Programme Specification

A statement of the knowledge, understanding and skills that underpin a taught programme of study leading to an award from The University of Sheffield

Programme Details

1. Programme title	Financial Mathematics
2. Programme code	MASU05 (BSc)
3. QAA FHEQ level	Honours (BSc)
4. Faculty	Science
5. Department	School of Mathematics and Statistics (SoMaS)
6. Other departments providing credit bearing modules for the programme	Economics, Management School
7. Accrediting Professional or Statutory Body	Not applicable
8. Date of production/revision	January 2008, January 2009, March 2012, March 2016, September 2021, September 2022

Awards	Type of award	Duration
9. Final award	Bachelor of Science with Honours (BSc Hons) (MASU05)	3 years
10. Intermediate awards		

Programme Codes

11. JACS code(s) *Select between one and three codes from the [HESA website.](#)*	G100		
12. HECoS code(s) S*elect between one and three codes from the [HECoS vocabulary.](#)*	100401	100403	

Programme Delivery

13. Mode of study	Full-time
14. Mode of delivery	Full-time

15. Background to the programme and subject area

The growth of the financial services industry has been one of the striking features of economic life in recent years. Mathematics has played a pivotal role in this development and, as a result, there is a sizeable and growing demand, from financial institutions and the City, for people with appropriate technical skills and with an understanding of the relevant mathematics. This programme is designed to produce graduates with a suitable mathematical and financial background to enter careers, at the technical end of the financial services industry, as financial engineers, or quantitative analysts.

Until the early fifties, finance was more of an art than a science. This changed with the emergence of key ideas such as *risk and return* and *diversification*. The subject of financial mathematics really took off in 1973 with the discovery of the famous Black-Scholes formula, which features prominently in the programme. This formula enabled analysts to price options satisfactorily for the first time and this success has led to the dramatic growth in the volume of trading in financial derivatives.

As investors know well, stock prices are unpredictable. The unavoidable uncertainty and variability in future price movements makes the area a natural field of application for the methods and viewpoint of probability and statistics. Just as the ordinary calculus has long been fundamental in science and engineering, a new calculus, known as Itô's calculus or financial calculus, has been developed to handle stochastic processes where movements are caused by randomness or driving noise. Stochastic processes have become central in finance, providing the machinery needed to handle the pricing and hedging of financial derivatives, and are at the centre of the final year of this programme.

The School of Mathematics and Statistics (SoMaS) is composed of three areas: Applied Mathematics, Pure Mathematics and Probability & Statistics. All three areas contribute to the programme, reflecting the necessary breadth of mathematical knowledge for success in this area. We have the support of the Management School and the Department of Economics who provide modules that help students to put their mathematical knowledge in context. We are fortunate in having, both in SoMaS and in the Management School, staff with experience as practitioners. SoMaS has rich experience of teaching relevant topics such as linear programming and partial differential equations, and staff with research expertise in stochastic processes.

Further information is available from the school web site: http://www.shef.ac.uk/maths

16. Programme aims

BSc Financial Mathematics aims to:	
A1	provide degree programmes with internal choice to accommodate the diversity of students' interests and abilities;
A2	provide an intellectual environment conducive to learning;
A3	prepare students for careers which use their mathematical and/or statistical training;
A4	provide teaching which is informed and inspired by the research and scholarship of the staff;
A5	provide students with assessments of their achievements over a range of mathematical and statistical skills, and to identify and support academic excellence;

A6	provide students with a suitable mathematical and financial background to enter careers in the financial services industry.

17. Programme learning outcomes

Knowledge and understanding

On successful completion of the programme, students will be able to demonstrate knowledge and understanding of:

		Links to Aim(s)
K1	the methods of linear mathematics and advanced calculus;	2-6
K2	key fundamental concepts in Probability & Statistics, including some more specialist topics such as stochastic processes;	1-6
K3	aspects of finance, and particularly applications of mathematics to finance.	1-6

Skills and other attributes

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

S1	demonstrate skill in calculation and manipulation;	1-3, 5
S2	understand and evaluate logical arguments, identifying the assumptions and conclusions made, and develop their own arguments;	1-3, 5
S3	demonstrate the skills to model and analyse physical or practical problems, including the use of computer packages;	1-3, 5, 6
S4	present arguments and conclusions effectively and accurately;	2, 3, 5, 6
S5	appreciate the development of a general theory and its application to specific instances;	1-3, 5, 6
S6	acquire further necessary mathematical skills, if appropriate, to consider careers as practising mathematicians or statisticians, particularly in finance.	1-6

18. Learning and teaching methods

Lectures
A 10-credit lecture SoMaS module (or half-module) at Level 1 or 2 generally comprises 22 lectures supported by a weekly or fortnightly problems class. At Level 3, a typical 10-credit module has around 20 lectures. The lecturing methods used vary. Effective use is made of IT facilities, for example through computer demonstrations using data projectors. Students also learn mathematical techniques and theories through seeing problems being solved and results proved in lectures. Theory is developed and presented in a clear and logical way and is enhanced by the use of illustrative examples. In many modules, supporting written material is circulated. Some Level 3 modules include an element of project work for which guidance is provided in lectures.

Problems classes
At Levels 1 and 2, lecture groups are divided into smaller groups for problems classes lasting fifty minutes. Ample opportunity is provided for students to obtain individual help. Coursework, usually in the form of sets of problems, is regularly set and marked and feedback is given. This is usually administered through the problems classes. For the 40-credit "core" module at Level 1, students meet weekly in small groups with their personal tutor, and may be required to present their solutions and

participate in group discussions. Setting of coursework continues into Level 3, together with the associated feedback, but, due to the expected increasing maturity of students, the formal mechanism provided by problems classes is replaced by informal contact with the module lecturer.

Computing and Practical Sessions

At Level 1 all students on this programme are provided with training in the use of R, and optional modules at all later levels include the possibility of extending this knowledge.

Teaching in the Social Science Modules

Teaching in the Management and Economics modules uses lectures to impart essential knowledge, staff-led tutorials for groups of about 16 students, individual tutorials and a degree of independent study depending on the module.

19. Assessment and feedback methods

Most SoMaS modules are assessed by formal examinations, augmented in some cases by a component of assessed coursework; several modules include an element of the latter. The most common format involves the regular setting of assignments, each consisting of a number of problems based on material recently covered in lectures. Some modules include a project and/or poster presentation. Examinations are normally of 1.5, 2 or 2.5 hours' duration. Where a module is assessed both by examinations and by coursework, the latter contributes between 10% and 30% of the final mark.

The learning outcomes are assessed, primarily through examinations, in appropriate core modules and in the approved modules. As students' progress through the programmes, less explicit guidance on selection of techniques is given and, in examinations and other assessment, more is expected in terms of formulation of problems and in solving problems requiring several techniques or ideas. Aspects of the use of computer packages are assessed by coursework in the appropriate modules.

Assessment in the Social Science Modules

Assessment in the Management and Economic modules is by combinations of essays, reports and examinations.

20. Programme structure and student development

The teaching year is divided into two semesters each of fifteen weeks, the final three weeks of each being devoted to examinations. The programmes are fully modular, being delivered at Levels 1-3 mainly in 10-credit modules, taught and examined during a single semester, and in 20-credit modules, often examined at the end of the year. Each year of study represents 120 credits.

At Level 1 students take 80 credits of SoMaS modules. One is a core module on all single and dual programmes involving SoMaS. The material in this module comprises mathematical methods and the topics included are selected by the School with a view to the potential for application. This core module is augmented by two 20-credit SoMaS modules, in areas most relevant to the mathematics needed in finance, and 40 credits from the Management School or Economics providing a flavour of finance from a non-mathematical viewpoint. At Level 2, there are again 80 credits from within SoMaS, including a 30-credit module core to all programmes involving SoMaS, as well as other relevant modules, and students take 40 credits from a list of relevant Economics or Management modules. At Level 3 there are 40 core credits in topics central for mathematical finance. Students choose 40 credits from an approved list of SoMaS modules, some chosen for their applicability to finance, and 40 credits from an approved list of modules from Economics and the Management School.

Classification of the final degree is subject to the University of Sheffield General Regulations. Level 1 serves as a qualifying year and does not contribute to degree classification. The weighting for Levels 2 and 3 is 1:2.

The subject is essentially linear with key skills and core knowledge taught at Level 1 or Level 2 required at subsequent levels.

Level 1 introduces students to university level mathematics and establishes the mathematical base for the programme with instruction in areas such as calculus, differential equations and probability. Most modules include both theory and applications and develop key technical skills for use throughout the programme. Training in appropriate computer packages is given in the Probability and Statistics module and elsewhere.

At **Level 2,** students extend their knowledge of theory, gain further experience of application and consolidate their key skills. Some modules introduce new topics, while others involve more advanced material in areas, such as probability and differential equations, that have already featured at Level 1. In some modules the theoretical treatment is more formal than at Level 1. In calculus, students gain experience and understanding of the multivariable situation.

By **Level 3** students should have acquired sufficient mathematical background and maturity to cope with advanced topics, in particular stochastic processes, and their application to finance. Modules at this level are more specialised, and the options are consistent with the principles outlined in reference points (1), (3) and (4). Some of these modules continue the development of topics from earlier years and others, though requiring knowledge and skills already acquired and the corresponding degree of mathematical maturity, introduce topics that are essentially new.

Detailed information about the structure of programmes, regulations concerning assessment and progression and descriptions of individual modules are published in the University Calendar available online at http://www.sheffield.ac.uk/calendar/.

21. Criteria for admission to the programme

Detailed information regarding admission to programmes is available from the University's On-Line Prospectus at http://www.shef.ac.uk/courses/.

22. Reference points

The learning outcomes have been developed to reflect the following points of reference:

Subject Benchmark Statements
https://www.qaa.ac.uk/quality-code/subject-benchmark-statements

Framework for Higher Education Qualifications (2014)
https://www.qaa.ac.uk/docs/qaa/quality-code/qualifications-frameworks.pdf

University Strategic Plan
http://www.sheffield.ac.uk/strategicplan

Learning and Teaching Strategy (2016-21)
https://www.sheffield.ac.uk/polopoly_fs/1.661828!/file/FinalStrategy.pdf

23. Additional information

Personal Tutorials
The School of Mathematics and Statistics runs a personal tutorial system. All students are allocated a personal tutor from the School at the outset of their University career. It is hoped that the association will remain during the whole of each student's course. However, a system is in place to allow a student to transfer to another tutor if they wish. Personal tutors provide personal support and academic guidance, acting as a point of contact and gateway for University support services, such as Careers and the Counselling Service.

Students are expected to see their tutor at scheduled sessions, the frequency of which is highest at Level 1, and may contact their tutor at other times.

In addition to the pastoral support of their SoMaS personal tutor, students on this programme have the support of the SoMaS Programme Leader who provides specialist support arising from the nature

of this programme. The Senior Tutor is responsible for all day-to-day issues for individual students, liaising with the Programme Leader for students on this programme.

In addition, SoMaS has an active Staff-Student Forum and there is a lively Student Maths Society.

The web page for SoMaS is at http://www.shef.ac.uk/maths

This specification represents a concise statement about the main features of the programme and should be considered alongside other sources of information provided by the teaching department(s) and the University. In addition to programme specific information, further information about studying at The University of Sheffield can be accessed via our Student Services web site at http://www.shef.ac.uk/ssid.