Programme Specification for BSc (Hons) Mathematics

This document applies to students who commence the programme in or after September 2017

1.	**Awarding institution/body**	University of Worcester
2.	**Teaching institution**	University of Worcester
3.	**Programme accredited by**	The Single Honours Mathematics degree has been accredited by the IMA (Institute of Mathematics and its Applications www.ima.org.uk).
4.	**Final award**	BSc (Hons)
5.	**Programme title**	Mathematics
6.	**Pathways available**	Single, Joint, Major, Minor
7.	**Mode and/or site of delivery**	Standard taught programme, onsite at University of Worcester
8.	**Mode of attendance**	Full-time and part-time study
9.	**UCAS Code**	Mathematics G100, Biology and Mathematics CG11, Computing and Mathematics GI11, Education Studies and Mathematics GX13, Geography and Mathematics FX83, Physical Education and Mathematics GX15, Psychology and Mathematics GC18.
10.	**Subject Benchmark statement and/or professional body statement**	2015 QAA Subject benchmark statement for Mathematics, Statistics and Operational Research
11.	**Date of Programme Specification preparation/ revision**	January 2016 January 2017 addition of MATH3111. January 2017 removal of MATH3104, MATH3105, MATH3107, MATH3108, MATH3110 August 2017 - AQU amendments January 2018 – confirmation of modules

12. Educational aims of the programme

Mathematics is available as a Single Honours course or via one of six designated Joint Honours courses (Major or Minor pathways are also available). These provide a modern practice-based course in mathematics and statistics, which develops the logical and analytical problem solving skills required for the practical application of a range of mathematics and statistics methods and modelling techniques, using of a range of modern software. They include significant components of statistics, mathematical modelling and the development of problem solving skills. The Joint Honours courses include (but are not limited to) examples of problems which may be experienced in students' other Joint Honours subject, whilst the Single Honours course extends the breadth and depth of the mathematical topics explored, both from a practical and theoretical perspective.

In particular the courses aim to:

- develop the skills and knowledge relating to the practical application of mathematics and statistics, when applied to solving real problems or analysing real data sets in a typical work or research related environment using modern software that will enhance students' employability opportunities;

- offer a stimulating curriculum that provides a sound theoretical foundation in a number of areas of mathematics and statistics, and to provide an opportunity to study a range of mathematical and statistical methods and techniques appropriate for a mathematics graduate;

- develop intellectual abilities in abstract reasoning, logical deduction, logical argument and problem solving;

- enable students to develop a range of subject-specific skills and knowledge and transferable skills to prepare them for the many and varied areas of employment relevant to graduates in mathematics, or for postgraduate study or research;

- offer a curriculum that allows flexible choice to study additional advanced topics in mathematics and/or statistics that are relevant to their interests and career aspirations.

The intended learning outcomes of the programme and associated examples of the learning, teaching and assessment methods used to achieve these are detailed below.

13. Intended learning outcomes and learning, teaching and assessment methods

Knowledge and understanding:
On successful completion of the course, students will be able to:

Award	Learning Outcome	Module Codes
Single, Joint, Major, Minor	K1: Demonstrate a detailed conceptual knowledge and understanding of areas of mathematical and statistical methods appropriate for a mathematics graduate.	*All Level 5 and 6 MATH modules*
Single, Joint, Major, Minor	K2: Identify and describe a range of mathematical and statistical methods, models and techniques, and explain how to apply them to solve real problems and analyse real data sets.	*All Level 5 and 6 MATH modules*
Single, Joint, Major, Minor	K3: Select and apply a range of mathematical and statistical computing software, and interpret the results of a range of mathematical and statistical analyses.	*All Level 5 and 6 MATH modules**

** MATH3101/3102 may or may not address this LO depending on the nature of the student's project*

Examples of learning, teaching and assessment methods used:

- the programme develops both the theoretical and practical aspects in a sequential nature, building on layers of understanding and skill development over time;
- the development of theoretical knowledge and understanding is, for most modules, achieved via a regular programme of lectures, seminars and problem solving classes, which will include student interaction, discussion and will often include student-led presentations;
- practical skills will be developed by guided PC lab-based sessions at Level 4 and more open-ended PC lab-based investigations at Levels 5 and 6;
- support is provided by interactive learning resources available on the virtual learning environment, through guided private study throughout the programme and via academic tutors particularly at Level 4 in relation to reviewing students' portfolio progress;
- assessment is by a variety of means, including individual and group-based projects, oral presentations, poster presentations, PC lab-based assessment tasks and end of module examinations, which are all supported by regular formative feedback.

Cognitive and intellectual skills:
On successful completion of the course, students will be able to:

Award	Learning Outcome	Module Codes
Single, Joint, Major, Minor	C1: Demonstrate skills in abstract reasoning, logical deduction, logical argument and problem solving.	*All Level 5 and 6 MATH modules*
Single, Joint, Major, Minor	C2: Comprehend problems and formulate them mathematically in order to develop mathematical and/or statistical models or analyses and demonstrate how and when they can be applied.	*MATH2102, MATH2103, MATH3101/3102*, MATH3105, MATH3106, MATH3107, MATH3108, MATH3109, MATH3110*
Single, Joint, Major (not Minor)	C3: Identify the limitations of any models or analyses employed, as well as being able to describe the assumptions on which they are based and the possible consequences of their violation.	*MATH2102, MATH2103, MATH3101/3102*, MATH3105, MATH3106, MATH3107, MATH3108, MATH3109, MATH3110*
Single, Joint, Major (not Minor)	C4: Evaluate the appropriateness of any software used for the mathematical or statistical problems being addressed.	*MATH2102, MATH2103, MATH3101/3102*, MATH3105, MATH3106, MATH3107, MATH3108, MATH3109, MATH3110*

** MATH3101/3102 may or may not address this LO depending on the nature of the student's project*

Examples of learning, teaching and assessment methods used:

- in order to allow sufficient time to develop students' cognitive and intellectual skills, the programme has been designed so that students have 4-hours of contact per week for each module (for 24 weeks for a 30 credit module or 12 weeks for a 15 credit module);
- arguments will be developed in lectures and seminars in specific contexts, which will then be supported by smaller group activities such as working on paper based problems and PC lab-based activities to allow students to work on problem-solving activities;
- the lectures, seminars and problem solving classes are complemented, for most modules, with practical PC lab-based sessions to develop the practical application of the methods being studied and to develop the skills in formulating and developing mathematical and statistical models which is a key theme of the programme;
- smaller more well-defined problems are considered at Level 4, progressing to larger less-well defined problems in less familiar contexts at both Levels 5 and 6;
- peer support will be encouraged to foster a community ethos on the course, through both informal contacts and also peer feedback within the context of student-led seminar presentations.

Practical skills relevant to employment:
On successful completion of the course, students will be able to:

Award	Learning Outcome	Module Codes
Single, Joint, Major, Minor	P1: Demonstrate highly developed skills in numeracy and be comfortable with numerate concepts and arguments.	*All Level 5 and 6 MATH modules*
Single, Joint, Major, Minor	P2: Assess problems logically, approach them analytically and be able to apply their skills and knowledge to new unfamiliar problems.	*All Level 5 and 6 MATH modules*
Single, Joint, Major, Minor	P3: Demonstrate skills and expertise in the use of a range of modern software relevant to the	*MATH2102, MATH2103,*

	practical application of mathematics and statistics.	*MATH3105, MATH3106, MATH3107, MATH3108, MATH3109, MATH3110*
Single, Joint, Major, Minor	P4: Be aware of, and sensitive to, the ethical or legal issues relating to the collection and management of data.	*MATH2103, MATH3101/3102*, MATH3107, MATH3108*

** MATH3101/3102 may or may not address this LO depending on the nature of the student's project*

Examples of learning, teaching and assessment methods used:

- most modules will have PC lab-based sessions where the use of modern software will be practiced extensively;
- software to be used will include, for example, Matlab, Maple, R, and SPSS; as well as software commonly found in the workplace such as Excel, Word and Powerpoint;
- a Level 4 module dedicated to computational mathematics will explore the practical application of algorithms and numerical methods to solve real problems and develop programming skills;
- Single Honours students must study the Level 6 Mathematics Project to further develop their practical skills in this respect; students following the Major or Joint pathways must study the Level 6 Mathematics Project or an equivalent independent study;
- expert speakers from industry, as well as other academic staff from outside of mathematics at the university with contextual expertise, have agreed to offer seminar talks of relevance to the practical application of their knowledge and skills.

Transferable/key skills:

On successful completion of the course, students will be able to:

Award	Learning Outcome	Module Codes
Single, Joint, Major, Minor	T1: Communicate effectively both orally and in writing, in order to formulate, solve and report their solution to problems and analyses to both technical and non-technical audiences.	*All Level 5 and 6 MATH modules*
Single, Joint, Major, Minor	T2: Work effectively as a member of a team.	*MATH2102 ,MATH2103*
Single, Joint, Major, Minor	T3: Utilise time management and organisational skills including meeting deadlines, prioritising tasks and organising schedules.	*All Level 5 and 6 MATH modules*

Examples of learning, teaching and assessment methods used:

- the student induction process aims to introduce students to several aspects of learning and study, for example time management related to assignment hand-in dates and working as a team;
- the programme contains a range of approaches to learning, teaching and assessment, designed to encourage students to learn both as individuals and as a member of a team;
- several modules involve formal group work including assessment of a written report;
- some modules at Level 4 include opportunities for students to solve smaller problems in groups and present their solution to the class;
- opportunities for formative feedback via presentations are provided along with several opportunities for each student to undertake a summative assessment to demonstrate these skills;
- other modules at Level 5 will continue to develop student's investigation and communication skills, so that these are sufficiently well developed for undertaking their project or independent study at Level 6.

14. Assessment Strategy

The overall purpose of the assessment regime is to enable students to:

- demonstrate the acquisition and development of analytical, practical and intellectual skills commensurate with study at Levels 4, 5 and 6 of the 2008 Framework for Higher Education Qualifications (FHEQ), and the 2015 QAA Subject benchmark statement for Mathematics, Statistics and Operational Research;
- gain experience in working individually and as part of a team and to communicate the results of their analyses both orally and in written reports;
- receive continuous, regular and appropriate feedback throughout all modules on the course.

The programme's assessment strategy has been considered within the context of the University of Worcester's Learning, Teaching and Assessment Strategy and Assessment Policy.

Assessments for the individual modules have been designed to enable students to demonstrate that they have successfully met the learning outcomes. Each module outlines the nature of the assessment and the respective weighting of each assessment item, as well as a detailed assessment brief and assessment criteria. Emphasis is placed both on the development of the underlying theory and the logical and analytical problem solving skills. The styles of each assessment takes into account a myriad of factors, including learning outcomes, content of the module and teaching and learning styles. Other aspects of the programme of particular emphasis include:

1. facilitating student presentations within seminars and problem classes;
2. peer feedback on student presentations;
3. PC lab-based work in most modules to practice the formulation and solution of problems using appropriate mathematical and statistical packages and other software commonly found in the workplace;
4. regular group work and projects to practice the development of team-working skills;
5. scheduling of summative assessments during the year;
6. where possible, an anonymous marking strategy is used.

Formative assessment also plays a key part in the learning and teaching strategy for the course. A range of opportunities for formative assessment and feedback have been incorporated into the design of the course. Particular examples include:

1. the requirement of students to maintain portfolios of their work in key Level 4 modules and the use of these within the academic tutoring process;
2. students being required to complete regular problem sheets with model solutions being provided for each question and feedback provided whenever possible;
3. immediate feedback on student-led presentations in class in Level 4 modules;
4. peer assessment and marking of presentations, group report and posters in Level 5 modules;
5. student-led discussions in seminars in Level 6 modules.

15. Programme structures and requirements

This course is available in full-time or part-time mode and has been designed to offer a balance of theory and practice in mathematics and statistics. The emphasis is on the development of logical and analytical problem solving skills required for the practical application of a range of mathematics and statistics methods and modelling techniques, using a range of modern software. The programme is also structured so that students can

develop these skills in relation to a range of different problem solving contexts relevant to areas of potential employment or research in the future.

The course is cumulative in nature in that much of the material at Level 4 is developed further at Level 5 before then being applied in more specialised areas at Level 6. At Level 4 the course will expose students to the practical application of mathematics and statistics to problem solving, modelling and data analysis. However Level 4 also provides an opportunity to cover the theoretical underpinning in foundational topics in mathematics and statistics, some of which will be familiar to many students, such as calculus and statistics, whereas some will be new to them such as logic and number theory. At Level 5 all students will continue to develop the theoretical foundation in both mathematics and statistics, and will also continue to concentrate more time on the applications of problem solving, modelling and data analysis in both mathematical modelling and statistical modelling contexts.

Award map for BSc (Hons) Mathematics

Course Title: BSc (Hons) Mathematics	

Level 4						
Module Code	**Module Title**	**Credits** (Number)	**Status** (Mandatory (M) Designated (D) or Optional (O))		**Pre-requisites** (Code of Module required)	**Co-requisites/ exclusions and other notes**
			Single Hons	**Joint Hons**		
MATH1101	Mathematical Foundations	30	M	M	None	
MATH1102	Introduction to Applied Mathematical Modelling (Semester 2)	15	M	M	None	
MATH1103	Introduction to Probability and Statistics (Semester 1)	15	-	M	None	Excluded: MATH1104
MATH1104	Explorations in Probability and Statistics	30	D	-	None	Excluded: MATH1103
MATH1105	Explorations in Number Theory and Geometry (Semester 2)	15	O	-	None	
MATH1106	Computational Thinking (Semester 1)	15	O	-	None	
MATH1107	Algorithms, Logic and Reasoning (Semester 1)	15	O	-	None	Co-requisite: MATH1106
LANG	Optional modules offered by the Language Centre	15/30	O			

Single Honours Requirements at Level 4
Single Honours students must take 120 credits in total drawn from the table above to include all mandatory modules MATH1101, MATH1102 and MATH1104, and optional modules - which can include up to 30 credits drawn from a range of Language Centre modules in: Academic English for native and non-native speakers of English; Modern Foreign Languages; and Teaching English as a Foreign Language (TEFL). Details of the available Language Centre modules can be found on the Language Centre website: http://www.worcester.ac.uk/your-home/language-centre-module-options.html.

Joint Honours Requirements at Level 4
Joint Honours students must take 60 credits from the table above to include MATH1101, MATH1102 and MATH1103.

Level 5							
Module Code	**Module Title**	**Credits** (Number)	**Status** (Mandatory (M) or Optional (O))				**Pre-requisites** (Code of Module required)
			SH	**Maj**	**JH**	**Min**	
MATH2101	Multivariable Calculus and Linear Algebra	30	M	M	M	O	MATH1101
MATH2102	Mathematical Modelling	30	M	O	O	O	MATH1101 and MATH1102
MATH2103	Statistical Modelling	30	M	O	O	O	MATH1101 and either MATH1103 or MATH1104
MATH2104	Statistical Estimation and Inference (Semester 2)	15	O	O	O	O	MATH1101 and either MATH1103 or MATH1104
MATH2105	Real Analysis (Semester 1)	15	O	O	O	O	MATH1101
LANG	Optional modules offered by the Language Centre	15/30	O				

Single Honours Requirements at Level 5
Single Honours students must take 120 credits in total drawn from the table above to include all mandatory modules MATH2101, MATH2102 and MATH2103, and optional modules - which can include up to 30 credits drawn from a range of Language Centre modules in: Academic English for native and non-native speakers of English; Modern Foreign Languages; and Teaching English as a Foreign Language (TEFL). Details of the available Language Centre modules can be found on the Language Centre website: http://www.worcester.ac.uk/your-home/language-centre-module-options.html.

Joint, Major and Minor Honours Requirements at Level 5
Students following Joint Honours pathways can adjust their studies at level 5 to take more modules in one subject or can maintain an equally balanced programme of modules in each subject. The precise award title (Joint Hons or Major/Minor Hons) depends on the total number of credits achieved in each subject at levels 5 and 6 – for further information see the table at the end of this section.

Major Pathway Requirements at Level 5
Major pathway students must take at least 60 and no more than 90 credits from the table above to include MATH2101 and at least one of MATH2102 and MATH2103.

Joint Pathway Requirements at Level 5
Joint pathway students must take at least 60 credits and no more than 75 credits from the table above to include MATH2101 and one of MATH2102 or MATH2103.

Minor Pathway Requirements at Level 5
Minor Pathway students must take at least 30 credits and no more than 60 credits from the table above to include at least one of MATH2101 and MATH2103.

Level 6							
Module Code	**Module Title**	**Credits** (Number)	**Status** (Mandatory (M) or Optional (O))				**Pre-requisites** (Code of Module required)
			SH	**Maj**	**JH**	**Min**	
MATH3101/3102	Mathematics Project	30	M	M	O	-	MATH2101 and one of MATH2102 or MATH2103
MATH3103	Abstract Algebra	15	O	O	O	O	MATH2101
MATH3106	Optimisation	15	O	O	O	O	MATH2101 and MATH2102
MATH3109	Multivariate Statistics	15	O	O	O	O	MATH2101 or MATH2103
MATH3111	Advanced Applications in Statistics	15	O	O	O	O	MATH2103

Joint, Major and Minor Honours Requirements at Level 6
Students following pathways in two subjects can adjust their studies at level 6 to take more modules in one subject or can maintain an equally balanced programme of modules in each subject. The precise award title (Joint Hons or Major/Minor Hons) depends on the total number of credits achieved in each subject at levels 5 and 6 – for further information see table at the end of this section.

Major Pathway Requirements at Level 6
Major pathway students must take either 75 or 90 credits from the table above to include MATH3101/3102.

Joint Pathway Requirements at Level 6
Joint pathway students must take 45, 60 or 75 credits (to make at least 105 credits over levels 5 and 6 in the subject, and no more than 135 credits over levels 5 and 6 in the subject) from the table above.
Joint pathway students, who choose to take their Independent Study (Mathematics Project) in this subject, must also take at least 30 credits from the table above (excluding MATH3101/3102).
Joint pathway students must take either, the Mathematics Project (MATH3101/3102), or the Independent Study (equivalent) in their other joint subject, or take JOIN3001/2 where an Independent Study covers both joint subjects.

Minor Pathway Requirements at Level 6
Minor pathway students must take either 30 or 45 credits from the table above excluding MATH3101/3102.

Credit requirements for awards involving two subjects
In determining whether an award derived from two subjects is Joint Honours (subject 1 **and** subject 2) or Major/Minor Honours (subject 1 **with** subject 2) credits taken in each subject at levels 5 and 6 will count as follows:

Subject 1	Subject 2	Award
120	120	Joint Hons
135	105	Joint Hons
150	90	Major/minor Hons
165	75	Major/minor Hons
180	60	Major/minor Hons

16. QAA and Professional Academic Standards and Quality

The award is located at Level 6 of the FHEQ. The learning outcomes for the programme and individual modules, along with the learning, teaching and assessment strategies have been developed with reference to the UK Quality Code for Higher Education and the 2015 QAA Subject benchmark statement for Mathematics, Statistics and Operational Research.

The Single honours degree in Mathematics is accredited with the Institute of Mathematics and its Applications (IMA). This means that this programme will meet the educational requirements of the Chartered Mathematician designation awarded by the Institute of Mathematics and its Applications, when followed by subsequent training and experience in employment to obtain equivalent competences to those specified by the Quality Assurance Agency (QAA) for bachelor degrees.

17. Support for students

Our fundamental approach to student support is centred on the need to motivate and inspire our students.

17.1 Student induction

Our student induction process consists of activities designed to provide students with an introduction to the course and an opportunity to meet their academic tutor as well as getting to know each other.

The following are examples of activities for student induction:

- A discussion of how to study and thrive on a maths degree;
- What are calculus and linear algebra?;
- Resources in the library and online mathematics and statistics resources;
- What mathematics have you studied before arriving at university?;
- University of Worcester Mathematics Society and the Maths Arcade;
- Talks on employability and careers;
- Team-working activities;
- Visit to the HIVE library;
- Meeting with module leaders and Personal Academic Tutors;
- Hands-on sessions on University computer systems and available software;
- Talks by registry, library and student services;
- Student Union activities.

17.2 Personal academic tutoring

Each student has a nominated Personal Academic Tutor to provide academic advice and guidance, personal development planning and pastoral support as appropriate. The Personal Academic Tutor plays a significant role in enhancing the student's academic and personal experience of studying. Key aspects of the role include:

- Assisting students to make the transition to studying in higher education;
- Helping students to understand the requirements of their course;
- Supporting students to take responsibility for their own learning;
- Helping students to make the most of learning resources and other forms of support available;
- Supporting students in academic, professional and career related planning and development;
- Advising and guiding students on issues or problems that arise while they are at University;

- Supporting students for whom there may be particular challenges;
- Meeting students on a regularly scheduled basis. Individual meetings will be held throughout the academic year, and the Personal Academic Tutor will provide group meeting times during the Induction Week;
- Tutors will advise students on individual course options, module selection and academic planning.

At Level 4, students will be required to compile a portfolio consisting of solutions to weekly problems and practical exercises in the key foundational modules in mathematics and statistics. They will be encouraged and supported to show that they are marking and reviewing their own work based on model solutions that are made available during the module. The overall portfolio will be reviewed periodically by the student's Personal Academic Tutor (or a nominated member of the course team where the Personal Academic Tutor is not mathematics-based), in order to help the student assess their progress.

17.3 Support Processes and Mechanisms

The following have been put in place to provide support for undergraduate students within the Institute of Science and the Environment.

- induction programme including input from Student Services;
- module outlines include module code, module title, level, planned teaching activities, attendance requirements, assessment brief, assessment criteria and reading lists;
- library, IT, Media and Print support is provided by Information Learning Services (ILS) staff through an Information Desk and Study Guides;
- student representation on the Course Management Committee to address course-wide opportunities for enhancement;
- access to details of module availability, registration and results via the student online learning environment (SOLE page);
- a range of support services, including finance, Student Services (Firstpoint), and accommodation advice;
- student and academic support, representation and social networking via the Students' Union;
- Equal Opportunity via the Disability and Dyslexia Service, which implements codes of practice in relation to disability, racial and other forms of discrimination and also provides practical support and guidance for students with learning difficulties;
- Career Services offer one-to-one drop-in advice and information and publishes career events, activities and job opportunities;
- a Virtual Learning Environment to provide module-specific material, documents, activities and networking, as well as a more general announcements and updates;
- a full list of services can be found in the Course Handbook.

The University is also considering the potential to develop a Mathematics and Statistics Help Service (MASH) at Worcester, which would also provide an obvious significant area of further support for students on the course.

18. Admissions

Admissions Policy

The University aims to be accessible and is committed to widening participation and encouraging diversity in the student population. Hence we actively encourage and welcome people from the widest range of economic and cultural backgrounds and value the contribution of mature learners who may be able to use their work experience as

evidence of prior learning. However evidence of mathematics attainment at least equivalent to A Level will be required for admission to the course.

Entry requirements
Since mathematics is a subject which builds incrementally in complexity from GCSE to A Level (or equivalent) and beyond, it is a typical requirement for students onto the course that they have as a minimum an A Level at grade C in mathematics, although a grade A or B is preferable.

The normal minimum entry requirement for undergraduate degree courses is the possession of 4 GCSEs (Grade C/4 or above) and a minimum of 2 A Levels (or equivalent Level 3 qualifications).

The current UCAS Tariff requirements for entry to this course are published in the prospectus and on the UW website https://www.worc.ac.uk/journey/a-z-of-courses.html

See Admissions Policy for other acceptable qualifications.

Recognition of Prior Learning
Details of acceptable level 3 qualifications, policy in relation to mature students or applicants with few or no formal qualifications can be found in the prospectus or on the University webpages. Information on eligibility for recognition of prior learning for the purposes of entry or advanced standing is also available from the University webpages or from the Registry Admissions Office (01905 855111).

Further information on Recognition of Prior Learning can be found at http://www.worcester.ac.uk/registryservices/941.htm

Admissions procedures
Full-time applicants apply through UCAS.
Part-time applicants apply directly to University of Worcester (UW).

Admissions/selection criteria
The decision to offer a place will be based on a candidate's prior attainment in mathematics at A Level (or equivalent) and their demonstrated enthusiasm for the subject, commitment to study and the academic capability to succeed on the course.

19. Methods for evaluating and improving the quality and standards of teaching and learning

Mechanisms for review and evaluation of teaching, learning and assessment, the curriculum and outcome standards include:

- module feedback;
- Annual Course Evaluation reports;
- Periodic Review including external scrutiny;
- peer teaching observation;
- External Examiner's reports;
- academic staff annual appraisal;
- Staff Development Away Days and other events.

Mechanisms for gaining student feedback on the quality of teaching and their learning experience:

- Course Management Committee;
- Module feedback, including module feedback questionnaires and online questionnaires;
- meetings with module tutors and academic tutors;
- National Students Survey;
- University of Worcester Student Survey;

- induction, exit and other ad hoc surveys;
- StARs (Student Academic Representatives).

Feedback to students concerning decisions, changes and action points will be provided by direct feedback from the student representatives, the minutes of the Course Management Committee meeting and the Annual Evaluation Report.

20. Regulation of assessment

The course operates under the University's Taught Courses Regulatory Framework

Requirements to pass modules

- Modules are assessed using a variety of assessment activities which are detailed in the module specifications.
- The minimum pass mark is D- for each module.
- Students are required to submit all items of assessment in order to pass a module, and in some modules, a pass mark in each item of assessment may be required.
- Full details of the assessment requirements for a module, including the assessment criteria, are published in the module outline.

Submission of assessment items

- Students who submit course work late but within 5 days of the due date will have work marked, but the grade will be capped at D- unless an application for mitigating circumstances is accepted.
- Students who submit work later than 5 days but within 14 days of the due date will not have work marked unless they have submitted a valid claim of mitigating circumstances.
- For full details of submission regulations see Taught Courses Regulatory Framework.

Retrieval of failure

- Students are entitled to resit failed assessment items for any module that is awarded a fail grade.
- Reassessment items that are passed are capped at D-.
- If a student is unsuccessful in the reassessment, they have the right to retake the module (or, in some circumstances, take an alternative module).

Requirements for Progression

- Students at Level 4 may be permitted to progress to Level 5 when they have passed at least 90 credits at Level 4.
- Students at Level 5 may be permitted to progress to Level 6 when they have passed at least 90 credits at Level 5.
- A student who fails 90 credits or more due to non-submission will be required to withdraw from the University.
- Students who pass less than 90 credits but have submitted all items of assessment will be required to retake modules.

Requirements for Awards

Award	Requirement
CertHE	Passed 120 credits at Level 4 or higher.
DipHE	Passed a minimum of 240 credits with at least 90 credits at Level 5 or higher.
Degree (non-honours)	Passed a minimum of 300 credits with at least 90 credits at Level 5 or higher and a minimum of 60 credits at Level 6, including the mandatory modules for

	Level 5 and Level 6 of the award (not the Independent Study module) as specified on the award map.
Degree with honours	Passed a minimum of 360 credits with at least 90 credits at Level 5 or higher and a minimum of 120 credits at Level 6.

Classification
The honours classification will be determined by whichever of the following two methods results in the higher classification.

Classification determined on the profile of the best grades from 60 credits attained at Level 5 and the best grades from 120 credits at Level 6. Level 5 and Level 6 grades count equally in the profile.

or

Classification determined on the profile of the best grades from 120 credits attained at Level 6 only.

21. Indicators of quality and standards

The programme has been designed to be accredited by the IMA (Institute of Mathematics and its Applications www.ima.org.uk). The external assessor during course approval/validation (also the IMA's external assessor for IMA accreditation) commented that "The design of the course provides a coherent and exciting maths experience" and also that "There is a shortage of skilled mathematicians and statisticians in industry and graduates from this course will be excellently prepared with the academic knowledge, practical technical ability and employability skills to meet this demand".

The mathematics course team have significant experience of teaching mathematics and statistics at undergraduate level. Between them they have been engaged in and are still engaged in teaching and learning projects relating to mathematics and statistics. In addition they have experience of providing mathematics and statistics advice and support to students of all abilities, with the course leader being a significant contributor to the work of the sigma-network (www.sigma-network.ac.uk), which is a national network promoting excellence in the provision of mathematics and statistics support. The course leader is also the national lead for the statstutor project (www.statstutor.ac.uk) which is an online resource in statistics aimed at supporting students with teaching and learning of statistics in higher education.

The mathematics course team also have experience of either working in industry or engaging with partners from industry on work-based projects relating to the application of mathematics and statistics. This has enabled the development of a good network of contacts that have contributed to the development of the mathematics course and who have also agreed to contribute to providing a work-based context to parts of the course through invited guest seminars or projects.

22. Graduate destinations, employability and links with employers

Graduate destinations

There is strong evidence of a national demand for graduates with Mathematics, with plentiful evidence that skills in mathematics and statistics are critical to the success of the British economy, particularly in science, engineering and manufacturing.

Graduates in mathematics are employed in many areas including:

- Actuarial and insurance;
- Finance, banking and accountancy;
- Teaching (there is also a continuing shortage of well qualified mathematics teachers which will continue with the introduction of the new post-16 core maths curriculum);
- Science and engineering;
- Government departments and defence;
- Pharmaceutical and health industries;
- Research and development;
- Sports modelling, betting and trading professions;
- Logistics, planning and market research;
- IT and computing;

The starting salaries for mathematics graduates are also amongst the highest of all the graduate disciplines[1] and were ranked 9th (behind *Medicine*, *Dentistry*, *Economics*, *Veterinary Science* and some specific forms of *Engineering*) out of 59 subject areas at £24,296 against an average of £21,762.

Student employability

- The course is inherently about developing logical and analytical problem solving skills, which are required in many areas of employment.
- Most modules will have PC lab-based sessions where the use of software relevant to the application, problem solving and data analysis will be practiced extensively. This includes, for example, Matlab, Maple, R, and SPSS, as well as software commonly found in the workplace such as Excel, Word and Powerpoint.
- Students will be encouraged to become student members of the Royal Statistical Society (www.rss.org.uk) and Institute of Mathematics and its Applications (www.ima.org.uk) where appropriate and to engage with those organisations.
- There are many opportunities for students to practice and develop their skills in working as a team, presenting and communicating their work in writing.
- Expert speakers from industry, as well as other academic staff from outside of mathematics at the university with contextual expertise, have agreed to offer seminar talks of relevance to the practical application of their knowledge and skills.
- Single Honours students must study the Level 6 Mathematics Project to further develop their practical skills in this respect; students following the Major or Joint pathways must study the Level 6 Mathematics Project or an equivalent independent study.

Links with employers

With regard to regional employers, discussions about the course have involved companies such as QinetiQ, AVL, Worcester Bosch, Yamazaki Mazak, SLR Consulting and Malvern Instruments. Discussions about the course have also involved larger national companies such as British Gas and Rolls Royce. In addition the course team have particular links with companies involved in space planning, such as CPB Projects, software development, such as FICO, and a number of companies in the sports modelling and trading industries, such as Smartodds, Sporting Index, Black Swan Partners and Sports Trading Network. Discussions about the course have also been held with these employers.

These discussions were facilitated through:

[1] HESA 2010-11. Published April 2013

- meetings in person with local employers;
- attendance by the course leader at an Employers' Forum organised by the IMA (Institute of Mathematics and its Applications) held at Rolls Royce, Derby, which included round table discussions of the skills required by mathematics graduates in the workplace;
- email correspondence with employers located outside of the region.

The areas of mathematics proposed in the curriculum match those that these employers value. Many of these employers have agreed to offer seminar presentations about the use of mathematics in the employment context, careers talks, to attend the final year poster day planned as part of the mathematics project module and to consider the possibilities for real projects to be undertaken. This network of employer contacts, both local and national, will also inform the continued development of the mathematics courses.

Please note: This specification provides a concise summary of the main features of the programme and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if s/he takes full advantage of the learning opportunities that are provided. More detailed information on the learning outcomes, content and teaching, learning and assessment methods of each module can be found in the module outlines and the course handbook provided to all students at the start of the course.