



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

1	Programme Title	Statistics with Medical Applications
2	Programme Code	MAST21, MAST22
3	JACS Code	G300, G311
4	Level of Study	Postgraduate
5a	Final Qualification	MSc in Statistics with Medical Applications (MSc)
5b	QAA FHEQ Level	Masters
6a	Intermediate Qualification(s)	Postgraduate Diploma (PG Dip), Postgraduate Certificate (PG Cert)
6b	QAA FHEQ Level	L7
7	Teaching Institution (if not Sheffield)	Not applicable
8	Faculty	Science
9	Department	School of Mathematics and Statistics
10	Other Departments involved in teaching the programme	ScHARR
11	Mode(s) of Attendance	Full-time (MAST21), Part-time (MAST22)
12	Duration of the Programme	1 year (MAST21), 2 years (MAST22)
13	Accrediting Professional or Statutory Body	Royal Statistical Society
14	Date of production/revision	November 2008, revised March 2012, March 2016, April 2021

15. Background to the programme and subject area

Statistics (the subject) lies at the heart of Medicine. From John Snow's identification of the source of London cholera in the 1850s and Doll's & Hill's pioneering work on the link between lung cancer and smoking in the 20th century to genomics, proteomics and modern clinical trials, statistical ideas and methods have been crucial in many medical advances. More statisticians work in medicine, health and related fields than in any other area. Nevertheless, there is a shortage of well-qualified medical statisticians and therefore a substantial demand for high-quality postgraduate training in this area, including demand for such training in part-time distance-learning form.

The MSc in Statistics with Medical Applications provides both a practically-based professional training in the application of statistics to medical and related areas, and a foundation for those wishing to pursue further research. It is available via distance-learning (2-4 years, part-time) as an alternative to 1 year full-time study.. The programme is a development of that leading to the MSc in Statistics, which has been running successfully for many years. It builds on the provision of a firm grounding in practical statistical methodology and computation, including the development of the personal skills in demand by employers, from the established Statistics MSc programme, and adds to them development of an understanding of, and ability to apply, the concepts, models and tools of modern medical statistics. It provides an excellent foundation for a statistical career in medical areas, or for further study for a research degree.

The MSc is accredited by the Royal Statistical Society. The Society accords GradStat status with one year's relevant experience towards CStat status to all students who pass the course.

The programme is kept in close touch with the needs of employers through the programme's Advisory Board, whose members are drawn from the pharmaceutical industry, medical organizations, commerce and government. Students benefit from contacts with members of the Board, from meetings with employers through open days, from career presentations and through work on dissertation projects on medical and health-related topics.

16. Programme aims

The MSc aims to:

- (a) provide a high-quality thorough initial training for professional statisticians with a strong interest in medical, health and pharmaceutical applications;
- (b) provide an intellectual environment conducive to learning;
- (c) prepare students for careers which use their training in medical statistics;
- (d) provide teaching which is informed and inspired by the research and scholarship of the staff;
- (e) foster attitudes and confidence which will allow students to acquire new statistical knowledge throughout a subsequent career;
- (f) provide students with assessments of their achievements, and to identify and support academic excellence.

17. Programme learning outcomes

Knowledge and understanding:

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

K1	statistical theory, including Bayesian and frequentist approaches for statistical inference;
K2	a wide variety of statistical modelling techniques;
K3	computational methods for implementing statistical analyses;
K4	at least one statistical computing language;
K5	the application of statistical methods in medical research.

Skills and other attributes:

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

S1	identify and implement an appropriate statistical modelling method, when presented with a data analysis problem, including data analysis problems in clinical trials;
S2	produce written reports which describe statistical analyses and present the findings;
S3	use appropriate software for analysing data, implementing statistical modelling methods, and preparing written reports;
S4	communicate the results of statistical analyses to non-expert audiences;
S5	plan and complete an extended individual study of a statistical problem and to present the results in a dissertation.

18. Teaching, learning and assessment

Development of the learning outcomes is promoted through the following teaching and learning methods:

MAST21 is a full-time residential programme, with lectures, MAST22 is a part-time distance learning programme. They are as closely integrated as possible within the constraints this difference imposes. The distance learning version is designed so that students study the same subjects as students on the full time version.

Blackboard

The course materials are made available through Blackboard and support is available from a designated personal tutor, from the individual module lecturers and from the course's Course Director via email or telephone. Most communication within the course takes place via Blackboard and so training in its use is given early in the MSc.

For all modules (except the dissertation module) students are provided with study materials, structured problems and a schedule of work. The Blackboard discussion board is the main vehicle for academic interaction. It also serves to keep distance-learning students exactly in step with the delivery of material in

Sheffield. (K1-K5).

Independent Learning

This is the cornerstone of success in the programme. It is vital for the assimilation of the material provided, for the preparation of written reports, and other presentations, and for the proper use of sophisticated software (K1-K5).

Lectures

A 15-credit lecture-module generally comprises about 20 lectures. In lectures the important points in the lecture notes are explained and illustrated, with computer demonstrations when appropriate. The Blackboard discussion board is used to keep distance-learning students up-to-date with what has been covered and highlight any special points made during lectures. (K1-5, S1, S3). Some lectures will include discussion and demonstration of presenting statistical concepts to non-expert audiences (S4).

Computing classes

A number of classes are held in computer labs, where students can learn and practise statistical computing. Demonstrators are available in the classes to help students with any questions or problems (K3, K4, S3).

Formative assessment

All modules (with the exception of the dissertation module) include non-assessed exercises. Students can hand in their work and receive feedback on their solutions. Where appropriate, model solutions are provided for these exercises (K1, K2, S1).

Project work and feedback

Students will complete a number of projects over the MSc, and will receive feedback on both technical aspects particular to the project, and presentation themes that are common to all projects (S1-S4).

Dissertation

Teaching for the dissertation is through supervision by one or more members of School of Health and Related Research. The dissertation project is on a medical topic. Students will experience the key phases of a relatively large piece of work: planning to a deadline; researching background information; acquisition and validation of data; problem specification; carrying out relevant analyses; and reporting at length through the dissertation. Dissertation topics may be provided by external clients, and learning to communicate with, and relate to, these clients is an extra benefit of the dissertation; for distance learning students, projects based in the workplace in co-operation with an employer are encouraged. (K1-K5, S4, S5).

Personal Tutorials

The Department runs a personal tutorial system conforming to the guidelines in the University's Students' Charter. The system is essentially pastoral; tutors are available to provide personal support and general academic guidance.

Opportunities to demonstrate achievement of the learning outcomes are provided through the following assessment methods:

Project work, requiring report-writing and statistical computing K1-K5, S1-S4. K1, SK1, S1-2.

Examinations, which are held in May/June, K1-K3, K5, S1.

Dissertation K1-K5, S1, S3-5.

19. Reference points

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 Vision

<https://www.sheffield.ac.uk/vision>

Learning and Teaching Strategy (2016-21)

https://www.sheffield.ac.uk/polopoly_fs/1.661828!/file/FinalStrategy.pdf

The research interests and scholarship of the staff.

The Royal Statistical Society's accreditation framework.

Contacts with employers, mainly through the programme's Advisory Board

The University of Sheffield Students' Charter at
<http://www.shef.ac.uk/ssid/ourcommitment/charter/>

The University's coat of arms, containing the inscriptions *Disce Doce* (Learn and Teach) and *Rerum Cognoscere Causas* (To Discover the Causes of Things; from Virgil's *Georgics* II, 490), at
<http://www.sheffield.ac.uk/about/arms>

20. Programme structure and regulations

All students must take:

1. MAS61004 The Statistician's Toolkit.
 2. MAS61006 Bayesian Statistics and Computational Methods.
 3. MAS61002 Medical Statistics
- and will complete a 60 credit dissertation.

Students on MAST21 will take at least one of

1. HAR6260 Economic Evaluation.
2. HAR619 Epidemiology.
3. HAR650 Systematic Reviews and Critical Appraisal Techniques.
4. HAR6531 Qualitative Research Design and Analysis.

and at most two of

1. MAS61007 Machine Learning.
2. MAS61003 Sampling Theory and Design of Experiments.
3. MAS61005 Time Series.

With the permission of both the course director and the modules leaders, up to 45 credits from the lists of optional modules may be replaced by:

1. HAR6115 Economic Evaluation in International Health Technology Assessment.
2. HAR6114 Systematic Reviews and Evidence Synthesis Principles.
3. HAR6116 Randomised Controlled Trials to Support Reimbursement Decision Making.
4. HAR6113 Cost Effective Modelling in International Health Technology Development.
5. HAR6119 Building Cost Effective Models for Health Technology Assessment.
6. HAR6118 Utility and Patient-reported Outcomes Data in HTA.

Students on MAST22 can choose three modules from

1. MAS61003 Sampling Theory and Design of Experiments.
2. MAS61005 Time Series.
3. MAS61007 Machine Learning.
4. HAR6113 Cost Effective Modelling in International Health Technology Development.
5. HAR6118 Utility and Patient-reported Outcomes Data in HTA.
6. HAR6044 Systematic Approaches to Evidence Assessment.
7. HAR6048 Epidemiology.
8. HAR6116 Randomised Controlled Trials to Support Reimbursement Decision Making.
9. HAR6043 Research Methods.
10. HAR6115 Economic Evaluation in International Health Technology Assessment.
11. HAR6114 Systematic Reviews and Evidence Synthesis Principles.
12. HAR6113 Cost Effective Modelling in International Health Technology Development.
13. HAR6118 Utility and Patient-reported Outcomes Data in HTA.
14. HAR6119 Building Cost Effective Models for Health Technology Assessment.

Subject to appropriate balancing of modules across semesters and years of study.

For full time students the dissertation is mainly prepared during the summer. The arrangement for part-time students is more flexible but it is expected that they too will do most of the work during the summers or in the year after they have completed all the other modules.

Successful completion of the programme leads to the award of the MSc with either 'pass', 'pass with merit' or 'pass with distinction' grade.

Detailed information about the structure of programmes, regulations concerning assessment and progression and descriptions of individual modules are published in the University Calendar available on-line at <http://www.shef.ac.uk/govern/calendar/regs.html>.

21. Student development over the course of study

The three compulsory modules (MAS61002, MAS61004 and MAS61006) form a 'core', and will equip students with essential modelling, computational and professional skills, as well as specialist knowledge in medical statistics. These will include linear and generalised linear modelling, exploratory data analysis and statistical computing using R, Bayesian inference and Monte Carlo methods, and presentation skills. Students will have the knowledge and confidence to tackle a wide range of data analysis problems, and, when confronted with 'non-standard' problems, make use of computational methods and/or simple exploratory approaches as appropriate.

The remaining modules enable the students to develop specialised knowledge of particular topics in both statistics and in medical statistics, as well as further developing their professional skills in communication and report-writing. The dissertation draws on the knowledge and skills acquired in the remainder of the programme.

22. Criteria for admission to the programme

The minimum entrance requirement for the course is:

either a Second Class Honours Degree, from a three or four year course at a UK university, with substantial mathematical and statistical components; or any comparable qualification of equivalent standard. The School also offers a Graduate Certificate which can be used as an entry qualification for the programme.

In addition, students whose first language is not English will need to demonstrate English language proficiency (even if their education has been chiefly in English). Our usual minimum requirements are: TOEFL 232 (computer-based) or 575 (paper-based), IELTS 6.5, or equivalent.

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

23. Additional information

There is an active local group of the Royal Statistical Society in Sheffield which organises a series of meetings through the year featuring visiting national speakers. The talks are accessible to and interesting for students on this programme.

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>.