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**	Health Economics & Decision Modelling
2	**Programme Code**	HART44 (Full-time), HART45 (Part-time)
3	**JACS Code**	B900
4	**Level of Study**	Postgraduate
5a	**Final Qualification**	MSc
5b	**QAA FHEQ Level**	7
6a	**Intermediate Qualification(s)**	Postgraduate Diploma, Postgraduate Certificate
6b	**QAA FHEQ Level**	7
7	**Teaching Institution** (if not Sheffield)	Not applicable
8	**Faculty**	Health
9	**Department**	School of Medicine and Population Health
10	**Other Departments involved in teaching the programme**	Not applicable
11	**Mode(s) of Attendance**	Full-time or Part-time
12	**Duration of the Programme**	1 year or 2 years
13	**Accrediting Professional or Statutory Body**	Not applicable
14	**Date of production/revision**	February 2011, February 2015, January 2016, March 2017, February 2024

15. Background to the programme and subject area

This programme is designed to equip participants with the techniques and methods of health economics and decision modelling in order to meet a massively expanding global demand for analysis of the costs, benefits, efficiencies and consequences of health-related strategies. Governments, healthcare organisations and the pharmaceutical industry across the developed and developing world are engaged in planning, decision making, purchasing and provision of health and healthcare strategies with healthcare a significant and fast-growing proportion of national GDP. These organisations need or are required to use robust analyses to support priority setting and decisions.

The role of mathematical modelling in informing healthcare resource allocation has been increasing since the mid-1980s and with the creation of the National Institute for Health and Care Excellence (NICE) in 1999. Postgraduate courses in Health Economics, Operational Research and Statistics are available from several Universities. However, the health economics courses tend to be broad and economics based, whilst the OR courses focus on a wide range of methods applied across all areas of industry. There are only a few courses that focus specifically on the application of health economics and mathematical modelling to health and healthcare decision making problems and each to varying degrees. The MSc in Health Economics and Decision Modelling is designed to provide a truly bespoke practical training course grounded in theory for individuals wishing to pursue careers as health economists or health economic modellers in academia, government agencies, healthcare purchasing or provider organisations, consultancy organisations and the pharmaceutical industry.

16. Programme aims

The general aim of the programme is:

To produce highly competent and qualified Masters' level graduates with a thorough training in Health Economics and Decision Modelling, enabling them to contribute fully from the outset in professional settings, enhance our reputation and progress to become internationally influential in the development and application of Health Economics and Decision Modelling methods. Graduates will be capable of designing and undertaking appropriate analyses and supporting decision making in:

- government or other policy organisations
- healthcare purchase or provider organisations
- health related consultancy
- medical research sector
- the pharmaceutical industry and
- academia

17. Programme learning outcomes

Knowledge and understanding:	
K1	Health Economics - To comprehend and differentiate the general principles of health economics in order to conceive and plan analytical approaches and to critically appraise proposed or published work internationally and in the UK.
K2	Economic Evaluation - To comprehend the state of the art in the techniques of health economic evaluation from alternative perspectives (including the use of patient reported health outcomes, the valuation of benefits, and collection and analysis of costs) in order to design effective studies, decide on their planned implementation, and interpret and use the results to support decision making.
K3	Modelling - To comprehend and decide how and when to apply the core techniques of mathematical decision modelling to healthcare decision making including Decision trees, Markov models, simulation models and uncertainty analysis. To apply problem structuring and project management processes to support the process of model design, building, validation and testing. To appreciate the range of international health care problems amenable to mathematical modelling. To critically appraise the structure, assumptions and parameter inputs of 3rd party models and interpret their results.
K4	Study Design and Systematic Review Methods - To understand the differences between different study designs, when they are appropriate and their limitations. To understand the process involved in searching for relevant clinical and cost-effectiveness evidence to inform health care decision-making. To understand the basic methods for synthesising quantitative evidence and methods for conducting qualitative research.
K5	Medical Statistics and Evidence Synthesis - To have a basic grounding in statistical methods used to analyse and report data from randomised controlled trials (RCTs). To understand the difference between the frequentist and Bayesian approaches to statistics. To understand the issues involved in synthesising quantitative evidence from RCTs and undertake meta-analyses using appropriate software (e.g. WinBUGS). To understand the biases associated with observational data and be able to minimise biases associated with estimates of treatment effect.
K6	Selecting Appropriate Approach - To understand where the techniques are applicable and have the critical and analytical insight to select appropriate analytical techniques for particular decision problems.
K7	Project Management and Reporting - To have the knowledge to design, undertake and deliver a relevant Masters' level dissertation project in the area and produce a professional level research report in the form of a 10,000-15,000 word dissertation report.

Skills and other attributes:	
S1	Ability to think through problems from a health economics principles perspective.
S2	Ability to critique, design, operationalise, and conduct trial-based economic evaluations including the assessment of the costs and benefits via health outcome measures and to analyse the results in statistical using appropriate software.

S3	Ability to design, plan, develop and successfully implement computer-based models applying the core mathematical techniques in required software (including for example Excel/VBA and SIMUL8 simulation software).
S4	Ability to design and undertake competent medical statistics analyses, conduct a Bayesian meta-analysis, and analyse observational data to estimate relative treatment effects and natural history used to inform economic models.
S5	Ability to select appropriate techniques and use project management and development skills to produce successful analyses for particular decision problems.
S6	Ability to design, undertake and deliver a relevant dissertation level project to a health economic related problem.

To be awarded Masters' level qualification, students must demonstrate achievement in all of the K and S learning outcomes above.

To be awarded Diploma level qualification, students must pass all taught units (120 credits), but not the dissertation, which means achieving K1-K6 and S1-S5 above, but not S6.

To be awarded Certificate level qualification, students must pass 60 credits, which must include those related to learning outcomes K1-K6 and S1–S5.

18. Teaching, learning and assessment

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

Induction

New students are invited to an Introductory Week in the week before formal teaching begins. The purpose of the introductory week is to enable students to meet each other, the Course Administrator, the Course Director and staff from module teams who will be teaching them, to familiarise students with the resources available within the School of Medicine and Population Health (SMPH) and to explore their expectations of, and anxieties about, the programme. Within the first month of the semester students have their first meeting with their personal tutor.

Students will be provided with appropriate pre-course learning material with worked solutions to facilitate a minimum level of understanding before the course begins (e.g. Introduction to EXCEL and VBA).

Structure for Delivery

Though each module varies, the general pattern of weekly study on each module over a 10-12 week semester period is approximately:

- 2 hour delivery session - the majority of which is lecture based but also blended to include demonstration of computer based techniques, and individual and group exercises as appropriate.
- 10 hours of student independent study (homework).
- 1 hour problem class / seminar / tutorial per week or fortnight to give the opportunity for teaching staff and students to check learning.

Lectures/presentations

Provide students with formal teaching on the core subject areas of health economics and decision modelling supported by presentation and discussion of research undertaken in SMPH, and presentations from external speakers with expertise in specific subject areas. (K1-K7).

Practical sessions

Hands on training and practice takes place with the use of PC based economic, mathematical and statistical modelling methods using appropriate software, and on information resources and literature searching approaches for accessing relevant data and evidence. (S1-S5).

Independent Study

Most of the independent study hours each week will focus on the topic of the delivery session, allowing students to revisit and build on the knowledge gained, develop skills through practical exercise and extend their knowledge through further reading (K1-K6, S1-S5). This will be followed up with problem/tutorial classes (see below). Some preparation for certain delivery sessions in terms of pre-reading is also required.

The homework will include:

- required reading (K1-K5).

- tasks and problems to be done individually or sometimes in pairs or small groups (S1-S5).
- short written assignments (K1-K6, S1-S5).
- development of small computer-based solutions to specific problems (K1-K6, S1-S5).
- development of presentations to be given in problem classes (K1-K6, S1-S5).
- development of short reports on model process and results (K1-K6, S1-S5).

Problem classes\tutorials\seminars

Problem classes and tutorials will follow-up independent study and assess progress and learning in each unit. Commonly these will include working through specific exercises given to develop skills learned through the delivery session from the previous week (K1-K6, S1-S5). Presentations by individual students, and seminars and Q&A sessions with invited experts may also take place in some units. Two seminar programmes, one ScHARR based and another Health Economics and Decision Science based, are held each semester, to which students' are encouraged to attend.

Group work

Encourage the development of independent and collaborative research skills through group work and exercises.

Students are encouraged to apply the principles and techniques of health economics and decision modelling in practice and develop their analytical thinking and critical appraisal skills through sharing and discussion of the issues which arise in example topics (K6, S5).

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

Formative assessment

Formative assessments are conducted as part of teaching sessions or as homework. These include structured exercises which require individuals to apply specific techniques in each taught unit, structured exercises designed to test critical thinking skills on an individual and group basis and group led projects and seminar discussions (K1-K6, S1-S5). These assessments test student's abilities and understanding of core principles and skills learnt and allow any areas of weakness or difficulty in individual students to be identified and resolved before they undertake the more formal course assessment work. They also identify areas of specific interest and strengths to be supported and developed as dissertation projects.

Summative assessment

Taught modules summative assessments take the following forms:

- Unseen examinations requiring students to tackle unseen problems of the type relevant to the unit. (K1-K6, S1-S5).
- Individual student assignments. These include creating economic models, conducting and reporting statistical analyses, essays and other forms of report designed to demonstrate students' application of knowledge; for example, developing a research proposal, and a detailed report on a simulation modelling project with an oral examination/presentation. (K1-K6, S1-S5).
- Submission of the dissertation allows the student to demonstrate their understanding of the principles and techniques learned in the taught modules, their critical thinking and appropriate selection of approach, and the application of health economics and decision modelling to a piece of original, individually conducted research. It also demonstrates the acquisition of appropriate organisational and presentational skills. Students are expected to undertake dissertation projects that will lead to potentially publishable results. Each student is provided with a dissertation supervisor to offer advice and support on preparation of a dissertation requiring original primary or secondary research. There is opportunity for dissertations to have direct client involvement from NHS bodies, government agencies, academic institutions, consultancy firms or pharmaceutical companies, who offer specific topics and ongoing client involvement. Early in the dissertation process, each student gives a short presentation on their proposed dissertation topic. Module leaders, dissertation supervisors and other members of academic staff are invited to provide constructive comments on each project. Dissertations must be properly presented, referenced and bound in accordance with University regulations. Support and advice is provided to students who wish to go on to publish or present their dissertation work in peer-reviewed settings. (K1-K6, S1-S5 but especially K7 and S6).

19. Reference points

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

The research-informed orientation of the University of Sheffield and the School of Medicine and Population Health as set out in University and School research strategies.

National and international guidelines on approaches to health economic analysis for decision making including those from:

The National Institute for Health and Care Excellence (NICE) at
https://www.nice.org.uk/article/pmg9/chapter/foreword

The International Society for Pharmaco-economics and Outcomes Research (ISPOR) at
http://www.ispor.org/workpaper/practices_index.asp

University Vision and Strategic Plan
https://www.sheffield.ac.uk/vision

20. Programme structure and regulations

The programme of study shall be pursued full-time for *one* year and part-time for not less than *two* years and shall be subject to a time limit of *three* years.

Taught modules are each worth 15 credits and the dissertation is worth 60 credits.

The first semester modules provide a detailed training in the basic principles of health economics, statistical methods used to assess clinical effectiveness and economic evaluation. Statistical methods used in health economic analysis and more advanced methods used in economic modelling are developed in the second semester, enabling the student to study and master methods for valuing the benefits of health care.

The Advanced Simulation Methods module provides students with the knowledge, skills and practice in specialist professional level modelling. The Study Design and Systematic Review Methods and Further Statistical Methods in Health Economic Analysis modules provides students with an awareness of the different sources of evidence that this available and how it can be analysed to assess clinical effectiveness and provide input to economic models. The Valuing the Benefits of Health module provides students with an understanding of the role of quality of life measures in health economics.

For part time students, the course first year introduces economic evaluation while focusing on important statistical methods used in the advanced health economic modules covered in the second year.

The dissertation brings all of the learning together and the expectation that a strongly analytical and quantitative project will be undertaken building on several, though not necessarily all, of the taught units in order to demonstrate mastery of the approaches that the student has learned.

Detailed information about the structure of programmes, regulations concerning assessment and progression and descriptions of individual units are published in the University Calendar available on-line at
https://www.sheffield.ac.uk/calendar

21. Student development over the course of study

The programme has been designed to enable developmental understanding of Health Economics and Decision Modelling. A range of personal and generic skills are developed progressively alongside the development of knowledge through structured learning and assessments. Eight core taught units provide the student with the skills and knowledge which can then be applied to undertake a dissertation.

The three health economics units are an integrated set of learning processes. The first, Introduction to Health Economics, covers important theory grounding the student in key principles which are generally applicable to health and healthcare problems, including microeconomic concepts, different types of efficiency and equity goals. It also focuses students on critically evaluating different approaches to the production, funding and distribution of health care. Economic Evaluation takes a more applied approach, with students understanding the principles of economic evaluation, and covering the standard methods used to undertake economic evaluations in healthcare and their pros and cons, both technically and for policy making. Valuing the Benefits of Health Care focuses in particular on the key dimension of valuing health outcomes and equips students to use and critique the quality adjusted life year (QALY) and alternative approaches.

The two modelling units build up a professional level competency in cost-effectiveness modelling but with a clear focus on and experience of the health-related applications. The Cost-Effectiveness Modelling for Health Technology Assessment unit gives students the experience of using and developing decision trees, Markov models and other standard approaches to construct health economic models using standard software The Advanced Simulation Methods unit equips students with a professional level skill in using Monte-Carlo simulation software, and provides the challenge of producing a written report to disseminate results and defend the choice of model structure and data inputs by means of an interactive oral examination.

The Study Design and Systematic Review Methods module provides students with an understanding of the range of study designs used in health care research, the use of quantitative and qualitative methods of analysis, and the design and conduct of literature searches required to support health economic analyses. The Medical Statistics & Evidence Synthesis module equips students with a working knowledge of setting and testing statistical hypotheses to analyse and report data from randomised controlled trials (RCTs) and the generation of evidence used to inform an economic analysis using Bayesian methods. Further Statistical Methods for Health Economic Analysis builds on this by providing students with more advanced statistical skills, including analysing data from non-RCTs and dealing with bias and confounding.

Finally, by the time of the dissertation, students should be capable of demonstrating mastery of the techniques in the taught course modules and the appropriate selection, integration and application of these techniques to solve a real world decision making problem. Students should also exhibit an awareness of pros and cons of the approach taken, justify the analysis and present the research findings in a written report.

22. Criteria for admission to the programme

Rationale: The course should attract high quality students from the UK, EU and non-EU who wish to pursue a career in health economics, mathematical modelling and health economic modelling, with a large enough cohort to ensure synergy and co-operative learning and an economically viable course.

Proposed entrance requirements
See http://www.sheffield.ac.uk/scharr/prospective_students/applying/index

Entrance requirements are based on a candidate's academic record and experience. The usual minimum academic qualification is a 2.1 first degree from a recognised university in a numerate subject such as: Economics, Operational Research, Mathematics, Statistics, Industrial Engineering, Management Science, Physics, and Systems Control. Conditional offers are made to candidates awaiting results.

Candidates with good academic degrees in other disciplines and a substantial record of using mathematical / statistical / economic / quantitative skills will be considered.

Applicants whose first language is not English AND who do not hold a degree from an English-speaking university are required to take the International English Language Testing Service test (IELTS). The test scores currently required are 6.5 (academic) for IELTS, with 5.5 minimum in each component. Prospective students previously educated in English do not need to take the IELTS test.

Detailed information regarding admission to the programme is available at http://www.shef.ac.uk/prospective/

23. Additional information

SMPH is a large, multidisciplinary School within the Faculty of Health, specialising in postgraduate teaching, health services and public health research, and the application of health economics and decision science to health services and public health. The Health Economics and Decision Science (HEDS) section is a leading research and consultancy centre with over 80 core staff specialising in methodological and applied research in the area of health economics and decision modelling (http://www.shef.ac.uk/scharr/sections/heds). This MSc programme builds on the research foundation of HEDS to provide leading edge specialist training for students across the world.

The course and its graduates are attractive to government, NHS, pharmaceutical industry and consultancy employers. We have a track record in attracting bursary funding from a range of sources for Masters level courses over a number of years. Pharmaceutical industry and consultancy company collaborators have provided some bursary places as well as opportunities for dissertation placements.

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.