

# Programme Specification

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## Mathematics with Statistics (2020-21)

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.

Awarding Institution	University of Southampton
Teaching Institution	University of Southampton
Mode of Study	Full-time
Duration in years	3
Accreditation details	None
Final award	Bachelor of Science with Honours (BSc (Hons))
Name of Award	Mathematics with Statistics
Interim Exit awards	Bachelor of Science (Ordinary) Certificate of Higher Education (CertHE) Diploma of Higher Education (DipHE)
FHEQ level of final award	Level 6
UCAS code	G1G3
Programme Code	4709
QAA Subject Benchmark or other external reference	Mathematics, Statistics And Operational Research 2007
Programme Lead	Wei Liu
Pathway Lead	

## Programme Overview

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### Brief outline of the programme

Training in statistics offers a unique range of challenges and provides opportunities to work on a large variety of important problems in industry, environmental science, medical research and within the government. The technical skills that you will acquire are in great demand, as are the general skills of understanding and analysing problems and communicating the results to other scientists. This degree may lead to possible exemption from some Core Technical professional actuarial examinations depending on option choices made.

Transfer to this programme at the end of the first semester is possible from a number of other programmes within Mathematical Sciences.

Your contact hours will vary depending on your module/option choices. Full information about contact hours is provided in individual module profiles.

### Learning and teaching

The Mathematical Sciences School uses a wide variety of modern learning and teaching methods involving problem classes, workshops and computer based learning that builds on what you learn in lectures.

### Assessment

Assessment is varied enabling you to demonstrate your strengths and show what you have learnt. Students are provided with access to relevant software that they can use on their own personal computers to assist their studies.

## Special Features of the programme

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N/A

**Please note:** As a research-led University, we undertake a continuous review of our programmes to ensure quality enhancement and to manage our resources. As a result, this programme may be revised during a student's period of registration; however, any revision will be balanced against the requirement that the student should receive the educational service expected. Please read our [Disclaimer](#) to see why, when and how changes may be made to a student's programme.

Programmes and major changes to programmes are approved through the University's [programme validation process](#) which is described in the University's [Quality handbook](#).

## Educational Aims of the Programme

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The aims of the programme are to:

- Introduce you to the main basic areas of mathematics;
- Develop your understanding of abstract mathematical concepts;
- Offer you the opportunity to study advanced mathematical concepts and techniques;
- Develop your modelling and problem solving skills;
- Offer you the opportunity to construct an individual programme of study within a coherent framework;
- Offer you the opportunity to study applications of mathematics in a variety of contexts which utilize mathematical and statistical models;
- Introduce you to theoretical statistical concepts;
- Develop your understanding of practical statistical methods;
- Prepare you for a career as a statistician in industry and commerce;
- Give you the statistical grounding required to prepare you for postgraduate study.
- Develop your subject specific and transferable skills including an analytical approach to problem solving, logical argument and deductive reasoning, abstraction and generalisation, and written communication skills in mathematics;
- Provide some of the basic IT skills necessary for further study and employment, including word processing and use of the internet;
- Help you to develop key skills: personal organisation, teamwork, problem solving and analysis, finding and using information, and written and oral presentation.

## Programme Learning Outcomes

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### Knowledge and Understanding

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On successful completion of this programme you will have knowledge and understanding of:

- A1. The fundamentals of calculus, linear algebra, and statistics;
- A2. The fundamentals of ordinary differential equations and their applications;
- A3. The principles of mathematical proof and some of the techniques of proof;
- A4. The fundamental concepts of real analysis of functions of one variable;
- A5. The assumptions underlying statistical methods.

## Teaching and Learning Methods

Acquisition of knowledge and understanding of A1 through A5 is through structured exposition based on lectures, tutorial classes, and private study, all of which are equally important. Increasing independence of learning is required as the programme progresses. Throughout the programme you are encouraged to use additional recommended reading material for private study to consolidate the formal learning process, and to broaden and deepen your understanding.

## Assessment Methods

Assessment is undertaken in the first year by a mixture of unseen examinations, regular marked coursework, class tests and computer-based work, together with a small component of project and laboratory work. This variety of assessment relates to 2.1 through 2.3, and also to some of the skills described below. This varied approach to assessment continues in the remainder of the programme, with the relative emphasis depending on the options chosen (A4 - A5).

## Subject Specific Intellectual and Research Skills

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On successful completion of this programme you will be able to:

- B1. Mathematical problem-solving skills for certain types of problems and their variants in a variety of mathematical contexts;
- B2. The ability to undertake algebraic calculations accurately and with understanding;
- B3. The ability to use computer packages (for example, R) as vehicles for mathematical exploration and understanding;
- B4. The ability to understand and to construct mathematical proofs;
- B5. The ability to appreciate, construct and analyse mathematical models of practical situations;
- B6. The ability to apply statistical methods such as regression and analysis of variance to practical situations.

## Teaching and Learning Methods

Problem-solving is at the heart of all mathematical activity, and so it is emphasised throughout the learning and teaching experience, as is the need for accurate calculation and logical argument. The use of specific mathematical and computational packages is a part of the curriculum, and the skills acquired there are used in later modules as appropriate. The statistical computing language R is used in the applications of statistics modules available within this programme.

## Assessment Methods

The various methods of assessment described in section 2 involve problem-solving (B1) in addition to the assessment of knowledge and understanding (B2, B4 through B6). Fluency in computer packages (B3) is assessed by coursework.

## Transferable and Generic Skills

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On successful completion of this programme you will be able to:

- C1. Communicate mathematical and statistical ideas in written form;
- C2. Undertake oral presentations;

- C3. Demonstrate group-working skills
- C4. Use spreadsheets and show basic word-processing skills;
- C5. Use and obtain information from a variety of different sources including the internet, books and other printed material;
- C6. Use the skills you have acquired (e.g. time-management, organisation, problem-solving, critical analysis, independent learning, etc.) for life-long learning

### **Teaching and Learning Methods**

The learning of transferable skills begins in the first year. The first year lecturers will set problems for which one of a range of computing packages, such as the statistics package R, will be useful, thereby developing transferable skills alongside subject specific skills. Other IT skills such as basic word processing are used alongside first year project work, particularly in statistics. Mathematics Workshops are offered during the first and second years, and extensive electronic resources on study skills are available through the Mathematics and University websites.

Further development of IT skills, written communication and general skills such as organisation and time-management is associated to optional second and third year modules which may have an element of coursework in their assessment. The second and third year project-based modules develop your portfolio of skills to include internet and library research, group working, and presentation skills.

### **Assessment Methods**

Throughout the programme the clear communication of mathematics is part of the assessment criteria, either explicitly or implicitly. For project work, and for those modules which involve coursework assignments, a proportion of the assessment is allocated to communication (C1, C2, and C4). Project work and coursework assessment also relate to C5, and where appropriate, C3. The skills referred to in C6 refer to problem-solving, an integral component of all mathematical work, and other learning skills are implicit.

## **Programme Structure**

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The programme structure table is below:

Information about pre and co-requisites is included in individual module profiles.

Where optional modules have been specified, the following is an indicative list of available optional modules, which are subject to change each academic year. Please note in some instances modules have limited spaces available.

### **Pathway**

#### **Part I**

This degree programme will provide you with the skills in mathematics and statistics and the communication skills that you will require for a career as a statistician.

In addition to this, our Curriculum Innovation Programme offers our students the chance to take optional modules outside their core disciplines. This allows you to personalise your education, to develop new skills and knowledge for your future.

The structure of the programme and the modules currently offered are set out below. Of the modules shown against each year of your programme, some are compulsory (ie enrolment is automatic) and others are optional. Against each year, you are directed to which modules are compulsory and which are optional. The optional modules listed constitute an indicative list. There will always be choice but the options might vary between years. A complete list of optional modules currently available on your programme can be found via the Student Record Self-Service system

([https://studentrecords.soton.ac.uk/BNNRPROD/bwkkspgr.showpage?page=ESC\\_PROGCAT\\_FINDPR](https://studentrecords.soton.ac.uk/BNNRPROD/bwkkspgr.showpage?page=ESC_PROGCAT_FINDPR)). .

The programme comprises three parts, each corresponding to one year of full-time study. You will normally have to take 4 modules (30 ECTS/60 CATS) each semester (ie 8 modules (60 ECTS/120 CATS) in each year of the programme. Each credit can be considered as the equivalent of approximately ten hours of study. All the modules offered in this programme (except the dissertation) are 7.5 ECTS/15 CATS modules. This means that each module comprises around 150 hours of study divided into contact time (e.g. lectures, seminars, workshops) and non-contact time when you will be engaged in directed study (preparation for classes) and independent study when you will be involved in producing assignments and preparing and taking examinations.

Students must take at least 16 MATHxxxx modules in parts 1, 2 and 3, and at least 4 MATH3xxx modules in part 3.

The option modules shown below constitute an indicative list; there will always be choice but the options might vary between years. A full list of modules and rules will be available to you via the Student Record Self-Service system once you enrol at the University.

#### Part I Compulsory

Code	Module Title	ECTS	Type
MATH1046	First Year Mathematics Workshop	0	Compulsory
MATH1024	Introduction to Probability and Statistics	7.5	Compulsory
MATH1049	Linear Algebra II	7.5	Compulsory
MATH1060	Multivariable Calculus	7.5	Compulsory
MATH1058	Operational Research I and Mathematical Computing	7.5	Compulsory
MATH1047		0	Compulsory

#### Part I Core

Code	Module Title	ECTS	Type
MATH1059	Calculus	7.5	Core
MATH1048	Linear Algebra I	7.5	Core

#### Part I Option - Rule 1

Select 2 modules from the following.

Students may select either ECON1001 or ECON1003 (Not Both). If you have NOT passed Economics at A Level, or an equivalent level, you may select ECON 1001 only, if you HAVE passed Economics at A Level you may select ECON 1003 only.

Only 1 non-Math module may be taken this year in either semester 1 or semester 2.

+ FREEXX15 - Part 1 Elective Module (15 credits)

+ LANGXX15 - Language Module (15 credits)

+ LANGXX30 - Language Module (30 credits)

Code	Module Title	ECTS	Type
MATH1057	Dynamics and Relativity	7.5	Optional
ECON1001	Foundations of Microeconomics	7.5	Optional
DEMO1001	Introduction to Demographic Methods	7.5	Optional
MATH1001	Number Theory	7.5	Optional

ECON1002	Principles of Macroeconomics	7.5	Optional
ECON1003	Principles of Microeconomics	7.5	Optional

## Part II

### Part II Compulsory

Code	Module Title	ECTS	Type
MATH2039	Analysis	7.5	Compulsory
MATH2038	Partial Differential Equations	7.5	Compulsory
MATH2011	Statistical Distribution Theory	7.5	Compulsory
MATH2010	Statistical Modelling I	7.5	Compulsory
MATH2012	Stochastic Processes	7.5	Compulsory

### Part II Option - Rule 1

Select 3 modules (45 credits) from the following.

Modules often taken as part of the programme are MATH2013, MATH2040 and MATH2014.

Please do NOT select modules you have taken previously.

If you do, you will be contacted by your Student Office and asked to amend your choices.

Please also ensure that you select an even split of credits overall by semester including your compulsory modules.

Only 1 non-Math module may be taken this year in either semester 1 or semester 2.

+ FREEXY15 - Part 2 Elective Module (15 credits)

+ LANGXX15 - Language Module (15 credits)

Code	Module Title	ECTS	Type
MATH2014	Algorithms	7.5	Optional
UOSM2001	Business Skills for Employability	7.5	Optional
CRIM1004	Criminal Justice Studies	7.5	Optional
PSYC2007	Developmental Psychology	7.5	Optional
MATH2044	Fields and Fluids	7.5	Optional
MATH2040	Financial Mathematics	7.5	Optional
MATH2049	Geometry and Topology	7.5	Optional
UOSM2004	Global Health	7.5	Optional
MATH2003	Group Theory	7.5	Optional
MATH3087	Maths and your Future	7.5	Optional
MATH2013	Operational Research II	7.5	Optional
PSYC2018	Perception	7.5	Optional
SOES1009	The Living Earth	7.5	Optional
UOSM2011	The Management of Risk and Uncertainty	7.5	Optional
MATH2045	Vector Calculus and Complex Variable	7.5	Optional

## Part III

### Part III Compulsory

Students must have taken at least one of MATH3023, MATH3031, MATH3032 or MATH3087 during their programme.

Code	Module Title	ECTS	Type
MATH3014	Design and Analysis of Experiments	7.5	Compulsory
MATH3044	Statistical Inference	7.5	Compulsory
MATH3091	Statistical Modelling II	7.5	Compulsory

### Part III Option - Rule 0

You must select 1 module (15 Credits) from the list below.

If you took MATH3087 and do not wish to take one of the other modules listed below, please contact your

student office. You may not select MATH3087 if you have previously taken it in part II.

Code	Module Title	ECTS	Type
MATH3023	Communicating and Teaching Mathematics	7.5	Optional
MATH3032	Mathematical Investigation and Communication	7.5	Optional
MATH3031	Mathematics Project	7.5	Optional
MATH3087	Maths and your Future	7.5	Optional

#### Part III Option - Rule 1

Select 4-5 modules (60-75 credits) from the following.

Please ensure that you select an even split of credits overall by semester including your compulsory modules. If you do not, you will be contacted by your Student Office and asked to amend your choices.

If you have already taken MATH2046 Algebra and Geometry you may not select MATH2049 Geometry and Topology.

#### Part III Option - Rule 1 Group 1

Select 0 modules (0 credits) up to a maximum of 1 module (15 credits) from the following.

Only 1 non-Math module may be taken this year in either semester 1 or semester 2.

+ FREEXY15 - Part 2 Elective Module (15 credits)

+ LANGXX15 - Language Module (15 credits)

Code	Module Title	ECTS	Type
MATH2014	Algorithms	7.5	Optional
UOSM2001	Business Skills for Employability	7.5	Optional
GEOG3048	Desert Landscapes: Modelling and Measuring Aeolian Systems	7.5	Optional
PSYC2007	Developmental Psychology	7.5	Optional
UOSM2020	Economics with Experiments	7.5	Optional
MATH2044	Fields and Fluids	7.5	Optional
MATH2040	Financial Mathematics	7.5	Optional
MATH2049	Geometry and Topology	7.5	Optional
UOSM2004	Global Health	7.5	Optional
MATH2003	Group Theory	7.5	Optional
MATH2013	Operational Research II	7.5	Optional
PSYC2018	Perception	7.5	Optional
MATH2010	Statistical Modelling I	7.5	Optional
UOSM2011	The Management of Risk and Uncertainty	7.5	Optional
MATH2045	Vector Calculus and Complex Variable	7.5	Optional

#### Part III Option - Rule 1 Group 2

Select 3 modules (45 credits) up to a maximum of 5 modules (75 credits) from the following.

Only 1 non-Math module may be taken this year in either semester 1 or semester 2.

+ FREEXZ15 - Part 3 Elective Module (15 credits)

+ LANGXX15 - Language Module (15 credits)

+ LANGXX30 - Language Module (30 credits)

Code	Module Title	ECTS	Type
MATH3063	Actuarial Mathematics I	7.5	Optional
MATH3066	Actuarial Mathematics II	7.5	Optional
MATH3072	Advanced Fluid Dynamics	7.5	Optional
MATH3083	Advanced Partial Differential Equations	7.5	Optional
MATH3080	Algebraic Topology	7.5	Optional
MATH3023	Communicating and Teaching Mathematics	7.5	Optional
MATH3088	Complex Analysis	7.5	Optional
MATH3078	Further Number Theory	7.5	Optional

MATH3086	Galois Theory	7.5	Optional
MATH3033	Graph Theory	7.5	Optional
MATH3076	Hilbert Spaces	7.5	Optional
MATH3084	Integral Transform Methods	7.5	Optional
MATH3052	Mathematical Biology	7.5	Optional
MATH3022	Mathematical Finance	7.5	Optional
MATH3032	Mathematical Investigation and Communication	7.5	Optional
MATH3017	Mathematical Programming	7.5	Optional
MATH3089	Mathematics for the Modern World	7.5	Optional
MATH3031	Mathematics Project	7.5	Optional
MATH3087	Maths and your Future	7.5	Optional
MATH3018	Numerical Methods	7.5	Optional
MATH3016	Optimization	7.5	Optional
MATH3006	Relativity, Black Holes and Cosmology	7.5	Optional
MATH3013	Simulation & Queues	7.5	Optional
STAT3010	Statistical Methods in Insurance	7.5	Optional
MATH3090	Structure and Dynamics of Networks	7.5	Optional
MATH3085	Survival Models	7.5	Optional

## Progression Requirements

The programme follows the University's regulations for [\*Progression, Determination and Classification of Results : Undergraduate and Integrated Masters Programmes\*](#) or [\*Progression, Determination and Classification of Results: Postgraduate Master's Programmes\*](#). Any exemptions or variations to the University regulations, approved by AQSC are located in [\*section VI of the University Calendar\*](#).

## Support for student learning

There are facilities and services to support your learning some of which are accessible to students across the University and some of which will be geared more particularly to students in your particular Faculty or discipline area.

The University provides:

- library resources, including e-books, on-line journals and databases, which are comprehensive and up-to-date; together with assistance from Library staff to enable you to make the best use of these resources
- high speed access to online electronic learning resources on the Internet from dedicated PC Workstations onsite and from your own devices; laptops, smartphones and tablet PCs via the Eduroam wireless network. There is a wide range of application software available from the Student Public Workstations.
- computer accounts which will connect you to a number of learning technologies for example, the Blackboard virtual learning environment (which facilitates online learning and access to specific learning resources)
- standard ICT tools such as Email, secure filestore and calendars.
- access to key information through the MySouthampton Student Mobile Portal which delivers timetables, Module information, Locations, Tutor details, Library account, bus timetables etc. while you are on the move.
- IT support through a comprehensive website, telephone and online ticketed support and a dedicated helpdesk in the Hartley Library.
- Enabling Services offering support services and resources via a triage model to access crisis management, mental health support and counselling. Support includes daily Drop In at Highfield campus at 13.00 – 15.00 (Monday, Wednesday and Friday out of term-time) or via on-line chat on weekdays from 14.00 – 16.00. Arrangements can also be made for meetings via Skype.
- assessment and support (including specialist IT support) facilities if you have a disability, long term health problem or Specific Learning Difficulty (e.g. dyslexia)
- the Student Services Centre (SSC) to assist you with a range of general enquiries including financial matters, accommodation, exams, graduation, student visas, ID cards
- Career and Employability services, advising on job search, applications, interviews, paid work, volunteering and internship opportunities and getting the most out of your extra-curricular activities alongside your degree programme when writing your CV.
- Other support that includes health services (GPs), chaplaincy (for all faiths) and 'out of hours' support for students in Halls and in the local community (18.00-08.00).
- A Centre for Language Study, providing assistance in the development of English language and study skills for non-native speakers.



The Students' Union provides

- an academic student representation system, consisting of Course Representatives, Academic Presidents, Faculty Officers and the Vice-President Education; SUSU provides training and support for all these representatives, whose role is to represent students' views to the University.
- opportunities for extracurricular activities and volunteering
- an Advice Centre offering free and confidential advice including support if you need to make an academic appeal
- Support for student peer-to-peer groups, such as Nightline.

## Methods for evaluating the quality of teaching and learning

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You will have the opportunity to have your say on the quality of the programme in the following ways:

- Completing student evaluation questionnaires for each module of the programme.
- Acting as a student representative on various committees, e.g. Staff/Student Liaison Committees, School Programmes Committee OR providing comments to your student representative to feedback on your behalf.
- Serving as a student representative on Faculty Scrutiny Groups for programme validation.
- Taking part in programme validation meetings by joining a panel of students to meet with the Faculty Scrutiny Group.

Further details on the University's quality assurance processes are given in the [Quality handbook](#).

## Career Opportunities

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In a world surrounded by data statisticians are highly sought after to analyse and make sense of it, to provide usable information to businesses and governments. Pretty much every industry and organisation imaginable needs statisticians nowadays, including: the finance industry, the retail industry, the pharmaceuticals industry, government and local councils, and the manufacturing industry.

Employability is embedded into modules from the first year onwards and right from the first lecture. We explain the degree skills which are taught throughout the modules and offer a number of optional employability modules.

We place great importance on the development of graduate skills vital for future employment by adding transferrable skills into learning and teaching.

Our degrees are a passport to vocational and non-vocational careers alike, with recent graduates employed in roles ranging from actuaries and statisticians to crime analysts and medical researchers. A good number also stay at University to study for a Postgraduate degree, i.e. MSc or PhD.

## External Examiner(s) for the programme

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Name: Professor Miguel Anjos – University of Edinburgh

Name: Professor Andrey Lazarev – Lancaster University

Name: Dr Thomas Mohaupt – University of Liverpool

Name: Professor Jeremy Oakley – University of Sheffield

Students must not contact External Examiner(s) directly, and external examiners have been advised to refer any such communications back to the University. Students should raise any general queries about the assessment and examination process for the programme with their Course Representative, for consideration through Staff: Student Liaison Committee in the first instance, and Student representatives on Staff: Student Liaison Committees will have the opportunity to consider external examiners' reports as part of the University's quality

assurance process.

External examiners do not have a direct role in determining results for individual students, and students wishing to discuss their own performance in assessment should contact their Personal Academic Tutor in the first instance.

**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 they take full advantage of the learning opportunities that are provided. More detailed information can be found in the programme handbook.

## Appendix 1:

Students are responsible for meeting the cost of essential textbooks, and of producing such essays, assignments, laboratory reports and dissertations as are required to fulfil the academic requirements for each programme of study. In addition to this, students registered for this programme also have to pay for:

### Additional Costs

Type	Details
Approved Calculators	Candidates may use calculators in the examination room only as specified by the University and as permitted by the rubric of individual examination papers. The University approved models are Casio FX-570 and Casio FX-85GT Plus. These may be purchased from any source and no longer need to carry the University logo.
Printing and Photocopying Costs	<p>In the majority of cases, coursework such as essays; projects; dissertations is likely to be submitted on line. However, there are some items where it is not possible to submit on line and students will be asked to provide a printed copy. A list of the University printing costs can be found here: [insert link to relevant page].</p> <p>For students undertaking modules with a high mathematical content, some assessed work will be submitted in handwritten hard copy format. Students are advised that they will need to bear the costs of the required stationery.</p>
Software Licenses	The software required for the programme is available on all public workstations on campus, and accessible from your own computer via VPN.
Stationery	You will be expected to provide your own day-to-day stationery items, e.g. pens, pencils, notebooks, etc.). Any specialist stationery items will be specified under the Additional Costs tab of the relevant module profile.
Textbooks	Where a module specifies core texts these should generally be available on the reserve list in the library. However due to demand, students may prefer to buy their own copies. These can be purchased from any source. Some modules suggest reading texts as optional background reading. The library may hold copies of such texts, or alternatively you may wish to purchase your own copies. Although not essential reading, you may benefit from the additional reading materials for the module.

In some cases you'll be able to choose modules (which may have different costs associated with that module) which will change the overall cost of a programme to you. Details of such costs will be listed in the Module Profile. Please also ensure you read the section on additional costs in the University's Fees, Charges and Expenses Regulations in the University Calendar available at [www.calendar.soton.ac.uk](http://www.calendar.soton.ac.uk).