Course Information Document: Undergraduate

For students starting in Academic Year 2022/23

1. Course Summary

Names of programme and award title(s)	BSc (Hons) Mathematics BSc (Hons) Mathematics (Applied Mathematics) BSc (Hons) Mathematics (Pure Mathematics) BSc (Hons) Mathematics (with Statistics) BSc (Hons) Mathematics with International Year (see Annex for details) BSc (Hons) Mathematics with Work Placement Year (see Annex for details)
Award type	Single Honours
Mode of study	Full-time
Framework of Higher Education Qualification (FHEQ) level of final award	Level 6
Normal length of the programme	3 years; 4 years with either the International Year or Placement Year between years 2 and 3
Maximum period of registration	The normal length as specified above plus 3 years
Location of study	Keele Campus
Accreditation (if applicable)	The none pathway programmes are accredited by the Institute of Mathematics and its Applications (IMA)
Regulator	Office for Students (OfS)
Tuition Fees	**UK students:** Fee for 2022/23 is £9,250* **International students:** Fee for 2022/23 is £17,900** The fee for the international year abroad is calculated at 15% of the standard year fee The fee for the work placement year is calculated at 20% of the standard year fee

Please note this document applies to Level 4 and 5 students in 2022/23. Level 6 students should refer instead to the document labelled '2020/21 Entry'.

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

* 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/

** We reserve the right to increase fees in subsequent years of study by an inflationary amount. Please refer to the accompanying Student Terms & Conditions for full details. Further information on fees can be found at http://www.keele.ac.uk/studentfunding/tuitionfees/

2. What is a Single Honours programme?

The Single Honours programme described in this document allows you to focus more or less exclusively on this subject. In keeping with Keele's commitment to breadth in the curriculum, the programme also gives you the opportunity to take some modules in other disciplines and in modern foreign languages as part of a 360-credit Honours degree. Thus it enables you to gain, and be able to demonstrate, a distinctive range of graduate attributes.

3. Overview of the Programme

Mathematics is a traditional discipline with a very long history. The Programme provides a broad coverage of the three main discipline areas of pure mathematics, applied mathematics and statistics. Pure mathematics is concerned with mathematical proof (the derivation of results), logical argument and abstraction. Applied mathematics is concerned with methods and their application to modelling real-world problems. Statistics concerns mathematical modelling of uncertainty and the analysis of data. The Programme has been designed to give maximum flexibility with many options in the final year, which allows students to pick options within their broad field of interest and to study topics to some depth. In addition to subject-specific skills, the Programme also provides students with generic and employability skills.

4. Aims of the programme

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

- develop the knowledge, understanding and skills relevant to discrete and continuous mathematics, including logical argument, rigorous mathematical proof, problem solving and mathematical modelling;
- develop the knowledge, understanding and skills relevant to statistical theory, methods of data investigation, the formulation and analysis of probability-based models in order to make inferences from samples, and applications of statistics and operational research;
- explore your interest in mathematics within a caring and intellectually stimulating environment
- cultivate your appreciation of the beauty, elegance and practicality of mathematics;
- emerge as a skilled and motivated graduate who is suitably prepared for further study or for employment within or outside your field;
- gain a range of generic and employability skills, particularly in any area where precise, logical thought and problem-solving skills are valued;
- establish a foundation for life-long learning, study and enquiry in mathematics.

The BSc (Hons) Mathematics (Applied Mathematics), BSc (Hons) Mathematics (Pure Mathematics), BSc (Hons) Mathematics (with Statistics) pathways allow students to specialise in a distinctive area of mathematics by taking a range of pre-defined final year related to the specialism. This gives a visible focus to the degree for students wishing to go into particular areas of mathematics.

By following the Applied Mathematics pathway through the degree, students will study a number of specialised modules related to applied mathematics including Mathematical Biology, Waves and Fluid Mechanics.

For the Pure Mathematics pathway, the main focus is on algebraic structures, beginning with their fundamental properties and continuing to more advanced applications.

For the with Statistics pathway, students will gain a solid background in probability and statistics which will equip them with theoretical framework. This is complemented with training in statistical software and students will then be exposed to further applications in areas such as Medical Statistics and Financial Mathematics.

Students on the standard BSc Mathematics degree can take a mixture of any of the modules in the pathways described above.

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
- Intellectual skills
- Key or transferable skills (including employability skills)

Subject knowledge and understanding

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

U1   appropriate mathematical methods and techniques in the areas of calculus, algebra, differential equations, vector calculus, complex variable, abstract algebra, and probability;

U2   the use of mathematical notation;

U3   the role of logical mathematical argument and deductive reasoning, including the formal process of mathematical proof, through the study of algebra, real analysis, complex variable and optional modules;

U4   using a structured mathematical or analytical approach to problem solving;

U5   the science of data investigation and data visualisation;

U6   probability-based models, hypothesis testing, statistical inference and likelihood;

U7   the application of statistics;

U8   the power of generalisation and abstraction through the study of abstract algebra and optional modules;

U9   mathematical modelling by dedicated modules and through the study of optional modules in dynamics, fluid mechanics, waves, and mathematical biology;

U10   mathematical word processing packages and symbolic manipulation packages;

U11   the use of a specialist statistical computing package in optional modules;

U12   more specialised areas of mathematics and statistics in optional modules at Level 6.

Subject specific skills

Successful students will be able to:

S1   demonstrate knowledge of key mathematical and statistical concepts, both explicitly and by applying them to the solution of problems;

S2   comprehend problems, abstract their essentials and formulate them in symbolic form so as to facilitate their analysis and solution, and understand how mathematical and statistical processes may be applied to them;

S3   select and apply appropriate mathematical and statistical techniques;

S4   use models to analyse an underlying problem and to interpret the results of this analysis;

S5   understand the importance of assumptions made in mathematical and statistical models, be aware of when and where they are used and possible consequences of their violation;

S6   construct and develop logical mathematical arguments with clear identification of assumptions and conclusions;

S7   reason critically, carefully and logically and derive (prove) mathematical results;

S8   demonstrate facility with mathematical abstraction;

S9   demonstrate skills relating particularly to the design and conduct of experimental and observational studies and the analysis of data resulting from them;

S10   formulate and test hypotheses;

S11   use an advanced symbolic manipulation package;

S12   use an advanced statistical package in optional modules;

S13   use mathematics typesetting software such as LaTeX or Word.

Intellectual skills

Successful students will be able to:

I1   analyse and solve problems;

I2   make reasoned decisions;

I3   think carefully and logically;

I4   persist with a problem until its successful conclusion;

I5   make critical interpretations of data and text;

I6   abstract and synthesise information;

I7   develop a reasoned argument;

I8   take responsibility for their own learning and reflect upon that learning.

Key or transferable skills (including employability skills)

Successful students will be able to:

E1   develop and sustain effective approaches to learning and study, including time management, organisational skills, flexibility, creativity and intellectual integrity;

E2   acquire, analyse, synthesise, summarise and present information and ideas from a range of sources;

E3   be adaptable, in particular display a readiness to address new problems from new areas;

E4   work effectively with information technology;

E5   communicate effectively and coherently by written and spoken means using appropriate techniques;

E6   transfer knowledge from one context to another, and to approach problems analytically and to assess them logically;

E7   work comfortably with numerate concepts and arguments in all stages of work;

E8   work independently or with others to achieve an objective;

E9   motivate themselves and sustain that motivation over an extended period of time.

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:

- **Traditional lectures** where the lecturer provides students with detailed notes, very often backed up by pre-prepared notes, together with references to text books, as is the norm in the discipline
- **Tutorial Classes** that are more informal than the lectures and provide the class tutor with the opportunity to revise and enforce core ideas and to provide students with more worked examples. It is also often the opportunity for students to try problems themselves and to discuss solutions with their peers, under the supervision of the tutor, who provides immediate feedback
- **Practical sessions** in the computer laboratories, in which students use the PCs interactively and are provided with feedback by the computer and the tutor
- **Independent study** based on processing lecture notes and reading text books, together with attempting regular coursework assignments

- **Web-based learning** using the University's virtual learning environment (KLE). The KLE is used to give students easy access to a wide range of resources, and as a platform for online discussions
- For those students who take the **project module** in their final year, the opportunity to undertake a piece of independent study supervised and supported by a member of staff

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

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

- Lectures and independent study allow students to gain knowledge and understanding of the three broad areas of mathematics.
- Tutorial Classes provide opportunities for students to ask questions about, and suggest answers to mathematical problems, and to present their own ideas to members of staff and other students using an appropriate medium of communication.
- Independent study, in particular, the regular coursework assignments, encourages students to reflect on their own learning and take responsibility for its development by addressing areas of difficulty, perhaps by discussing them with their fellow students or by getting additional help from a member of staff.
- Undertaking a project with the support of an experienced researcher allows students to formulate relevant research questions and devise a feasible strategy to answer them.

7. Teaching Staff

The Mathematics academic staff comprises of a number of Professors, Senior Lecturers, Lecturers and Teaching Fellows. Most members of staff are active in research. A number of members of the Mathematics Division hold teaching qualifications. Currently, several staff members are Fellows of the Higher Education Academy.

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

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

8. What is the structure of the Programme?

The academic year runs from September to June and is divided into two semesters. The number of weeks of teaching will vary from course to course, but you can generally expect to attend scheduled teaching sessions between the end of September and mid-December, and from mid-January to the end of April. Our degree courses are organised into modules. Each module is usually a self-contained unit of study and each is usually assessed separately with the award of credits on the basis of 1 credit = 10 hours of student effort. An outline of the structure of the programme is provided in the tables below.

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

- Compulsory modules - a module that you are required to study on this course;
- Optional modules - these allow you some limited choice of what to study from a list of modules;
- Elective modules (Global Challenge Pathways at Level 4) - a choice of modules from different subject areas within the University that count towards the overall credit requirement but not the number of subject-related credits.

A summary of the credit requirements per year is as follows, with a minimum of 105 subject credits (compulsory plus optional) required for each year.

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

Year	Compulsory	Optional		Electives	
		Min	Max	Min	Max
Level 4	105	0	15	0	15
Level 5	105	0	15	0	15
Level 6	0	105	120	0	15

Module Lists

Level 4

At Level 4, students take 105 credits of compulsory modules. The remaining 15 credits may either be used to take a Global Challenge Pathway, a language module or an optional module listed below.

Compulsory modules	Module Code	Credits	Period
Mathematical Methods	MAT-10043	15	Semester 1
Calculus	MAT-10046	30	Semester 1-2
Algebra	MAT-10047	30	Semester 1-2
Investigations and Problem Solving	MAT-10049	30	Semester 1-2

Optional modules	Module Code	Credits	Period
Applied Mathematics	MAT-10051	15	Semester 2
Statistics	MAT-10053	15	Semester 2

Additional optional modules: Languages and English for Academic Purposes

Students on this programme will also be able to study language modules offered by the Language Centre, either as part of a Global Challenge Pathway or as optional modules, and may be able to achieve an enhanced degree title with the designation 'With (advanced) Competency in [language]', depending on the level of language attainment they achieve at Keele. For full details of how language modules can be accommodated within your programme of study, click https://www.keele.ac.uk/study/languagecentre/modernlanguages/enhanceddegreetitles/

Students who are required to take an English for Academic Purposes (EAP) module as a result of their language competency test result will be required to pick this as their first option choice. *NB:* students can take an EAP module only with the approval of the English Language Programme Director and are not able to take any other Language module in the same academic year.

Global Challenge Pathways (GCPs) - Level 4 (year 1) students only

Students at Level 4 in 2022/23 have the option of taking a Global Challenge Pathway, which includes one 15-credit module in each year of the degree. Global Challenge Pathways offer students the chance to fulfil an exciting, engaging route of interdisciplinary study. Choosing a pathway, students will be presented with a global issue or 'challenge' which directly relates to societal issues, needs and debates. They will be invited to take part in academic and external facing projects which address these issues, within an interdisciplinary community of students and staff. Students completing a Global Challenge Pathway will receive recognition on their degree certificate.

Digital Futures	The Digital Futures pathway offers you the opportunity to become an active contributor to current debates, cutting-edge research, and projects with external partners, addressing both the exciting potential and the challenges of disruptive digital transformation across all spheres of life. Part of a diverse and interdisciplinary pathway community, you will engage in exciting, impactful collaborative project work in innovative formats. Engaged in real-world scenarios, you will use digital technology and creativity to promote inclusive, empowering, and sustainable change at local and global levels. **Module**: **A digital life: challenges and opportunities (GCP-10005)**
Climate Change & Sustainability	Through the Climate Change & Sustainability pathway you will develop the skills, understanding and drive to become agents of change to tackle climate change and wider sustainability challenges. You will work with international partners to explore climate change and sustainability in different international contexts; lead your own projects to drive real change in your communities; and be part of educating others to help achieve a more sustainable future. **Module**: **Climate Change & Sustainable Futures: Global Perspectives (GCP-10009)**
Social Justice	Students on this pathway will embark on a reflective journey drawing upon decolonising, feminist, and ethical perspectives on social justice, forging transformative outputs as agents of change. You will enter a dialogue with local, national, and international partners from Universities, NGOs, International Human Rights Committees. You will engage with key societal challenges, for example Covid 19 as a social crisis with impact on gender and racial identities. The pathway will allow you to monitor and critically evaluate policies and human rights treaties, and produce and disseminate digitally fluent, international and sustainable project findings. **Module**: **Reflections on Social Injustices, Past and Present (GCP-10003)**
Enterprise & the Future of Work	If we are to achieve the promise of Sustainable Development Goals, solve the climate crisis and take advantage of the changes that the digital revolution provide, we need to understand the power of enterprise and prepare for future contexts of work, creativity and disruption. Supporting you to be part of future-facing solutions, this pathway will give you the ability to make judgements on the utilisation of resources, labour and capital. It will support you in developing creative, original thinking, allowing you to collaborate on projects that persuade and effect change, setting you up to thrive in future environments of work and innovation. **Module**: **Enterprise and the Future of Work 1 (GCP-10007)**
Global Health Challenges	By taking the global health challenge pathway you will develop solutions to improve the health and quality of life for particular people and communities, engaging with these groups to co-design interventions. This pathway will provide you with skills that go beyond a focus on health and will allow you to develop your ability to work in a team and lead change in society. The knowledge, skills and work experience will complement your core degree and enhance your career opportunities and graduate aspirations. **Module**: **Key concepts and challenges in global health (GCP-10001)**

| Languages & Intercultural Awareness | By choosing modules from this pathway, will develop a practical knowledge of a specific language, allowing you to graduate with an enhanced degree title, or develop skills to teach English as a Foreign Language. You will meet and communicate with speakers different linguistic and cultural communities, ranging from students at partner universities in Japan and China, to refugees in Hanley, and develop an understanding of how languages and cultures interact.

This pathway explores the power of language as a force both for breaking down and building cultural and political barriers - words can be weapons as well as bridges. You will examine how language is used, examine linguistic choices and how these impact on intercultural understanding. Throughout the pathway we also examine the practice of communication across cultural contexts, exploring cultural differences such as the language of ethnicity and gender.

Modules: **you will be able to select from either a Modern Language of your choice OR Certificate in TESOL Level 1.** |
|---|---|

Level 5

Compulsory modules	Module Code	Credits	Period
Differential Equations	MAT-20008	15	Semester 1
Probability	MAT-20023	15	Semester 1
Computational Mathematics	MAT-20031	15	Semester 1
Exploring Algebra and Analysis	MAT-20035	15	Semester 1
Complex Variable I and Vector Calculus	MAT-20004	15	Semester 2
Abstract Algebra	MAT-20025	15	Semester 2
Professional Mathematics and Data Science	MAT-20037	15	Semester 2

Optional modules	Module Code	Credits	Period
Dynamics	MAT-20005	15	Semester 2
Linear Statistical Models	MAT-20027	15	Semester 2
Analysis II	MAT-20029	15	Semester 2

Level 6

Optional modules	Module Code	Credits	Period
Non-linear Differential Equations	MAT-30002	15	Semester 1
Partial Differential Equations	MAT-30003	15	Semester 1
Group Theory	MAT-30013	15	Semester 1
Number Theory and Cryptography	MAT-30038	15	Semester 1
Financial Mathematics	MAT-30039	15	Semester 1
Project II - ISP	MAT-30016	15	Semester 1-2
Project (30 credits)	MAT-30043	30	Semester 1-2
Fluid Mechanics	MAT-30004	15	Semester 2
Complex Variable II	MAT-30010	15	Semester 2
Waves	MAT-30011	15	Semester 2
Medical Statistics	MAT-30014	15	Semester 2
Mathematical Biology	MAT-30023	15	Semester 2
Linear Algebra and Rings	MAT-30045	15	Semester 2
Introduction to Linear Elasticity	MAT-30047	15	Semester 2
Mathematical Modelling	MAT-30051	15	Semester 2

For the pathway degrees, there are a set of compulsory modules that must be taken at Level 6 to obtain that specific degree title. Levels 4 and 5 are identical to the BSc (Hons) Mathematics.

BSc (Hons) Mathematics (Applied Mathematics)

Year	Compulsory	Optional		Electives	
		Min	Max	Min	Max
Level 6	30	75	90	0	15

Module Lists

Level 6

Compulsory modules	Module Code	Credits	Period
Non-linear Differential Equations	MAT-30002	15	Semester 1
Partial Differential Equations	MAT-30003	15	Semester 1
Optional modules	**Module Code**	**Credits**	**Period**
Group Theory	MAT-30013	15	Semester 1
Number Theory and Cryptography	MAT-30038	15	Semester 1
Financial Mathematics	MAT-30039	15	Semester 1
Project II - ISP	MAT-30016	15	Semester 1-2
Project (30 credits)	MAT-30043	30	Semester 1-2
Fluid Mechanics	MAT-30004	15	Semester 2
Complex Variable II	MAT-30010	15	Semester 2
Waves	MAT-30011	15	Semester 2
Medical Statistics	MAT-30014	15	Semester 2
Mathematical Biology	MAT-30023	15	Semester 2
Linear Algebra and Rings	MAT-30045	15	Semester 2
Introduction to Linear Elasticity	MAT-30047	15	Semester 2
Mathematical Modelling	MAT-30051	15	Semester 2

BSc (Hons) Mathematics (Pure Mathematics)

Year	Compulsory	Optional		Electives	
		Min	Max	Min	Max
Level 6	30	75	90	0	15

Module Lists

Level 6

Compulsory modules	Module Code	Credits	Period
Group Theory	MAT-30013	15	Semester 1
Number Theory and Cryptography	MAT-30038	15	Semester 1
Optional modules	**Module Code**	**Credits**	**Period**
Non-linear Differential Equations	MAT-30002	15	Semester 1
Partial Differential Equations	MAT-30003	15	Semester 1
Financial Mathematics	MAT-30039	15	Semester 1
Project II - ISP	MAT-30016	15	Semester 1-2
Project (30 credits)	MAT-30043	30	Semester 1-2
Fluid Mechanics	MAT-30004	15	Semester 2
Complex Variable II	MAT-30010	15	Semester 2
Waves	MAT-30011	15	Semester 2
Medical Statistics	MAT-30014	15	Semester 2
Mathematical Biology	MAT-30023	15	Semester 2
Linear Algebra and Rings	MAT-30045	15	Semester 2
Introduction to Linear Elasticity	MAT-30047	15	Semester 2
Mathematical Modelling	MAT-30051	15	Semester 2

BSc (Hons) Mathematics (with Statistics)

Year	Compulsory	Optional		Electives	
		Min	**Max**	**Min**	**Max**
Level 6	30	75	90	0	15

Module Lists

Level 6

Compulsory modules	Module Code	Credits	Period
Financial Mathematics	MAT-30039	15	Semester 1
Medical Statistics	MAT-30014	15	Semester 2
Optional modules	**Module Code**	**Credits**	**Period**
Group Theory	MAT-30013	15	Semester 1
Number Theory and Cryptography	MAT-30038	15	Semester 1
Non-linear Differential Equations	MAT-30002	15	Semester 1
Partial Differential Equations	MAT-30003	15	Semester 1
Project II - ISP	MAT-30016	15	Semester 1-2
Project (30 credits)	MAT-30043	30	Semester 1-2
Fluid Mechanics	MAT-30004	15	Semester 2
Complex Variable II	MAT-30010	15	Semester 2
Waves	MAT-30011	15	Semester 2
Mathematical Biology	MAT-30023	15	Semester 2
Linear Algebra and Rings	MAT-30045	15	Semester 2
Introduction to Linear Elasticity	MAT-30047	15	Semester 2
Mathematical Modelling	MAT-30051	15	Semester 2

9. Final and intermediate awards

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

Honours Degree	360 credits	You will require at least 120 credits at levels 4, 5 and 6 You must accumulate at least 315 credits in Mathematics (out of 360 credits overall) to graduate with a named single honours degree in this subject.
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

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

Work Placement Year option: in addition to the above students must pass a non-credit bearing module covering the work placement year in order to graduate with a named degree including the 'with Work Placement Year' wording. Students who do not complete, or fail the work placement year, will be transferred to the three-year version of the programme.

10. How is the Programme Assessed?

The wide variety of assessment methods used on this programme 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 on your programme:

- **Unseen examinations:** test a student's knowledge and understanding of mathematics. They are the usual, primary mode of assessment in mathematics programmes across the HE sector. Such examinations are of two hours in length and all questions are compulsory. Many taught modules in Levels 4 to 6 have unseen examinations as part of the assessment profile.
- **Class tests:** these are taken during the course of a module, usually in a lecture slot. They are intended to assess a student's current understanding and subject knowledge in that module in a structured and focused manner. Many taught modules in Levels 4 to 6 have class tests as part of the assessment profile.
- **Coursework:**normally consists of regular short assignments designed to assess, in more depth than class tests, a student's knowledge and understanding of the course material. Some of these assignments may be computer-based and some may take the form of short reports.
- **Short reports:** for which students are required to write up their own account of small group studies and discussions on particular topics.
- **Project Reports:** are formal summaries of the work done by a student undertaking a project. Where the project is the review of an area of mathematics the report tests the student's ability to evaluate the material and identify and summarise the key points. Statistics projects often involve the analysis of real-world data and the report will test the student's ability to make critical judgements concerning the appropriateness of different strategies for the collection and analysis of such data. For projects involving mathematical modelling the report tests the student's ability to construct appropriate models, make realistic simplifying assumptions, and use the model effectively to analyse the problem.
- **Video presentations:** where students produce an informative video presentation suitable for a general audience which explains their project, its purpose and the outcomes. These videos are presented to the class and can be live, animated, or a combination of both.
- **Oral presentations:** assess a student's ability to communicate their knowledge and understanding, both visually and orally, to both general and academic audiences.

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

	Scheduled learning and teaching activities	**Guided independent Study**	**Placements**
Year 1 (Level 4)	31%	69%	0%
Year 2 (Level 5)	33%	67%	0%
Year 3 (Level 6)	24%	76%	0%

12. Accreditation

All three programmes are accredited by the Institute of Mathematics and its Applications (IMA)

13. University 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/

If this programme has any exemptions, variations or additions to the University Regulations these will be detailed in an Annex at the end of this document titled 'Programme-specific regulations'.

14. Other Learning Opportunities

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 in the Annex for the International Year.

Work Placement Year

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

15. Additional Costs

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 programme.

16. Annex - International Year

Mathematics with International Year

International Year Programme
Students registered for this Single Honours programme may either be admitted for or apply to transfer during their period of study at Level 5 to the International Year option. Students accepted onto this option 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 Year 2 (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 standard programme 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 the International Year option.
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 55% across all modules at Level 5 is required. Students with up to 15 credits of re-assessment who meet the 55% requirement may progress to the International Year. Where no Semester 1 marks have been awarded performance in 1st year marks and ongoing 2nd year assessments are taken into account)
- 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)

Any failed Level 5 modules without good cause will result in the student being prohibited from transferring to the 4-year BSc Mathematics with International Year programme.

Students may not register for both an International Year and a Placement Year.

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:

1. describe, discuss and reflect upon the cultural and international differences and similarities of different learning environments;
2. discuss the benefits and challenges of global citizenship and internationalisation;
3. explain how their perspective on their academic discipline has been influenced by locating it within an international setting;
4. communicate effectively in an international setting;
5. reflect on previous learning within an international context.

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.

Regulations

Students registered for the International Year are subject to the programme-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 two thirds* mathematics topics.

This may impact on the choice of modules to study. For example: students will have to choose certain modules to ensure you have the discipline specific credits required.

Students are barred from studying any module with significant overlap to the Level 6 modules they will study 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 who meet external eligibility criteria 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.

17. Annex - Work Placement Year

Mathematics with Work Placement Year

Work Placement Year summary
Students registered for this programme may either be admitted for or apply to transfer during their studies to the 'with Work Placement Year' option (NB: for Combined Honours students the rules relating to the work placement year in the subject where the placement is organised are to be followed). Students accepted onto this programme will have an extra year of study (the Work Placement Year) with a relevant placement provider after they have completed Year 2 (Level 5) at Keele. To proceed to the Placement Year, students must normally achieve an average of 55% across all Level 4 and 5 modules and undergo an interview with the Programme Director or the Academic Tutor for the Work Placement Year. If students do not meet these requirements they will revert back to the Single Honours Mathematics Programme. Students who successfully complete both the second year (Level 5) and the Work Placement Year will be permitted to progress to Level 6. Students who fail to satisfactorily complete the Work Placement Year will normally revert to the 3-year programme 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 the Work Placement Year option.
Work Placement Year Programme Aims
In addition to the programme aims specified in the main body of this document, the Work Placement Year aims to provide students with: 1. Substantial experience of work with a relevant placement provider, including familiarisation with the professional working environment; 2. the opportunity to apply academic theory learned as part of their taught degree to real situations in the work place, and to expand their employability skills.
Entry Requirements for the Work Placement Year

Admission to the Work Placement Year is subject to successful application, interview and references from appropriate staff. Students have the opportunity to apply directly for the 4-year 'with work placement year' degree programme, or to transfer onto the 4-year programme at the end of Year-1 and in Year-2 at the end of Semester 1. Students who are initially registered for the 4-year degree programme may transfer onto the 3-year degree programme at any point in time, prior to undertaking the year-long work placement. Students who fail to pass the work placement year, and those who fail to meet the minimum requirements of the work placement year module (minimum 30 weeks full time (1,050 hours), or equivalent, work placement), will be automatically transferred onto the 3-year degree programme.

The criteria to be applied are:

- A good University attendance record and be in 'good academic standing'.
- Passed all Year-1 and Year-2 Semester 1 modules with an overall module average of 55% or higher.
- General Aptitude (to be demonstrated by the application(s) to relevant placement providers with prior agreement from the Programme Director or the Academic Tutor for the Work Placement Year, interview during the 2nd semester of Year 2 (Level 5), and by recommendation of the student's personal tutor and as necessary, other staff members).
- Students undertaking work placements will be expected to complete a Health and Safety checklist prior to commencing their work experience and will be required to satisfy the Health and Safety regulations of the company or organisation at which they are based.
- Students must have met the progression requirements to proceed to their final year of study prior to commencing a work placement. Failure to complete reassessment work in the summer reassessment period due to a work placement position will not be classed as exceptional circumstances.
- *(International students only)* Due to visa requirements, it is not possible for international students who require a Tier 4 Visa to apply for direct entry onto the 4-year with Work Placement Year degree programme. Students wishing to transfer onto this programme should discuss this with student support, the academic tutor for the work placement year, and the Programme Lead. Students should be aware that there are visa implications for this transfer, and it is the student's responsibility to complete any and all necessary processes to be eligible for this programme. There may be additional costs, including applying for a new Visa from outside of the UK for international students associated with a transfer to the work placement programme.

Students may not register for both an International Year and a Work Placement Year.

Student Support

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

- Regular contact between the student and a named member of staff who will be assigned to the student as their University supervisor. The University supervisor will be in regular contact with the student throughout the year, and be on hand to provide advice (pastoral or academic) and liaise with the Placement supervisor on the student's behalf if required.
- Two formal contacts with the student during the placement year: the University supervisor will visit the student in their placement organisation at around the 5 weeks afters placement has commenced, and then visit again (or conduct a telephone/video call tutorial) at around 15 weeks into the placement.
- Weekly supervision sessions will take place with the placement supervisor (or his/her nominee) throughout the duration of the placement.

Learning Outcomes

In addition to the learning outcomes specified in the main text of the Programme Specification, students who complete the 'with Work Placement Year' option will be able to:

1. evaluate their own employability skills (via a SWOT analysis);
2. create Intended Learning Outcomes for their placement in order to develop the skills areas which they have identified as needing further enhancement;
3. develop, through practice in the work place, the work-related skills identified through their SWOT analysis and Intended Learning Outcomes;
4. apply academic theory learned as part of their taught degree to real situations in the work place;
5. reflect on their work placement activities and evaluate their impact on their own employability skills;
6. explain how the sector of the placement operates and identify the skills required to pursue careers within the sector.

These learning outcomes will be assessed through the non-credit bearing Work Placement Year module (MAT-30035) which involves:

1. the submission of a SWOT analysis and action plan and an evaluation of the student's performance based on the placement supervisor's initial report;
2. the submission of a monthly reflective diary to the University supervisor and an evaluation of the student's performance based on the placement supervisor's final report;
3. a presentation about their placement experience to an audience of other students coming off placement and those about to go out on placement. The audience is also likely to contain the University supervisor and other staff from Mathematics;

Regulations

Students registered for the 'with Work Placement Year' option are subject to programme-specific regulations (if any) and the University regulations. In addition, during the Work Placement Year, the following regulations will apply:

1. Students undertaking the Work Placement Year must successfully complete the zero-credit rated 'Work Placement Year' module (MAT-30035)
2. Students must pass Assessment 1 (mid-placement portfolio) with a mark of 40% in order to continue with their work placement and pass the Work Placement Year module. Students will not be permitted to take reassessment of this component of the module.
3. Students failing Assessment 1 at first attempt will be required to withdraw from the Work Placement Year module and will be transferred onto the 3-year degree programme.
4. Students will be permitted to take reassessment of Assessment 2 (Final Placement Portfolio) and Assessment 3 (Oral Presentation), as appropriate. Students are not permitted to repeat the Work Placement Year.

Students will be expected to behave professionally in terms of:

(i) conforming to the work practices of the organisation; and

(ii) remembering that they are representatives of the University and their actions will reflect on the School and have an impact on that organisation's willingness (or otherwise) to remain engaged with the placement.

Additional costs for the Work Placement Year

Tuition fees for students on the Work Placement Year will be charged at 20% of the annual tuition fees for that year of study, as set out in Section 1. The Work Placement 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 placement provider, accommodation, food and personal costs. Depending on the placement provider additional costs may include parking permits, travel and transport, suitable clothing, DBS checks, and compulsory health checks.

A small stipend may be available to students from the placement provider during the placement but this will need to be explored on a placement-by-placement basis as some organisations, such as charities, may not have any extra money available. Students should budget with the assumption that their placement will be unpaid.

Eligibility for student finance will depend on the type of placement and whether it is paid or not. If it is paid, this is likely to affect student finance eligibility, however if it is voluntary and therefore unpaid, should not affect student finance eligibility. Students are required to confirm eligibility with their student finance provider.

International students who require a Tier 4 visa should check with the Immigration Compliance team prior to commencing any type of paid placement to ensure that they are not contravening their visa requirements.

18. Annex - Programme-specific regulations

Programme Regulations: Mathematics

Final Award and Award Titles	BSc (Hons) Mathematics BSc (Hons) Mathematics with International Year BSc (Hons) Mathematics with Work Placement Year
Intermediate Award(s)	Diploma in Higher Education Certificate in Higher Education
Last modified	December 2020
Programme Specification	https://www.keele.ac.uk/qa/programmespecifications

The University's Academic Regulations which can be found on the Keele University website (https://www.keele.ac.uk/regulations/)[1] apply to and regulate the programme, other than in instances where the specific programme regulations listed below over-ride them. These programme regulations list:

- *Exemptions* which are characterised by the omission of the relevant regulation.
- *Variations* which are characterised by the replacement of part of the regulation with alternative wording.
- *Additional Requirements* which set out what additional rules that apply to students in relation to this programme.

The following **exemptions, variations** and **additional requirements** to the University regulations have been checked by Academic Services and have been approved by the Faculty Education Committee.

A) EXEMPTIONS

The clause(s) listed below describe where an exemption from the University's Academic Regulations exists:

For the whole duration of their studies, students on this Programme are exempt from the following regulations:

- **No exemptions apply.**

B) VARIATIONS

The clause(s) listed below describe where a variation from the University's Academic Regulations exists:

Variation 1: Transfer onto the MMath programme

This programme varies from Regulation C6, paragraph 2.1, which states the rules governing admission onto an Integrated Masters programme. This regulation will apply to the MMath Mathematics Programme with the following exceptions to the progression requirements in section 10.1:

1. In section 10.1, disregard 10.1.(b);
2. In section 10.2 replace 'Lower Second Class' with 'Upper Second Class'.

Single Honours BSc Mathematics students will be permitted to transfer onto the MMath Programme at any point up to the end of the first semester of Level 6, subject to having met any relevant progression criteria and, in any event, only with the approval of the Programme Director.

Variation 2: Degree Award

1. In addition to module condonement, Mathematics also applies module compensation at Levels 5 and 6. This allows for, in exceptional circumstance, the granting by the Mathematics Examination Board of full credits for a module in which the student has scored less than 29%.
2. Compensation is entirely at the discretion of the Mathematics Exam Board. At Level 5, normally the Mathematics Exam Board will not compensate 15 credits where another Level 5 15 credit module is failed between 30 and 38.

[1] References to University Regulations in this document apply to the content of the University's Regulatory Framework as set out on the University website here https://www.keele.ac.uk/regulations/.

Version History

This document

Date Approved: 13 May 2022

Previous documents

Version No	Year	Owner	Date Approved	Summary of and rationale for changes
1.1	2021/22	PAUL TRUMAN	24 March 2021	Added MAT-30051 Mathematical Modelling as a Level 6 optional module.
1	2021/22	EDWARD DE QUINCEY	08 February 2021	
2.3	2020/21	PAUL TRUMAN	31 January 2022	No changes
2.2	2020/21	PAUL TRUMAN	24 March 2021	Added MAT-30051 Mathematical Modelling as a Level 6 optional module.
2.1	2020/21	PAUL TRUMAN	08 February 2021	Changes to Level 6 optional modules: MAT-30001 Graph Theory moved from semester 2 to semester 1. MAT-30047 Introduction to linear elasticity added.

Version No	Year	Owner	Date Approved	Summary of and rationale for changes
2	2020/21	PAUL TRUMAN	08 December 2020	Minor update to Programme Specific Regulations (Variation 1): deadline for transfer from the SH programme to the MMath changed from the end of level 5 to the end of the first semester of level 6.
1	2020/21	PAUL TRUMAN	19 December 2019	
3.2	2019/20	PAUL TRUMAN	24 March 2021	Added MAT-30051 Mathematical Modelling as a Level 6 optional module.
3.1	2019/20	PAUL TRUMAN	08 February 2021	Changes to Level 6 optional modules: MAT-30001 Graph Theory moved from semester 2 to semester 1. MAT-30047 Introduction to linear elasticity added. MAT-30030 Metric and Topological Spaces Removed MAT-30033 Applied Time Series Removed
3	2019/20	PAUL TRUMAN	08 December 2020	Minor update to Programme Specific Regulations (Variation 1): deadline for transfer from the SH programme to the MMath changed from the end of level 5 to the end of the first semester of level 6.
2	2019/20	SARAH ROBERTS	02 June 2020	Changes to modules with 'Mathematical Modelling' removed as a compulsory module and 'Professional Mathematics and Data Science' added as an optional module at Level 5, and optional module changes at Level 6.
1	2019/20	PAUL TRUMAN	19 December 2019	