Programme Specification

1 Awarding institution: University of Newcastle upon Tyne

2 Teaching institution: University of Newcastle upon Tyne

3 Final award: B.Sc. (Hons)

4 Programme title: Financial Mathematics

5 Accrediting Bodies: None

6 UCAS Code: GN13

7 QAA Benchmarking Groups: Mathematics, Statistics and Operational Research; Accounting

8 Date of production/revision: 23 August 2004

9 Programme Aims:

- To produce graduates who have a sound, broad knowledge of the fundamental aspects of mathematics and statistics.

- To develop students' ability to reason logically and their capacity for mathematical and statistical thinking.

- To provide a modern introduction to financial mathematics and accounting.

- To provide the fundamental knowledge required to tackle practical problems in financial mathematics.

- To provide an understanding of model assumptions and when they are violated.

- To develop mathematical skills including the pricing and hedging of financial instruments.

- To develop skills in written and oral communication.

- To provide the knowledge to be able to use information technology in this area.

- To equip students with the knowledge and skills to apply mathematics and statistics in the business world.

- To equip students with the knowledge and skills required to work in banking and finance or areas within management which require good quantitative skills.

- To provide a sound grounding in the conceptual and applied aspects of finance.

- To provide a programme which meets the FHEQ at Honours level and which takes appropriate account of the subject benchmark statements in Mathematics, statistics and operational Research and Accounting

10 Intended Learning Outcomes

A. Knowledge and Understanding
At the end of the course students will be expected to have:

A1.   An understanding of fundamental concepts and methods of mathematics and statistics.

A2.   Knowledge and experience of theoretical concepts and analytical techniques in mathematics and statistics.

A3.   The knowledge and experience to tackle practical problems in financial mathematics.

A4.   An understanding of some of the principles of financial reporting and management accounting.

A5.   Familiarity with some relevant information technology.

A6.   Knowledge and understanding of chosen specialist areas in financial mathematics.

A7.   An understanding of model assumptions and when they are violated.

A8.   Knowledge of the fundamental techniques used in the pricing and hedging of financial instruments.

A9.   The knowledge to apply mathematics and statistics in the business world.

A10.   An understanding of the principal models used in finance and their application to the financial management of multinational corporations.

A11.   An in-depth understanding of either the concepts and rules of financial reporting or of the principal techniques of management accounting and their application to firms.

A12.   An awareness of academic research in finance.

Mapping Teaching and Learning Strategies and Methods
Acquisition of A1-A12 is through a combination of lectures, coursework and projects.

Assessment Strategies and Methods
The testing of the knowledge base is through a combination of unseen written examinations (A1-A12) and assessed coursework (A1-A12) in the form of projects, assignments and programming exercises.

B. Subject Specific/Professional Skills
Students will be able to:

B1.   Apply their knowledge of financial mathematics to financial problems;

B2.   Use and apply programming languages and software to financial problems;

B3.   Record and summarise transactions and prepare financial statements;

B4.   Solve problems in accounting and finance;

B5.   Apply financial models;

B6.   Exercise numerical and computational skills.

Mapping Teaching and Learning Strategies and Methods
Acquisition of B1-B6 is through a combination of coursework and projects.

Assessment Strategies and Methods
The testing of the knowledge base is through a combination of unseen written examinations (B1-B6) and assessed coursework (B1-B6) in the form of projects, assignments and programming exercises.

C. Cognitive Skills
At the end of the course students will have:

C1.   A facility for mathematical and statistical thinking;

C2.   A facility for the critical evaluation of arguments and evidence;

C3.   The skill to formulate complex financial issues in a quantitative way;

C4.   Skill in the organisation and interpretation of data;

C5.   The ability to draw conclusions from data supplied to the student or acquired by the student.

Mapping Teaching and Learning Strategies and Methods
Acquisition of C1-C5 is through a combination of lectures, coursework and projects.

Assessment Strategies and Methods
The testing of the knowledge base is through a combination of unseen written examinations (C1-C5) and assessed coursework (C1-C5) in the form of projects, assignments and programming exercises.

D. Key (transferable) Skills

The programme provides opportunities for students to develop:

D1.   The ability to communicate orally in English;

D2.   Written communication skills;

D3.   The ability to use computer-based information resources;

D4.   Numeracy and problem-solving skills;

D5.   IT literacy;

D6.   The facility to work independently.

Mapping Teaching and Learning Strategies and Methods
Acquisition of D1-D6 is through a combination of coursework and projects.

Assessment Strategies and Methods
The testing of the knowledge base is through a combination of unseen written examinations (D1-D6) and assessed coursework (D1-D6) in the form of projects, assignments and programming exercises.

Throughout the learner is encouraged to undertake independent reading both to supplement and consolidate what is being taught/learnt and to broaden their individual knowledge and understanding of the subject.

11 Programme Features, Curriculum, and Structure

The Programme will be regulated by the Board of Studies in Financial
Mathematics, which will be convened by the Director of Teaching in the
School of Mathematics and Statistics, or his nominee. The membership of
the Board will comprise all academic staff involved in the delivery of
the programme and will include a representative of the Business School
nominated by the Head of the Business School.

(i) Programme Features

(a) the duration of the course: 3 years

(b) the number of Stages: 3

(c) the overall credit arrangements

In each year, students on the BSc degree will take 120 credits divided between two subject areas as
follows:

• 80 credits of modules offered by the School of Mathematics and Statistics (the modules
   in Financial Mathematics will be compulsory)

• 40 credits from an approved list of modules offered by the Business School.

(d) the module credit arrangements: see below for the list of modules.

(e) requirements for progression are as detailed in the University Degree Programme
    Regulations and Examination conventions.

(f) innovative features of the course
This degree scheme will introduce students to the application of advanced mathematical and
statistical techniques to finance.

(ii) Curriculum and Structure
This major-minor degree programme combines Mathematics and Statistics applicable to finance
with Accounting. To be able to read and understand the literature of financial mathematics a
student must have a sound grounding in core mathematical techniques, such as calculus, differential
equations, real analysis, linear algebra etc., which are substantial bodies of knowledge and which
are covered in the core Stage 1 and 2 modules. At each stage there will be at least 40 credits of a
specifically financial or accountancy nature over the two Schools. At Stage 3 there will be a choice
of at least 70 credits of material directly relevant to finance or accountancy.

Stage 1
All students are required to take the following modules:

Module	Credit:	Status*	Descriptive Title
MAS102	10 + 10	cp	Mathematical Methods
MAS111	10 + 10	cp	Mathematical Modelling and Differential Equations
MAS121	10 + 10	cp	Number Systems and the Foundations of Analysis
MAS131	10 + 10	cp	Introduction to Probability and Statistics

together with modules to a total credit value of 40 credits from the list of available Business School modules below:

Module code:	Credit:	Status*	Descriptive Title
ACC101	10 + 10	cr	Foundations of Accounting
ACC102	10	cp	Introduction to Information Technology,
ACC106	5 + 5	cr	Introduction to Business Finance.

* (cp) means compulsory, (cr) means compulsory and core

Stage 2
All students are required to take the following modules:

Module code:	Credit:	Status*	Descriptive Title
MAS251	10	cp	Mathematical Methods
MAS252	10	cp	Mathematical Modelling,
MAS267	10	cp	Introduction to Financial Mathematics
MAS261	10	cp	Fields Polynomials and Vector Spaces,
MAS262	10	cp	Sets, Functions and Permutations,
MAS271	10	cp	Foundations of Probability,
MAS272	10	cp	Foundations of Statistics.

together with modules to a total credit value of 40 credits from the list of available Business School modules below:

Module code:	Credit:	Status*:	Descriptive Title
ACC203	10 + 10	op	Financial Control,
ACC205	10 + 10	op	Income Measurement,
ACC207	10 + 10	cr	Corporate Finance.

* (cp) means compulsory, (cr) means compulsory and core, and (op) means optional.

The remaining 10 credits are selected from a list of appropriate modules offered by the School of Mathematics and Statistics. Selection from the following modules will be recommended but alternative modules may be substituted with the agreement of the Degree Programme Director.

Module code:	Credit:	Descriptive Title	Subject
MAS227	10	Complex Variable	M
MAS253	10	Programming for Mathematics	M
MAS233	10	Statistical Methods	S
MAS234	10	Applied Probability	S

§ M – mathematics; S - statistics

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Stage 3

All students are required to take the following modules:

Module code:	Credit:	Status*	Descriptive Title
MAS323	10	cp	Further Modelling
MAS357	10	cp	Time Series and Forecasting
MAS358	10	cp	Financial Modelling

together with modules to a total credit value of 40 credits from the list of available Business School modules below:

Module code:	Credit:	Status	Descriptive Title
ACC306	10 + 10	cp	International Financial Management,
ACC301	10 + 10	op	Financial Accounting,
ACC302	10 + 10	op	Management Accounting,
ACC317	10 + 10	op	Derivative Securities.

Here (cp) means compulsory, (cr) means core, and (op) means optional.

The remaining 50 credits are selected from a list of appropriate modules offered by the School of Mathematics and Statistics. Selection from the following modules will be recommended but alternative modules may be substituted with the agreement of the Degree Programme Director.

Module code:	Credit:	Descriptive Title	Subject
MAS313	10	Numerical and Computational Modelling	M
MAS329	10	Numerical Recipes	M
MAS336	10	Linear Systems	M
MAS344	10	Linear Analysis	M
MAS348	10	Measure Theory	M
MAS352	10	Techniques of Regression	S
MAS354	10	Bayesian Statistics	S
MAS362	10	An Introduction to Statistical Modelling	S

§ M – mathematics; S - statistics

Intended Learning outcomes

Stage 1

Module code:	Status	Intended Learning outcomes
MAS102	cp	A1, A2, D2, D4
MAS111	cp	A1, A2, C1, D2, D4
MAS121	cp	A1, A2, C1, D2, D4
MAS131	cp	A1, A2, C1, D2, D4
ACC101	cr	A4, B1, B3, D1, D2
ACC102	cp	A4, A5, B2, D1, D2, D3, D5
ACC106	cr	A4, A9, A10, A11, B1, B3, D1, D2

Stage 2

Module code:	Status	Intended Learning Outcomes
MAS251	cp	A1, A2, A7, C1, D2
MAS252	cp	A1, A2, A7, C1, D2
MAS267	cp	A1, A3, A6, A7, A8, B1, B4, B5, B6, C1, C3, D2
MAS261	cp	A1, A2, C1, D2
MAS262	cp	A1, A2, C1, D2
MAS271	cp	A1, A2, C1, D2
MAS272	cp	A1, A2, C1, D2
MAS227	op	A1, A2, C1, D2
MAS253	op	B2, D2, D3, D5, D6
MAS233	op	A1, A2, C1, D2
MAS234	op	A1, A2, C1, D2
ACC203	op	A4, A6, A10, B1, B3, B4, B5, C5, D1, D2
ACC205	op	A4, A6, B1, B3, B4, B5, C5, D1, D2
ACC207	cr	A4, A6, A10, A11, B3, B4, B5, C5, D1, D2

Stage 3

Module code:	Status	Intended Learning outcomes
MAS323	cp	A1, A2, A3, A5, A6, A7, A8, B1, B4, B5, C1, D2, D6
MAS357	cp	A1, A2, A3, A6, A7, A12, B1, B4, B5, C1, C3, D2, D6
MAS358	cp	A1, A2, A3, A6, A7, A8, A12, B1, B4, B5, C1, C3, D2, D6
MAS313	op	A1, A2, B2, C1, C5, D2, D3, D5, D6
MAS329	op	A1, A2, A12, B2, B6, C1, C5, D2, D3, D5, D6
MAS336	op	A1, A2, C1, D2, D6
MAS344	op	A1, A2, C1, D2, D6
MAS348	op	A1, A2, C1, D2, D6
MAS352	op	A1, A2, A7, C1, C2, C4, D2, D6
MAS653	op	B2, D2, D3, D5, D6
MAS354	op	A1, A2, A7, C1, C2, C4, C5, D2, D6
MAS362	op	A1, A2, A7, B2, C1, C2, C4, C5, D2, D3, D5, D6
ACC306	cp	A3, A4, A6, A10, A11, B1, B3, B4, B5, C5, D1, D2, D6
ACC301	op	A3, A4, A6, A11, A12, B1, B3, B4, B5, B6, C3, C4, C5, D1, D2, D6
ACC302	op	A4, A6, A11, A12, B1, B3, C2, C5, D1, D2, D6
ACC317	op	A3, A6, A12, B1, B4, B6, C3, C4, C5, D1, D2, D6

12 Criteria for Admission

Overview
The university enrols approximately 110 students each year to single honours degree programmes in Mathematics and Statistics. We will enrol about 10 onto the Financial Mathematics BSc degree programme. Admission of these students is conducted by the admissions staff in the School.

Applications
An academic member of the admissions staff considers each application (UCAS form). On the basis of this information it is decided whether to offer the applicant a place and if so what the terms of the offer are to be. Offers are intended to indicate a minimum standard that we require of our new students and are the primary mechanism by which we control the quality of our intake.

Mature students, or those with non-standard qualifications, are interviewed whenever this is practical (by telephone if necessary) before any offer is made.

Open Days
The School holds 5 open days between November and March. The Open Day programme covers an afternoon and involves informative talks, one-to-one meetings with lecturing staff, tours of the campus and city and contact with undergraduates. We strongly encourage applicants to attend an open day and, to this end, we offer a contribution to travel expenses for those travelling long distances.

Bursaries
The School offers some bursaries towards tuition fees for applicants who confirm degree programmes in Mathematics and Statistics at Newcastle as their first choice and meet the conditions of our offer in full.

Other recruiting activities

The School contributes two one-hour sessions for potential applicants and their relatives at the University Visit Days. The School also hosts two annual conferences for teachers and either Year 11 or Year 12 pupils of local schools. The conferences, intended to give pupils an impression of University life and provide contact between staff and school-teachers, involve an afternoon of lectures and, particularly for the Year 12 conference, discussions with both pupils and teachers.

13   Support for Students and their Learning:

Induction

The School provides a comprehensive induction programme for new students, which introduces the facilities for study available both at University and School level. On acceptance, students are sent a copy of the student handbook and its contents are discussed with them at induction. Students are also offered general advice about the course structure and the choices open to them at Stage 1. The handbook includes information about the School, and on the respective roles and responsibilities of staff and students. In other sessions, guidance is given on study skills and IT skills using the booklets "Winning at Mathematics" and "Introduction to the Oracle cluster", which are issued to all new students. A senior teacher from a local school addresses new students on the transition from School/College to University life. The School's handbooks were identified as examples of "good practice" by both the Faculty Teaching Committee and the Subject Review panel.

At subsequent stages, advice is provided about course structure, and the pathways open to students, at general meetings held in April; this allows students to pre-register their choice of modules in early May, for the following academic year, so that the timetable can be organised to allow the maximum number of student choices. Further detailed advice about modules is available during Induction Week at the start of the next academic year. Students also discuss their choices with their personal tutors and, where necessary, with the Degree Programme Directors (DPDs). Changes of module choices from pre-registration are allowed subject to the constraints of the timetable. Revision sessions on key material taught the previous year are provided to help students to prepare for their new modules.

Academic and Pastoral Support

General help on academic problems is available in class tutorials (see Section 2) and from lecturers individually.

Each student has a personal tutor who is responsible for providing access to pastoral care. Students identified on entry as requiring particular support (e.g. mature students, international students, students with disabilities, or those with an unusual background) are assigned to more experienced tutors. In a change of policy arising from a Teaching Forum on pastoral care, tutors meet their tutees at the start of the year and at the end of terms 1 and 2, rather than at the start of each semester. Support for students who encounter serious personal difficulties is provided by the University's Student Counselling Service. In addition, more general advice is available from the Student Advice Centre.

The School has a Degree Programme Director and three Assistant DPDs who each take responsibility for particular stages of study. They monitor the progress of students as described below.

Monitoring Student Progress

The performance of all students is carefully monitored. Records of work handed in and marks obtained on all modules are held by the Degree Programme Directors. In Stage 1, attendance at tutorials is also checked, and absentees contacted, in order to encourage good work habits.

The progress of all students is reviewed regularly by the DPDs; students, who give cause for concern (whether by failing to hand in work or by poor performance), are called in by the relevant DPD. The problems are discussed, and help and advice are offered. Persistent offenders may be required to demonstrate regular attendance at all classes by obtaining lecturers' signatures. Personal tutors are advised when a tutee's progress is giving cause for concern.

Careers Advice
The University Careers Service provides support and advice for students throughout their course of study. One of the careers advisers gives an introductory talk to Stage 1 students at induction and further talks in subsequent stages. At Stage 2, students are invited to assess their personal skills and are given guidance as to ways in which their skills profile might be improved. Also in Stage 2, students are given advice on how to prepare a draft CV. Early in their final year, students are given further advice on the career opportunities available and are encouraged to use the Careers Service facilities. Personal tutors, and one or two members of staff with particular experience, are also able to offer guidance.

For those students wishing to proceed to further academic study or research, a presentation is organised by the Director of Postgraduate Teaching.

Learning Resources: Physical

Many lectures take place in Merz Court. The lecture and tutorial rooms within the School are of a good standard and suitable for their purpose.

The computer cluster in Merz Court has 40 fast PCs (running WindowsXP) and 2 laser printers. It is conveniently situated within the School and is used as the primary teaching laboratory for practical classes. Mathematics and Statistics students also use the cluster when carrying out homework assignments and for general IT purposes, such as word-processing.

The cluster provides access to campus-wide facilities such as the central file space servers, electronic mail and the internet. Extensive software is available, ranging from the general, such as standard Microsoft applications (Word, Excel etc.), to the technical, such as the statistical package Minitab and the general symbolic algebra package Maple. The campus-wide windows network ensures that software and data sets used in our modules are accessible from any cluster (including the Halls of Residence), which is of great convenience to all users, both staff and students. A teaching room in the School has been designated as a reading room for private study by students; this facility is well-used. Students have access to a full-range of library services provided by the award-winning Robinson library.

Learning Resources: Staff

The academic staff are the primary teaching and learning resource. Staff have a wide range of experience in Mathematics and Statistics, with particular expertise in the research areas of functional analysis, group theory, fluid dynamics, cosmology, applied statistics, medical statistics and applied probability. Some staff also have extensive consultancy experience. This expertise informs our teaching, especially at the more advanced levels. All experienced staff act as personal tutors to students.

PhD students in the School also contribute to teaching by marking homework and conducting some first-year tutorials.

The academic staff and students are supported by the clerical staff in the General Office. The secretaries deal with many student enquiries on a day-to-day basis and they provide a helpful and friendly service.

The Computer Officer is responsible for maintaining the School's computing facilities and in advising on the purchase of hardware and software.

14 Methods for evaluating and improving the quality and standards of teaching and learning

Module reviews
Routine use is made of module questionnaires. The School uses a web based questionnaire which relates to individual modules and the Degree Programme in general. These questionnaires are summarised for discussion at Staff-Student Committee and Board of Studies. Changes to, or the introduction of new, modules are considered at the School Teaching and Learning Committee and at the Board of Studies. Student opinion is sought at the Staff/Student Committee and/or the Board of Studies. New modules and major changes to existing modules are subject to approval by the Faculty Teaching and learning Committee.

Programme reviews
The Board of Studies conducts an Annual Monitoring and Review of the degree programme and reports to Faculty Teaching and Learning Committee.

External examiner reports
External Examiner reports are considered by the Board of Studies under Reserved Business, in the absence of the student representatives. The Board responds to these reports through Faculty Teaching and Learning Committee.

Student evaluations
All modules, and the degree programme, are subject to review by student questionnaires. Informal student evaluation is also obtained at the Staff/Student Committee, and the Board of Studies.

Feedback mechanisms
 Feedback to students is achieved via the Staff/Student Committee and the Board of Studies.

Faculty and University Review Mechanisms
The Programme is subject to the University's Internal Subject Review programme which occurs approximately every 5 years and which includes a QAA trained reviewer and external reviewers who assist University staff to assess the quality of provision.

15 Regulation of Assessment

The Programme will be regulated by the Board of Examiners in Financial Mathematics, which will be convened by the Director of Teaching in the School of Mathematics and Statistics, or his nominee. The membership of the Board will comprise all academic staff involved in the delivery of the programme and will include a representative of the Business School nominated by the Head of the Business School.

Pass Marks
The pass mark, as defined in the University's Undergraduate Examination Conventions (http://www.ncl.ac.uk/calendar/university.regs/ugexamconv.html), is 40.

Course Requirements
Progression is subject to the University's Undergraduate Progress Regulations (http://www.ncl.ac.uk/calendar/university.regs/ugcont.html) and Undergraduate Examination Conventions (http://www.ncl.ac.uk/calendar/university.regs/ugexamconv.html). In summary, students must pass 120 credits at each Stage. Limited compensation down to 35 is possible at each Stage and there are resit opportunities, with certain restrictions.

Weighting of Stages
Modules taken at Stages 2 and 3 are Honours modules and the two stages contribute to the award of the final degree in the ratio 2:3.

Common Marking Scheme
The University employs a common marking scheme, which is specified in the Undergraduate Examination Conventions (http://www.ncl.ac.uk/calendar/university.regs/ugcont.html), namely

	Honours	**Non-honours**
<40	Fail	Failing
40-49	Third Class	Basic
50-59	Second Class, Second Division	Good
60-69	Second Class, First Division	Very Good
70+	First Class	Excellent

Role of the External Examiner
An External Examiner, a distinguished member of the subject community, is appointed by Faculty Teaching and Learning Committee, after recommendation from the Board of Studies. The External Examiner is expected to:

> See and approve examination papers
> Moderate examination and coursework marking
> Attend the June Board of Examiners
> Report to the University on the standards of the programme

All work is marked against the University mark scheme for which the `pass mark' is 40 and for which there are published marking criteria supplemented, as appropriate, for specific pieces of work, with additional criteria.

16 Indicators of Quality and Standards

The School of Mathematics and Statistics was awarded an excellent 23 out of 24 points in the QAA Subject Review in 2000. We were particularly commended for excellent teaching, student support and guidance, learning resources, and for having a well structured curriculum.

In the 2001 Research Assessment Exercise, the Statistics and Pure Mathematics submissions were each awarded 5, and the Applied Mathematics submission was awarded 4.

17 Other Sources of Information

This specification provides a concise summary of the main features of the programme and of the learning outcomes that a typical student might reasonably be expected to achieve if she/he takes full advantage of the learning opportunities provided. The accuracy of the information contained is reviewed by the University and may be checked by the Quality Assurance Agency for Higher Education.

In addition, information relating to the course is provided in:

The University Prospectus

The School Prospectus

The University Degree Programme Regulations

The School Degree Programme Handbook: http://www.ncl.ac.uk/math/internal/

The QAA Subject Review Report

Newcastle Programme Specification

School of Mathematics and Statistics web page: http://www.ncl.ac.uk/math/undergrad/