

## Programme Specification

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### Mathematics with Music (2018-19)

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 Music
Interim Exit awards	Certificate of Higher Education (CertHE)
	Diploma of Higher Education (DipHE)
FHEQ level of final award	Level 6
UCAS code	G1W3
Programme code	4727
QAA Subject Benchmark or other external reference	Mathematics, Statistics And Operational Research 2007
Programme Lead	Carlos Lobo (cl2u07)

### Programme Overview

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#### Brief outline of the programme

Students on this programme particularly welcome the opportunity to combine the abstraction and intellectual rigour of mathematics with the more emotional enrichment of music. Graduates who, on the one hand, are numerate and highly competent in problem solving skills and, on the other hand, have experience on the music side of combining technical studies (such as analytical listening, performance and composition) with historical and critical work are in considerable demand in a wide variety of areas of employment. This degree may lead to possible exemption from some Core Technical professional actuarial examinations depending on option choices made. Transfer to this programme is normally only possible early in Semester 1 from a number of other programmes in the School.

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 academic unit uses a wide variety of modern learning and teaching methods involving small group tutorial work 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.

## 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 physical models;
- Clarify the nature of musical experiences, explore musical repertoires and their cultural contexts, and study the relevance of music and music-making to societies past and present;
- Link aural to verbal articulations of musical ideas;
- Understand the relationships between theory and practice;
- Engage with musical processes and materials, whether through composition, performance, analysis or criticism;
- 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. Musical repertoires, the practices involved in their creation, performance, and transmission, and the historical and technical issues that inform knowledge about them;
- A6. The processes of composition, performance and reception;
- A7. Aural, analytical and practical musical skills;
- A8. Elements of history, cultural theory, literature, iconography, anthropology, ethnography, and the physical and technological sciences relevant to the study of music.

## Teaching and Learning Methods

Acquisition of knowledge and understanding of A.1 through A.8 is through structured exposition based on lectures, tutorial classes, workshops, private study, tutor-led and student-led seminars, and instrumental lessons, 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 examinations, regular marked coursework, class tests and computer-based work, together with a small component of project work. This variety of assessment relates to A.1 through A.4, 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. Music assessment may include formal examinations or performances, extended written submissions such as a dissertation or composition folio, essays, study diaries, shorter pieces of assessed coursework, individual and group presentations, and listening tests.

## 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 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. A range of musical skills, possibly including: musical cognitive skills, aural and analytical skills, performance skills, compositional skills, and/or music technology skills.

### **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.

### **Assessment Methods**

The various methods of assessment described above involve problem-solving (B.1) in addition to the assessment of knowledge and understanding (B.2, B.4 through B.6). The various methods of musical assessment are described above and cover the skills listed in B.6.

## **Transferable and Generic Skills**

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

- C1. Communicate mathematical ideas in written form;
- C2. Undertake oral presentations;
- C3. Demonstrate group-working skills;
- C4. Use and obtain information from a variety of different sources including the internet, books and other printed material;
- C5. Use the skills you have acquired (eg time-management, organisation, problem-solving, critical analysis, independent learning, etc) for life-long learning.

### **Teaching and Learning Methods**

Special classes devoted to study skills are offered during the first year, 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.

Your musical key skills will be developed, where appropriate, through lectures, tutor-led and student-led seminars, group projects, individual and group performances, involvement in performing organisations, independent research, individual tutorials and instrumental lessons.

## Assessment Methods

Throughout the programme the clear communication of Mathematics and Music 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 (4.1 , 4.2). Project work and coursework assessment also relate to 4.4, and where appropriate, 4.3. The skills referred to in 4.5 refer to problem-solving, an integral component of all mathematical work, and other learning skills are implicit.

Depending on the nature of your musical activity (musicology, composition, performance), you will be able to demonstrate your key skills through examinations or performances, extended submissions such as a dissertation or composition folio, essays, study diaries, shorter pieces of assessed coursework, individual and group presentations, and involvement in performing organisations. Progression is recognised in the assessment scheme, which tests transferable skills at appropriate years of study.

## Programme Structure

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The programme structure table is below:

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

### Part I

Typical course content

This programme allows you to combine your study of mathematics with music. The two subjects have a particular affinity, as they are each concerned with exploring abstract structure. Certainly some aspects of music can be thought of as "mathematics for the ear". Conversely, mathematics has an aesthetic of its own: an elegant proof is like a poem or a piece of music.

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.

Programme details

The structure of the programme and the modules currently offered are set out below. Of the modules shown against each part of your programme, some are compulsory (ie enrolment is automatic) and others are optional. Against each part, 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 list of optional modules will be available to you via the Student Record Self-Service system once you enrol at the University.

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 (i.e. 8 modules (60 ECTS/120 CATS) in each part of the programme. Each credit can be considered as the equivalent of approximately ten hours of study. Most of the modules offered in this programme 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 16 MATHxxxx and 8 MUSI/HUMAxxxx modules in 3 parts, and at least 4 MATH3xxx and 3 MUSI/HUMA3xxx 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
MATH1024	Introduction to Probability and Statistics	7.5	Compulsory
MATH1049	Linear Algebra II	7.5	Compulsory
MATH1060	Multivariable Calculus	7.5	Compulsory

#### Part I Core

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

#### Part I Optional

Code	Module Title	ECTS	Type
MUSI1017	Composition Fundamentals	7.5	Optional
MATH1057	Dynamics and Relativity	7.5	Optional
MUSI1020	Exploring Music 1	7.5	Optional

MUSI1021	Exploring Music 2	7.5	Optional
MUSI1016	First Year Performance Tuition (single module)	7.5	Optional
MUSI1007	Fundamentals of Analysis, Counterpoint and Harmony	7.5	Optional
MATH1058	Operational Research I and Mathematical Computing	7.5	Optional
MUSI1014	Transformations in Twentieth-Century Music: Pop, Jazz, Art Music and Beyond	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

### Part II Optional

Code	Module Title	ECTS	Type
MATH2045	Vector Calculus and Complex Variable	7.5	Optional
MUSI2020	Conducting	7.5	Optional
MATH2044	Fields and Fluids	7.5	Optional
MATH2049	Geometry and Topology	7.5	Optional
MATH2003	Group Theory	7.5	Optional
MUSI2094		7.5	Optional
MUSI2024	Jazz Theory	7.5	Optional

MUSI2116	Music Therapy 1: Fundamentals	7.5	Optional
MATH2011	Statistical Distribution Theory	7.5	Optional
MATH2010	Statistical Modelling I	7.5	Optional

### Part III

#### Part III Compulsory

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

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

#### Part III Optional

Code	Module Title	ECTS	Type
MUSI3011	Ensemble Performance I	7.5	Optional
MUSI3106	Music Therapy 2: Beneath the Surface	7.5	Optional
MUSI3019	Studio Techniques 2	7.5	Optional
MATH3063	Actuarial Mathematics I	7.5	Optional
MATH3066	Actuarial Mathematics II	7.5	Optional
MUSI3003	Commercial Composition	15	Optional



MATH3023	Communicating and Teaching Mathematics	7.5	Optional
MATH3033	Graph Theory	7.5	Optional
MATH3052	Mathematical Biology	7.5	Optional
MATH3022	Mathematical Finance	7.5	Optional
MATH3018	Numerical Methods	7.5	Optional
MATH3006	Relativity, Blackholes and Cosmology	7.5	Optional
MATH3044	Statistical Inference	7.5	Optional
MATH3085	Survival Models	7.5	Optional

## Progression Requirements

The programme will follow the University's regulations for [Progression, Determination and Classification of Results: Undergraduate and Integrated Masters Programmes](#) or the University's regulations for [Progression, Determination and Classification of Results: Standalone Masters Programmes](#) as set out in the General Academic Regulations in the University Calendar: <http://www.calendar.soton.ac.uk/sectionIV/sectIV-index.html>

## 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.

- Module co-ordinators support. Module co-ordinators will be available at designated times during the week to discuss issues related to the particular modules you are studying at the time. This will be in addition to class contact time.

- Academic/personal tutor. As soon as you register on this programme, you will be allocated a personal tutor. S/he is a member of the academic team and will be available to discuss general academic issues related to the programme as well as offer advice and support on any personal issues which may affect your studies.

- Module handbooks/outlines. These will be available at the start of each module (often in online format). The handbook includes the aims and learning outcomes of the module, the methods of assessment, relevant background material to the module and a session-by-session breakdown of the module together with appropriate reading lists.

- Within the Faculty, administrative support is provided by your Student Office which deals with student records and related issues and with queries related to your specific degree programme.

## 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 surveys for each module of the programme
- Acting as a student representative on various committees, e.g. Staff: Student Liaison Committees, Faculty Programmes Committee OR providing comments to your student representative to feed back 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

The ways in which the quality of your programme is checked, both inside and outside the University, are:

- Regular module and programme reports which are monitored by the Faculty
- Programme validation, normally every five years.
- External examiners, who produce an annual report
- A national Research Excellence Framework (our research activity contributes directly to the quality of your learning experience)
- Institutional Review by the Quality Assurance Agency

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

## Career Opportunities

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Employability is embedded into modules from the first year onwards. 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.

## External Examiner(s) for the programme

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Name: Professor John Parker - University of Durham

Name: Dr Lawrence Pettit - Queen Mary College University of London

Name: Professor Malcolm Brown - University of Kent

Name: Professor Peter Duck - University of Manchester

Name: Dr Bryan White - University of Leeds

Name: Professor Joe Cutler - Birmingham City University

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 s/he takes 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
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	<p>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.</p> <p>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.</p>
Instruments and Equipment	Students taking music modules should be aware that they may need to cover the cost of accompanists for performance modules. Further additional costs may be incurred, typically these may include: replacement strings, reeds, repair of equipment, music scripts etc.
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>

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).