinctive range of graduate attributes.

3. Overview of the Programme

The BSc (Hons) degree programme in Natural Sciences provides you with the opportunity to combine your interests in three science-based subjects, within the structure of a Single Honours degree programme. It aims to provide students with the scientific skills and expertise required to tackle many of the world's most pressing scientific and societal problems. The course at Keele draws on the expertise of scientists from within the Schools of Life Sciences; Chemical and Physical Sciences; Geography, Geology and the Environment; Psychology; and Computing and Mathematics, but also has close links with Keele's BA Liberal Arts programme providing students with opportunity for cross-faculty, interdisciplinary debates about topical world issues. The first year gives students a sound basis and understanding of their selected core science subjects; whilst in later years students can choose to specialize in their preferred scientific discipline, or to maintain a broad science-based portfolio. The degree structure is designed to cater for students who wish to continue to study three science subjects at degree level and who are open minded, creative, inquiring and excited by the challenge of solving complex problems. It aims to produce graduates who have the interdisciplinary background, communication and problem-solving skills to address complex scientific problems in a changing world.

4. Aims of the Programme

The broad aims of the programme are to:

- provide students with a sound scientific understanding of their selected 'core' science disciplines and the ability to apply this knowledge to help solve complex problems;
- gain a wide-range of laboratory and field-based skills, as appropriate to the student's chosen core science subjects, including the ability to carry out independent research;
- integrate scientific knowledge, and an awareness of social, economic and ethical issues, to address some of the World's most pressing societal concerns such as understanding the origins of the Universe, avoiding antibiotic drug resistance, mitigating climate change and providing long term food security;
- develop to a high professional standard, a broad range of employability skills including problem-solving, team work, independent research, communication and presentation skills.

5. What you will learn

The intended learning outcomes of the programme (what students should know, understand and be able to do at the end of the programme), can be described under the following headings:

- Subject knowledge and understanding
- Subject specific skills
- Key or transferable skills (including employability skills)

Subject knowledge and understanding

Successful students will be able to demonstrate knowledge and understanding of:

- the benefits of an interdisciplinary approach to science;
- the role Natural Scientists can play in the resolution of major challenges facing society;

- interdisciplinary perspectives on world/societal issues.

Subject specific skills

Successful students will be able to:

- effectively search and critically review the academic literature relating to a current interdisciplinary debate/discourse;
- recognise and make choices between the different methodological approaches to interdisciplinary research;
- frame research questions, aims and objectives, and design effective and achievable research/experimental projects;
- apply their knowledge, skills and experience to an aspect of current scientific research, through the use of established analytical scientific methods, literature review, data collection and interpretation;
- use a variety of evidence-based approaches to solve problems;
- apply reflection and critical skills to a wide range of issues;
- work with others to discover creative, innovative solutions to complex issues.

Key or transferable skills (including employability skills)

Successful students will be able to:

- locate, evaluate and make effective use of a wide range of university-level information sources;
- communicate clearly and effectively using appropriate scientific language and conventions in both written and oral forms;
- communicate complex ideas to lay audiences in a variety of forms;
- communicate reflective and critical ideas through advanced written and oral presentation skills.

The full range of intended learning outcomes that will be achieved by students taking the Natural Sciences degree programme will be highly dependent upon which combination of sciences* that they choose to study as 'core' and 'supporting'. Individual module specifications should be consulted for information on knowledge and understanding and skills obtained from optional modules within the degree programme, and for those modules taken as a supporting science. *The exact combination of subjects which can be taken as core and supporting is dependent upon timetabling restrictions (see Section 8).

Keele Graduate attributes

Engagement with this programme will enable you to develop your intellectual, personal and professional capabilities. At Keele, we call these our ten Graduate Attributes and they include independent thinking, synthesizing information, creative problem solving, communicating clearly, and appreciating the social, environmental and global implications of your studies and activities. Our educational programme and learning environment is designed to help you to become a well-rounded graduate who is capable of making a positive and valued contribution in a complex and rapidly changing world, whichever spheres of life you engage in after your studies are completed.

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

6. How is the Programme taught?

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

- Lectures

- Tutorials
- Laboratory Classes
- Problem-solving classes and workshops
- Screencasts
- Pre-laboratory and post-laboratory exercises
- Research projects
- IT instruction (spreadsheets, word-processing, chemical structure drawing, databases, textbook resources, information retrieval and literature searching)
- Group work
- Seminars with pre- and post-seminar discussions
- Interdisciplinary debates (links with BA Liberal Arts students)
- Self and peer-assessment for learning
- Information literacy activities
- Computer-aided learning (simulations and animations, online activities and exercises)
- Case studies
- Use of e-learning/the Keele Learning Environment (KLE)

Apart from these formal activities, students are also provided with regular opportunities to talk through particular areas of difficulty, and any special learning needs they may have, with their Personal Tutors or module lecturers on a one-to-one basis.

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

7. Teaching Staff

As Natural Sciences is such an interdisciplinary subject, staff from across the Faculty of Natural Sciences make contributions to the degree programme. The teaching and research profiles of the staff that deliver and support the Natural Sciences programme can be found at:

School of Geography, Geology and the Environment: <http://www.keele.ac.uk/gge/people/>

School of Chemical and Physical Sciences: <http://www.keele.ac.uk/chemistry/staff/>

School of Life Sciences: <http://www.keele.ac.uk/lifesci/people/>

School of Computing and Mathematics: <https://www.keele.ac.uk/scm/staff/>

School of Psychology: <https://www.keele.ac.uk/psychology/people/academic-stafflist/>

The University will attempt to minimise changes to our core teaching teams, however, delivery of the programme depends on having a sufficient number of staff with the relevant expertise to ensure that the programme is taught to the appropriate academic standard.

Staff turnover, for example where key members of staff leave, fall ill or go on research leave, may result in changes to the programme's content. The University will endeavour to ensure that any impact on students is limited if such changes occur.

8. What is the Structure of the Programme?

The academic year runs from September to June and is divided into two semesters. The number of weeks of teaching will vary from course to course, but you can generally expect to attend scheduled teaching sessions between the end of September and mid-December, and from mid-January to the end of May.

Our degree courses are organised into modules. Each module is usually a self-contained unit of study and each is usually assessed separately with the award of credits on the basis of 1 credit = 10 hours of student effort. An outline of the structure of the programme is provided in the tables below.

There are three types of module delivered as part of this programme. They are:

- Compulsory modules – a module that you are required to study on this course;
- Optional modules – these allow you some limited choice of what to study from a list of modules;
- Elective modules – a free choice of modules that count towards the overall credit requirement but not the number of subject-related credits.

The interdisciplinary nature of the BSc Natural Sciences degree programme means that different students will take different combinations of core, optional and elective modules depending on their chosen pathway through the Natural Sciences programme. Full details are shown in the Tables below. All Natural Sciences students take the following compulsory modules, which are bespoke to the BSc Natural Sciences degree programme:

	Compulsory Modules (for all students)
Year-1	NAT-10001: Science and Society (15-credits) Sem1-2
Year-2	NAT-20001: Research Skills for Natural Scientists (15-credits)
Year-3	NAT-30001: Grand Challenges in Society (15-credits)
	NAT-30002: Natural Sciences Research Project (30-credits)

In addition, students studying Natural Sciences take two science subjects as ‘core’ (45-credits per subject) plus EITHER a third science subject as a ‘supporting’ science (15-credits) OR an elective module (15-credits) in Years 1 and 2. In Year 3, students choose optional modules, subject to pre-requisites, from the range available within their core science subjects. The exact combination of subjects available to students is dependent upon timetabling restrictions and shown below:

Core Science 1 (45 credits)	Core Science 2 (45 credits)	Possible ‘Supporting Science Subjects’ (students choose one subject) (15 credits)*
Chemistry	Biology	<i>Earth Sciences OR Environmental Science OR Forensic Science</i>
Chemistry	Environmental Science	<i>Biology</i>
Chemistry	Earth Sciences	<i>Biology</i>
Chemistry	Forensic Science	<i>Biology</i>
Physical Geography	Biology	<i>Earth Sciences OR Environmental Science OR Forensic Science</i>
Physical Geography	Forensic Science	<i>Biology</i>
Physical Geography	Earth Sciences	<i>Biology</i>
Physical Geography	Environmental Science	<i>Biology</i>
Biology	Forensic Science	<i>Computer Science OR Psychology OR Physical Geography</i>
Biology	Earth Sciences	<i>Computer Science OR Psychology OR Physical Geography</i>
Biology	Environmental Science	<i>Computer Science OR Psychology OR Physical Geography</i>
Mathematics	Physics	<i>Computer Science OR Psychology OR Physical Geography</i>
Mathematics	Astrophysics	<i>Computer Science OR Psychology OR Physical Geography</i>
Mathematics	Biology	<i>Computer Science OR Psychology OR Physical Geography</i>
Mathematics	Chemistry	<i>Biology</i>
Mathematics	Physical Geography	<i>Biology</i>

Table 1: Possible core and supporting science subject combinations available as part of the BSc Natural Sciences degree programme at Years 1 and 2. In Year-3 students choose option modules, subject to pre-requisites and timetabling restrictions, from the range available within their core science subjects. *Students may choose to study a 15-credit elective module in Years 1 and 2 instead of a third science subject if desired.

The table below provides a summary of the content of the Natural Science programme for those science subjects which can be taken as core. Further information about specific modules can be found online.

Core Science (students choose two)	Year 1 (Level 4)	Year 2 (Level 5)	Year 3 (Level 6) options
<i>Astrophysics</i>	45-credits of compulsory modules: PHY-10024: Nature of Matter (Sem1) PHY-10020: Oscillations & Waves (Sem2) PHY-10023: Electricity & Stellar Structure (Sem2)	45-credits of compulsory modules: PHY-20027: Optics & Thermodynamics PHY-20002: Stellar astrophysics PHY-20026: Statistical mechanics and solid state physics	Available option modules are: PHY-30012: Electromagnetism PHY-30033: Particle Physics and Accelerators PHY-30001: Cosmology PHY-30027: Data Analysis and Model Testing PHY-30003: Compact Objects PHY-30025: Life in the Universe
<i>Physics</i>	45-credits of compulsory modules: PHY-10024: Nature of Matter (Sem1) PHY-10020: Oscillations & Waves (Sem2) PHY-10021: Electricity and Magnetism (Sem2)	45-credits of compulsory modules: PHY-20027: Optics & Thermodynamics PHY-20009: Nuclear & particle physics PHY-20026: Statistical mechanics and solid state physics	Available option modules are: PHY-30012: Electromagnetism PHY-30033: Particle Physics and Accelerators PHY-30001: Cosmology PHY-30027: Data Analysis and Model Testing PHY-30003: Compact Objects PHY-30025: Life in the Universe

<p>Chemistry</p>	<p>45-credits of compulsory modules:</p> <p>CHE-10063: Chemical Structure and Reactivity (Sem1-2) CHE-10057: Practical and Professional Chemistry Skills for Natural Sciences (Sem1-2)</p>	<p>Students choose to follow EITHER a Materials Chemistry pathway OR a Medicinal Chemistry pathway as follows (45-credits compulsory modules in either pathway):</p> <p><u>Materials Chemistry pathway:</u> CHE-20067: Molecular Chemistry and Reactions (Natural Sciences) CHE-20061: Spectroscopy and Analysis CHE-20065: Physical and Structural Chemistry</p> <p><u>Medicinal Chemistry pathway:</u> CHE-20067: Molecular Chemistry and Reactions (Natural Sciences) CHE-20061: Spectroscopy and Analysis CHE-20027: Medicinal and Biological Chemistry 1</p> <p><i>Note choice of pathway at Level-5 has implications for the optional modules available to students at Level-6</i></p>	<p>The following optional modules are available to students at Level-6 and are dependent upon the pathway studied at Level-5:</p> <p><u>Materials Chemistry pathway:</u> <u>Available Optional modules:</u> CHE-30037: Topics in Chemistry CHE-30038: Chemical Kinetics, Photochemistry & Inorganic Reaction Mechanisms CHE-30039: Advanced Inorganic Chemistry CHE-30042: Inorganic, Physical and Solid State Chemistry CHE-30043: Materials Chemistry and Catalysis</p> <p><u>Medicinal Chemistry pathway:</u> <u>Available Optional modules:</u> CHE-30038: Chemical Kinetics, Photochemistry & Inorganic Reaction Mechanisms CHE-30039: Advanced Organic Chemistry CHE-30044: Topics in Medicinal Chemistry CHE-30047: Medicinal and Biological Chemistry 2</p>
<p>Earth Sciences</p>	<p>45-credits of compulsory modules:</p> <p>ESC-10036 Planet Earth (Sem1) ESC-10047: Data Visualisation (Sem1) ESC-10048: the Earth System (Sem2)</p>	<p>45-credits of compulsory modules</p> <p>ESC-20036: Palaeoclimate and Quaternary Studies*</p> <p>ESC-20084 Geology and Society (30-credits)*</p> <p>*Both of these modules are associated with a one-day field course which usually take place during semester one.</p>	<p>Available optional modules are:</p> <p>ESC-30009: Natural Hazards ESC-30036: Exploration Geophysics ESC-30018: Global Environmental Change ESC-30006: Glaciers and Glacial Geomorphology ESC-30022: Hydrological and Engineering Geology ESC-30020: Water Resources ESC-30027: Coastal Environments</p>

Environmental Science	<p>45-credits of compulsory modules:</p> <p>ESC-10045: Introductory Geology for the Environmental Sciences (Sem1) CHE10044 Introductory Environmental Chemistry * (Sem2) ESC-10043: Greening Business: Employability and Sustainability (Sem2)</p> <p>*Students taking Chemistry as a core science replace CHE-10044 with ESC-10041: People and the Environment (Sem1-2)</p>	<p>45-credits of compulsory modules:</p> <p>ESC-20017: Human Impacts on the Environment ESC-20079: Environmental and Sustainability Impact Assessment and Research Planning (30-credits)¹</p> <p>¹<i>This module is associated with a week-long residential field course, which usually takes place during the Easter vacation of Year-2.</i></p>	<p>Available optional modules are:</p> <p>ESC-30045: Contemporary Topics in Environmental Science ESC-30040: Clean Technology ESC-30018: Global Environmental Change ESC-30020: Water Resources ESC-30027: Coastal Environments</p>
Forensic Science	<p>45-credits of compulsory modules:</p> <p>CHE-10039:Forensic Science Principles (Sem1) CHE-10037:Forensic Analysis (Sem2) CHE-10042:Forensic identification (Sem2)</p>	<p>45-credits of compulsory modules:</p> <p>CHE-20011: Spectroscopy and advanced analysis CHE-20010: Criminalistic methods CHE-20012: Drugs of abuse</p>	<p>Available optional modules are:</p> <p>CHE-30010:Forensic toxicology CHE-30033:Evaluation of evidence CHE-30024 Forensic Geoscience CHE-30035 Topics in Forensic Analysis</p>
Physical Geography	<p>45-credits of compulsory modules:</p> <p>ESC-10039: Fundamentals of Physical Geography (Sem1) ESC-10041: People and Environment (Sem2)</p> <p>ESC-10032: Global warming or a new ice age? (Sem2)</p>	<p>45-credits of compulsory modules:</p> <p>ESC-20050: Dynamic Geographies (15 credit, Physical Geography options only) ESC-20030: Regional LandSystems GEG-20018: Concepts and Debates (Physical Geography route)</p>	<p>Available optional modules are:</p> <p>ESC-30006: Glaciers & Glacial Geomorphology ESC-30018: Global Environmental Change ESC-30020: Water Resources</p> <p>ESC-30027: Coastal Environments</p>
Mathematics	<p>45-credits of compulsory modules:</p> <p>MAT-10046: Calculus (30-credits) (Sem1-2) MAT-10045: Introduction to Algebra (Sem1-2)</p>	<p>45-credits of compulsory modules:</p> <p>MAT-20008: Differential Equations MAT-20031 Computational Mathematics MAT-20025: Abstract Algebra</p>	<p>Available optional modules are:</p> <p>MAT-30002: Nonlinear Differential Equations MAT-30003: Partial Differential Equations MAT-30038 Number Theory and Cryptography MAT-30029: Professional Mathematics MAT-30001: Graph Theory MAT-30014: Medical Statistics MAT-30023: Mathematical Biology</p>

Biology	45-credits of compulsory modules: LSC-10077: Introduction to the Biological Sciences (45-credit module)	Students choose 45-credits of optional modules from the following list: <i>LSC-20071: Animal Adaptations</i> <i>LSC-20055: Life at the Extremes⁺</i> <i>LSC-20056: Research and Analytical Skills</i> <i>LSC-20052 Nutrition and Energy Balance</i> <i>⁺ This module is associated with an 8-day residential field course which usually takes place during the summer vacation before Year 2 of the programme - you will therefore need to have made this module choice before the end of Year 1 and confirmed your place on the field trip</i>	Available optional modules are: <i>LSC-30003: Applied Insect Ecology</i> <i>LSC-30043 Conservation Biology</i> <i>LSC-30006: Applied Fish Biology</i> <i>LSC-30017: Trees in their Environment</i> <i>LSC-30030: Human Evolution</i>
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All modules are 15-credits unless otherwise stated.

For modules which are available as part of more than one core science pathway, students will only gain credits for that module in one of their core sciences (i.e. the same module cannot be counted more than once in terms of credits).

The location of field courses is subject to change depending on factors such as staff availability, staff changes, staff expertise, costs, student numbers, other factors outside of our control (earthquakes, volcanic eruptions etc.).

The following table lists the subjects which can be taken as a **supporting science** and the specific modules students will be required to take:

Supporting Science Subject	Year 1 (Level 4)	Year 2 (Level 5)
Biology	LSC-10054 Plants: Sex Drugs and Alcohol (Sem2)	<i>LSC-20055: Life at the Extremes⁺</i> <i>OR</i> <i>LSC-20055: Animal Adaptations</i> <i>⁺ This module is associated with an 8-day residential field course which usually takes place during the summer vacation before Year 2 of the programme - you will therefore need to have made this module choice before the end of Year 1 and confirmed your place on the field trip</i>
Computer Science	CSC-10024: Programming 1 (Sem1)	CSC-20023: Computational Intelligence 1

Psychology	PSY-10034 Introduction to biological and cognitive psychology (Sem2)	PSY-20045, Biological and Cognitive Psychology
Earth Sciences	ESC-10045: Introductory Geology for the Environmental Sciences (Sem1)	ESC-20037: Geoscience and Society * Includes a one-day field course which usually takes place during semester two
Environmental Science	ESC-10043: Greening Business (Sem1)?	ESC-20017: Human Impacts on the Environment
Forensic Science	CHE-10039: Forensic Science Principles (Sem1)	CHE-20010: Criminalistic Methods
Physical Geography	ESC-10039: Fundamentals of Physical Geography (Sem1)	ESC-20030: Regional Landsystems

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

Learning Outcomes

The tables below set out what students learn in each year of the Programme, the modules in which that learning takes place, and the main ways in which students are assessed on their learning. In Year 1 (Level 4) and Year 2 (Level 5) and Year-3 (Level-6) these learning outcomes are achieved in the compulsory modules which all students are required to take. Note that the interdisciplinary nature of the Natural Sciences degree programme means that different students will take different combinations of core, optional and elective modules depending on their chosen pathway through the Natural Sciences programme. As such, only the learning outcomes for the compulsory, bespoke Natural Sciences modules (NAT-10001, NAT-20001, NAT-30001, and NAT-30002) are included here. For learning outcomes relating to other compulsory, optional and elective modules please visit: www.keele.ac.uk/recordsandexams/az

Subject Knowledge and Understanding		
Learning Outcome	Module in which this is delivered	Principal forms of assessment (of the Level Outcome) used
<i>Successful students will be able to demonstrate knowledge & understanding of:</i>		
<i>the benefits of an interdisciplinary approach to science;</i>	NAT-10001	Oral Presentation, Reflective Diary
<i>the role Natural Scientists can play in the resolution of major challenges facing society;</i>	NAT-10001	Reflective Diary
<i>Interdisciplinary perspectives on world/societal issues.</i>	NAT-30001	Critique, Group Project, Essay

Subject Specific Skills		
Learning Outcome	Module in which this is delivered	Principal forms of assessment (of the Level Outcome) used
<i>Successful students will be able to:</i>		
<i>effectively search and critically review the academic literature relating to a current interdisciplinary debate/discourse;</i>	NAT-20001	Literature Review
<i>recognise and make choices between the different methodological approaches to interdisciplinary research;</i>	NAT-20001	Literature Review, Research Proposal
<i>frame research questions, aims and objectives, and design effective and achievable research/experimental projects</i>	NAT-20001	Research Proposal
<i>apply their knowledge, skills and experience to an aspect of current scientific research, through the use of established analytical scientific methods, literature review, data collection and interpretation;</i>	NAT-30002	Dissertation, Conference Style Poster Presentation
<i>use a variety of evidence-based approaches to solve problems;</i>	NAT-30001	Essay

<i>apply reflection and critical skills to a wide range of issues;</i>	NAT-30001	Critique, Essay
<i>work with others to discover creative, innovative solutions to complex issues.</i>	NAT-30001	Group Project

Key or Transferable Skills (graduate attributes)		
Learning Outcome	Module in which this is delivered	Principal forms of assessment (of the Level Outcome) used
<i>Successful students will have the opportunity to:</i>		
<i>locate, evaluate and make effective use of a wide range of university level information sources;</i>	NAT-10001	Reflective Diary, Report
<i>communicate clearly and effectively using appropriate scientific language and conventions in both written and oral forms;</i>	NAT-10001	Oral Presentation, Reflective Diary, Report
<i>communicate complex ideas to lay audiences in a variety of forms;</i>	NAT-30001	Group Project
<i>communicate reflective and critical ideas through advanced written and oral presentation skills.</i>	NAT-30001	Critique, Group Project, Essay

9. Final and intermediate awards

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

Honours Degree	360 credits	You will require at least 120 credits at levels 4, 5 and 6.
Diploma in Higher Education	240 credits	You will require at least 120 credits at level 4 or higher and at least 120 credits at level 5 or higher
Certificate in Higher Education	120 credits	You will require at least 120 credits at level 4 or higher

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

10. How is the Programme assessed?

The wide variety of assessment methods used within Natural Sciences at Keele reflects the broad range of knowledge and skills that are developed as you progress through the degree programme. Teaching staff pay particular attention to specifying clear assessment criteria and providing timely, regular and constructive feedback that helps to clarify things you did not understand and helps you to improve your performance. The following list is representative of the variety of assessment methods used within Natural Sciences:

- **Unseen closed and open book examinations** in different formats test students' knowledge and understanding of the subject. Examinations may consist of essay, short answer and/or multiple choice questions, and paper comprehension.
- **Assessed Problem Sheets** assess the student's skills in solving numerical and other problems within the discipline by drawing on their scientific understanding and knowledge, and experience of experimental techniques
- **Essays** allow you to demonstrate your ability to articulate ideas clearly using argument and reasoning skills and with close reference to the contexts and critical concepts covered in the modules. Essays also develop and demonstrate research and presentation skills (including appropriate scholarly referencing).
- **Laboratory reports** – structured proformas and full lab reports are formal summaries of work carried out in the laboratory and test students' understanding of the practical aspects of the programme and develop the skills necessary to enable students to present and analyse their results.
- **Class tests** taken either conventionally or online via the Keele Learning Environment (KLE) assess students' subject knowledge and their ability to apply it in a more structured and focused way.
- **Technical reports** are formal, structured summaries of work that test students' understanding of the practical aspects of the programme and develop the skills necessary to enable students to present and analyse their results.
- **Information retrieval exercises** require students to locate and analyse information of different types from the internet, various databases, scientific publications and textbooks. The information is then presented in a prescribed written format.
- **IT assignments and computer-based exercises** (e.g. spreadsheets exercises) – various activities designed to assess students ability to use software to retrieve, analyse and present scientific data in a variety of formats.
- **Dissertations** enable students to explore in depth an area of particular interest through a substantial piece of focused research and writing, and test their ability to formulate and answer research questions.
- **Field course notebook and portfolios** assess work that has been carried out in the field, and typically include field notebooks, research proposals, short quizzes and both oral and written presentations. The specific assessment portfolio will vary according to the field course destination and subject focus.
- **Short reports** for which students are required to write up their own account of small group studies and discussions on particular topics.
- **Research projects and reports** test student's knowledge of different research methodologies and the limits and provisional nature of knowledge. They also enable students to demonstrate their ability to formulate research questions and to answer them using appropriate methods.
- **Oral and poster presentations and reports** assess individual students' subject knowledge and understanding. They also test their ability to work effectively as members of a team, to communicate what they know orally and visually, and to reflect on these processes as part of their own personal development.
- **Portfolios** may consist of a range of different pieces of work but routinely include a requirement that students provide some evidence of critical reflection on the development of their own learning.
- **Peer assessment:** In some cases students will be involved in marking other students' work, usually with a prescriptive marking guide. This helps students to appreciate where marks are gained and lost and gives them the opportunity to see the common mistakes made by other students.
- **Reviews** of other scholars' work test students' ability to identify and summarise the key points of a text and to evaluate the quality of arguments and the evidence used to support them. In the case of work based on empirical research, reviews also assess students' knowledge of research methodologies and their ability to make critical judgements about the appropriateness of different strategies for collecting and analysing data.

- **Video/screencast presentations** require students to produce a short video or screencast on a given topic and assess students' knowledge and understanding, and ability to communicate what they know orally and visually, and to reflect on these processes as part of their own personal development.
- **Experimental projects** test students' knowledge of research methodologies and their ability to carry them out. They also enable students to demonstrate their ability to formulate research questions, design experiments, carry them out and analyse the results.

Marks are awarded for summative assessments designed to assess your achievement of learning outcomes. You will also be assessed formatively to enable you to monitor your own progress and to assist staff in identifying and addressing any specific learning needs. Feedback, including guidance on how you can improve the quality of your work, is also provided on all summative assessments within three working weeks of submission, unless there are compelling circumstances that make this impossible, and more informally in the course of tutorial and seminar discussions.

11. Contact Time and Expected Workload

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

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

Activity	Year 1 (Level 4)	Year 2 (Level 5)	Year 3 (Level 6)
Scheduled learning and teaching activities	36%	29%	17%
Guided independent Study	64%	71%	83%
Placements	0%	0%	0%

12. Accreditation

This programme does not have accreditation from an external body.

13. Regulations

The University Regulations form the framework for learning, teaching and assessment and other aspects of the student experience. Further information about the University Regulations can be found at: <http://www.keele.ac.uk/student-agreement/>

A student who has completed a semester abroad will not normally be eligible to transfer onto the International Year option.

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

Subject	A-level	Subjects not included	International Baccalaureate	BTEC	Access to Higher Education Diploma	GCSE requirements

Natural Sciences	<p>ABB Including 2 Science A Levels. Science subjects could include Biology, Chemistry, Environmental Science, Geography, Geology, Mathematics or Physics.</p> <p>The following additional entry requirements are required for students choosing these subjects as a 'core science':</p> <p>Mathematics – grade A in A-level Mathematics Chemistry – grade A in A-level Chemistry Forensic Science – grade A in either A-Level Chemistry or Biology Life Sciences – grade A in A-level Chemistry or Biology</p> <p>A Pass in Science Practical will be required if applicant is taking A level Biology, Chemistry or Physics (England)**</p> <p>** Science practical only required from applicants taking reformed A level Biology, Chemistry or Physics in England.</p>	None	<p>34 points to include 2 Higher level Science subjects at 6 or above. Science subjects could include Biology, Chemistry, Environmental Science, Geography, Geology, Mathematics or Physics. Please note Core Sciences also have specific Science subject requirements e.g. Chemistry will require Higher Level Chemistry.</p>	<p>DDD You must also have taken sufficient Science credits, please contact us for advice.</p>	<p>Obtain Access to Higher Education Diploma with 39 Level 3 credits at Distinction and 6 Level 3 credits at Merit or above. You must also have taken sufficient Science credits, please contact us for advice.</p>	<p>Mathematics @ B (or 6), English Lang @ C (or 4)</p>
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NB: in addition there are subject specific requirements depending on your chosen core science subjects

Applicants who are not currently undertaking any formal study or who have been out of formal education for more than 3 years and are not qualified to A-level or BTEC standard may be offered entry to the University's Foundation Year Programme.

Applicants for whom English is not a first language must provide evidence of a recognised qualification in English language. The minimum score for entry to the Programme is Academic IELTS 6.0 or equivalent.

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

Accreditation of Prior Learning (APL) is considered on a case-by-case basis and those interested should contact the Programme Director. The University's guidelines on this can be found here:

<http://www.keele.ac.uk/ga/accreditationofpriorlearning/>

15. How are students supported on the programme?

Personal Tutors: All students are allocated a Personal Tutor for the duration of their studies as part of the University's Personal Tutor system. The role of the Personal Tutor is to meet formally with their tutees at least once per semester to discuss progress and performance, and to offer support and advice. In addition, to a personal tutor allocated to the student, students are encouraged to seek support from any of the Natural Sciences teaching and administrative staff. Students can make arrangements to see their Personal Tutor or other staff at any time.

Use of e-learning/the Keele Learning Environment (KLE): All modules are supported by learning materials that are accessible to students via the KLE. The School supports the University's policy on module support on the KLE.

Health and Safety: All students admitted to the programme receive detailed training on health and safety in the laboratory, as appropriate for the Science subjects they are studying. Students studying Earth Sciences, Environmental Science or Physical Geography are expected to abide by the rules and regulations governing the efficient working, safety and welfare of all members both within the University and in the field.

Students with disabilities: Students with disabilities or medical problems, who are admitted onto the Natural Science degree programme, will meet with a member of the University's Disability Services at the very start of the course in order to discuss any special requirements. Procedures will then be implemented according to the nature of the student's disability or medical problem. These procedures can range, for example, from allowing extra examination time for students diagnosed as dyslexic, to allocating additional staff or demonstrators to field classes to help students with mobility problems.

16. Learning Resources

The School of Chemical and Physical Sciences is housed in Lennard Jones Building, which contains well-equipped undergraduate Physics teaching laboratories and a dedicated PC laboratory supporting both Windows and Linux. There are rooms available in the building for the students to work and socialise with their peers. There are dedicated boxes located in the building for submission of the problem sheets and laboratory reports. In addition, the School Office is open continuously during the week from 9am to 5pm to answer student queries.

Chemistry at Keele is based in the Lennard-Jones building, which houses excellent, well-equipped teaching and research laboratory facilities. Each module has a site within the university's virtual learning environment (the Keele Learning Environment or KLE), which hosts teaching materials (lecture notes/slides, laboratory scripts, assessments, past examination papers, on-line quizzes, videos, screencasts and audio clips) and useful links. The KLE is accessible on or off campus and is also used for online submission and return of assessments. Each module has a module guide or specification which contains details of the specific intended learning outcomes, Graduate Attributes and assessments.

The School of **Geography, Geology and Environment** has its own building (the William Smith Building) that contains well-equipped laboratories and lecture theatres. The foyer provides pleasant surroundings for students to meet and socialise with their peers. The Office is currently open during the week from 8.45am to 5.00pm to answer student queries and deal with administrative tasks.

Biology is taught in modern teaching rooms across the University, almost all of which are equipped with computers, internet access and electronic whiteboards or projection equipment. The School of Life Sciences has recently benefited from £10 million of investment to expand its teaching and research areas. Rooms may be arranged either in traditional lecture format or more informally to allow students to work together in small groups. Practical sessions are held in dedicated teaching laboratories within the School of Life Sciences, which have places for a total of 210 students. The learning resources available to students on the Programme include:

- The extensive collection of books and journals relevant to undergraduate study held in the University Library. Much of this material is also accessible online to Keele students from anywhere in the world with a University username and password.
- A smaller collection of biological publications and materials held in the Undergraduate Resource Room in the School of Life Sciences. The Resource Room is open at regular times during teaching periods and the resources are specifically related to the needs of students on Biology programmes.
- The Keele Learning Environment (KLE) which provides easy access to a wide range of learning resources including lecture notes, electronic materials available in a repository maintained by the University Library and other resources – video, audio and text-based – accessible from external providers via the internet.

Mathematics is taught in lecture theatres equipped with whiteboards and projection equipment. There is also a large computer laboratory containing state-of-the-art computers and monitors. There is also a room within the Division which exclusively for use by students for private study. The learning resources available to students on the Programme include:

- The extensive collection of books and journals relevant to undergraduate study held in the University Library. Much of this material is also accessible online to Keele students from anywhere in the world with a University username and password.
- Detailed printed notes and other paper resources supplied in certain modules.
- A smaller collection of Mathematics texts available to students held in the Division's Reading Room.
- The Keele Learning Environment (KLE) which provides easy access to a range of learning resources including some lecture notes and past examination papers, and other resources accessible from external providers via the internet.

17. Other learning opportunities

Study abroad (semester)

Students on the Natural Sciences programme have the potential opportunity to spend a semester abroad in their second year studying at one of Keele's international partner universities.

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

No additional tuition fees are payable for a single semester studying abroad but students do have to bear the costs of travelling to and from their destination university, accommodation, food and personal costs. Depending on the destination they are studying at additional costs may include visas, study permits, residence permits, and compulsory health checks. Students should expect the total costs of studying abroad to be greater than if they study in the UK, information is made available from the Global Education Team throughout the process, as costs will vary depending on destination

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

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

Study Abroad (International Year)

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

Fieldwork

Fieldwork is an essential part of a scientist's training in Biology, Earth Science, Physical Geography and Environmental Science, providing both the opportunity to acquire and practice field-based skills, to develop skills of observation and recording and to work as effective members of a team.

Keele is ideally located to be able to integrate a large component of field work into its environmental science programmes with a wide range of habitats in easy reach, including the Keele campus itself with its lake system and extensive woodlands, in addition to the mining and industrial heritage of the local area providing ideal opportunities for the study of the impact of these activities on the environment.

18. Additional costs

Biology – Field Course Costs

Students taking Biology as a core or supporting science, who choose to take module LSC-20055, will do an 8-day compulsory field course accommodated at Bangor University during the summer vacation between the first and second years. The School of Life Sciences meets the cost of this, but the student will be expected to pay for their own travel to Bangor, and maintenance costs during the field course (for example food, appropriate clothing, etc.).

Environmental Science - Field Course Costs

Students taking Environmental Science as a core science will do a compulsory field course, chosen from the range available, as part of module ESC-20079. The School of Geography, Geology and the Environment meets the travel and accommodation costs of this field course but students should note that field courses may be fully or only partly catered for, depending on the field course chosen. Others field courses are entirely self-catered and students are expected to purchase meals (e.g. lunch and/or evening meal).

All Natural Sciences students undertake an independent research project in their final year. For some students, this MAY include additional field work that is normally carried out during the summer vacation between years 2 and 3. Students are responsible for organising their own transport and accommodation as well as paying any costs incurred whilst carrying out fieldwork. These costs are extremely variable as they are dependent on the nature of a student’s project and where the student chooses to carry out their project. Costs are minimal if the project work is undertaken in the students’ local area.

IMPORTANT: Students are expected to have adequate clothing for field trips. We reserve the right to change the venues of field courses due to both cost and academic considerations.

Activity	Estimated cost
Field courses – compulsory for students taking module LSC-20055 (8-day residential field course hosted at Bangor University and paid for by the School of Life Sciences).	£0
Travel - compulsory travel to Bangor University for students taking module LSC-20055	Variable
Field courses – compulsory for students taking module ESC-20079 (week-long residential field course paid for by the School of Geography, Geology and the Environment)	£0
Field courses – compulsory for students taking module ESC-20036 (one-day field course paid for by the School of Geography, Geology and the Environment)	£0
Field courses – compulsory for students taking module ESC-20037 (one-day field course paid for by the School of Geography, Geology and the Environment)	£0
Field courses – compulsory for students taking module ESC-20084 (one-day field course paid for by the School of Geography, Geology and the Environment).	£0
Equipment - waterproof clothing and suitable footwear for field courses if taking Biology, Environmental Science or Earth Sciences as a core science.	£150
Total estimated additional costs	Variable – depends on student’s pathway through the Natural Sciences programme

These costs have been forecast by the University as accurately as possible but may be subject to change as a result of factors outside of our control (for example, increase in costs for external services). Forecast costs are

reviewed on an annual basis to ensure they remain representative. Where additional costs are in direct control of the University we will ensure increases do not exceed 5%.

As to be expected there will be additional costs for inter-library loans and potential overdue library fines, print and graduation.

We do not anticipate any further costs for this undergraduate programme.

19. Quality management and enhancement

The quality and standards of learning in Natural Sciences are subject to a continuous process of monitoring, review and enhancement.

- The Learning and Teaching Committee of the School of Chemical and Physical Sciences is responsible for reviewing and monitoring quality management and enhancement procedures and activities across the School.
- Individual modules and the Natural Sciences Programme as a whole are reviewed and enhanced every year in the annual programme review which takes place at the end of the academic year and as part of the University's Curriculum Annual Review and Development (CARD) process.
- The programmes are run in accordance with the University's Quality Assurance procedures and are subject to periodic reviews under the Internal Quality Audit (IQA) process.

Student evaluation of, and feedback on, the quality of learning on every Natural Sciences module takes place every year using a variety of different methods:

- The results of student evaluations of all modules are reported to module leaders and reviewed by the Programme Committee as part of the Curriculum Annual Review and Development (CARD) process.
- Findings related to the Natural Sciences Programmes from the annual National Student Survey (NSS), and from regular surveys of the student experience conducted by the University, are subjected to careful analysis and a planned response at programme and School level.
- Feedback received from representatives of students in all three years of the Natural Sciences Programme is considered and acted on at regular meetings of the Student Staff Voice Committee.

The University appoints senior members of academic staff from other universities to act as external examiners on all programmes. They are responsible for:

- Approving examination questions
- Confirming all marks which contribute to a student's degree
- Reviewing and giving advice on the structure and content of the programme and assessment procedures

Information about current external examiner(s) can be found here:

<http://www.keele.ac.uk/qa/externalexaminers/currentexternalexaminers/>

20. The principles of programme design

The Natural Sciences Programmes described in this document have been drawn up with reference to, and in accordance with the guidance set out in, the following documents:

- a. UK Quality Code for Higher Education, Quality Assurance Agency for Higher Education: <http://www.qaa.ac.uk/quality-code>
- b. QAA Subject Benchmark Statement: Biosciences (2015): http://www.qaa.ac.uk/docs/qaa/subject-benchmark-statements/sbs-biosciences-15.pdf?sfvrsn=4eef781_24

Chemistry (2014): http://www.qaa.ac.uk/docs/qaa/subject-benchmark-statements/sbs-chemistry-14.pdf?sfvrsn=99e1f781_10

Computing (2016): http://www.qaa.ac.uk/docs/qaa/subject-benchmark-statements/sbs-computing-16.pdf?sfvrsn=26e1f781_10

Earth Sciences, Environmental Sciences and Environmental Studies (2014):
http://www.qaa.ac.uk/docs/qaa/subject-benchmark-statements/sbs-earth-sciences-14.pdf?sfvrsn=b0e3f781_10

Geography (2014): http://www.qaa.ac.uk/docs/qaa/subject-benchmark-statements/sbs-geography-14.pdf?sfvrsn=cb9ff781_12

Mathematics, Statistics and Operational Research (2015):
http://www.qaa.ac.uk/docs/qaa/subject-benchmark-statements/sbs-mathematics-15.pdf?sfvrsn=6399f781_12

Physics, Astronomy and Astrophysics (2016):
http://www.qaa.ac.uk/docs/qaa/subject-benchmark-statements/sbs-psychology-16.pdf?sfvrsn=af95f781_8

Psychology (2016):
<http://www.qaa.ac.uk/publications/information-and-guidance/publication?PubID=3119#.WfsgxVu0OUk>

- a. Keele University Regulations and Guidance for Students and Staff: <http://www.keele.ac.uk/regulations>

21. Document Version History

Date of first approved version (v1.0): 8th December 2017

Revision history

Version number ¹	Author	Date	Summary of and rationale for changes
1.1	Adam Moolna	21.09.18	Minor module changes due to updates in subject areas: Environmental Sciences year 2 module (Environmental and Sustainability Impact Assessment and Research Planning) and a Biology year 1 module
2.1	Adam Moolna	July 2019	Change to year 2 Mathematics compulsory module: 'Computational Mathematics' replaces 'Mathematical Modelling'

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

Annex A

BSc (Hons) Natural Sciences with International Year

International Year Programme

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

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

Study at Level 4, Level 5 and Level 6 will be as per the main body of this document. The additional detail contained in this annex will pertain solely to students registered for 'BSc (Hons) Natural Sciences with International Year'.

International Year Programme Aims

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

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

Entry Requirements for the International Year

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

The criteria to be applied are:

- Academic Performance (an average of 60% across all modules at Level 5 is normally required)
- General Aptitude (to be demonstrated by application for study abroad, interview during the 2nd semester of year 2 (Level 5), and by recommendation of the student's personal tutor, 1st and 2nd year tutors and programme director)

Student Support

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

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

Learning Outcomes

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

- a. Describe, discuss and reflect upon the cultural and international differences and similarities of different learning environments
- b. Discuss the benefits and challenges of global citizenship and internationalisation
- c. Explain how their perspective on their academic discipline has been influenced by locating it within

an international setting.

In addition, students who complete 'BSc (Hons) Natural Sciences with International Year' will be able to:

- i) apply their experiences abroad to the specific Graduate Attributes associated with their Natural Sciences degree programme;
- ii) integrate, apply and develop interdisciplinary principles and perspectives to solve global-scale problems.

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

Course Regulations

Students registered for the 'BSc (Hons) Natural Sciences with International Year' are subject to the course specific regulations (if any) and the University regulations. In addition, during the International Year, the following regulations will apply:

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

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

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

Additional costs for the International Year

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

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

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

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