UNIVERSITY OF SALFORD FORM PS (2009/10)

PROGRAMME SPECIFICATION

This form is to be completed and maintained for all taught undergraduate and postgraduate programmes and those (typically cohort-based) research programmes which incorporate a significant taught element (e.g. MRes and DProf). Notes of Guidance for completion are shown in italics in the right hand column below. A blank pro forma can be downloaded from http://www.governance.salford.ac.uk/page/aqa_forms

Guidance is also available from Developing Your New Programme - A Programme Developer's Guide 2009/10 at http://www.governance.salford.ac.uk/new_programme.

The Programme Specification is a definitive statement of an approved programme of study. It is also a key document for the programme approval process. At Outline Approval stage programme development teams must complete sections 1- 17. At Detailed Approval stage all sections of the form must be completed.

Amendments to sections of the Programme Specification may be made only with the approval of the relevant body in accordance with the University's programme design, approval and amendment procedures as indicated in the appended table.

General guidance on programme specifications is available from the QAA at *www.qaa.ac.uk/academicinfrastructure/programSpec/*

Date of completion of this version of programme specification: 15th September 2009

Date of approval by PARSC: 15th October 2009

Stage 1 Outline Approval Sections 1 – 17			
1	Awarding institution/body		University of Salford.
2	Taught at		University of Salford.
3	Faculty and School(s) responsible for the programme		Faculty of Science, Engineering and Environment. School of Computing, Science and Engineering.
4	Links with partner institutions		None
5	Programme accredited by		Accreditation sought from Institute of Mathematics and its Applications (IMA) by 2013 which is the year after the first award of degrees to the programme.
6	Final Award and Intermediate Terminating Qualifications	Final Award(s)	B.Sc.(Hons).
		ITQs	
7	The FHEQ (Framework for Higher Education) level of the qualification		Hons Degree/GradCert/GradDip Level 6
8	Programme Title		Mathematics
9	Length of programme (in each mode)		Three years full-time; six years part-time.
10	Mode(s) of attendance/delivery		Full-time; part-time attending.
11	Year of commencement		Academic year starting September 2010.
12	Funded by		HEFCE
13	Aims of programme		This programme aims to produce graduates proficient in applying their mathematical knowledge to the industrial and business

		workplace. This is achieved through modules predominantly in applied mathematics and also modules that address the mathematics used in business and industry. As well as this, students will have the opportunity to go on site visits, have a work placement between levels 5 and 6, and produce various reports and projects tackling relevant problems in business and industry, and also tackling cutting edge issues in applied mathematics which are becoming pressing concerns such as in the areas of climate prediction, nanotechnology, renewable energy and sustainable economics.
14	Entrance requirements	Typical offer is 300 UCAS points, including: • Grade B in maths (Advanced GCE) Applicants without the above will be considered on an individual basis according to the University's procedures.
15	For programmes not wholly 'owned' by one School the allocation of responsibility for the administration of the programme	N/A.

16	Programme structure	All modules are 20 credit long thin modules equally distributed between semesters 1 and 2, except the level 6 Project which is 40 credits equally spread between both semesters. There is an optional industrial/business placement year between level 5 and 6.

Level 4

Semester 1 Semester 2	Mathematical Methods 1 20 credits	Mathematical Modelling 20 credits	Mechanics and Vector Calculus 20 credits	Linear Algebra 20 credits	Probability 20 credits	Analysis 20 credits

Level 5

Semester 1 Semester 2	Mathematical Methods 2 20 credits	Business and Industrial Mathematics 20 credits	Statistics 20 credits	Numerical Analysis 20 credits	Inviscid Fluid Dynamics 20 credits	Tensor Algebra and Linear Elasticity 20 credits

Level 6

Semester 1 Semester 2	Mathematical Methods 3 20 credits	Project 40 credits	Option 20 credits	Option 20 credits	Option 20 credits

Level 6 options:
Viscous Fluids, Continuum Mechanics, Operational Research, Artificial Intelligence and Neural Networks, Mathematical Statistics, (All long thin modules 20 credits long equally spanning both semesters.).

Core fundamental mathematics modules
The modules Linear Algebra, Mechanics and Vector Calculus, Probability, Analysis, Numerical Analysis, and Statistics are fundamental core mathematics modules.

Applied Mathematics modules
The Mathematical Methods modules are compulsory through the three levels, and build a solid competency in solutions to partial and ordinary differential equations, integration techniques and transform analysis.
The modules Inviscid Fluid Dynamics, and Tensor Algebra and Linear Elasticity build up competency in the mathematical description of fluids and solids that are developed further by optional level 6 modules in Viscous Fluids and Continuum Mechanics.
The module Artificial Intelligence and Neural Networks applies mathematical techniques to problems in computing.

Statistics related modules
The modules Probability and also Statistics build up competency in

stochastic methods which are developed further in the optional level 6 modules of Mathematical Statistics and Operational Research.

Industry and Business related modules through the levels
In the second semester of level 4, the Mechanics and Vector Calculus module requires the students to apply mechanics and vector techniques to various case studies taken from industry. Similarly, the Mathematical Modelling level 4 module investigates mathematical models originating from business and industry.
At level 5, the Business and Industrial Mathematics module exposes students to a variety of applications of mathematics in business and industry through seminars given by a number of invited speakers. The module requires students to work together in teams. The students have an opportunity to investigate a mathematical application of their choice, will assign roles and present a series of reports culminating in a final report together with a presentation which will be assessed with feedback by an industrial liaison committee consisting of outside industrial and business staff. The module will also include site visits to various companies.
The industry and business theme is continued at level 6 by a 40 credit project involving students investigating rapidly emerging research areas in applied mathematics, in particular in climate prediction, nanotechnology, renewable energy and sustainable economics. Within one of these areas the student will develop a mathematical formulation from which meaningful results will be obtained, interpreted and presented.

The part-time mode is available by selection of 60 credits per year over 6 years.
The part time route is:

Year 1			
Sem 1	Mathematical Methods 1 20 credits	Mathematical Modelling 20 credits	Mechanics and Vector Calculus 20 credits
Sem 2			

Year 2			
Sem 1	Linear Algebra	Probability	Analysis
Sem 2	20 credits	20 credits	20 credits

Year 3			
Sem 1	Mathematical Methods 2	Numerical Analysis	Tensor Calculus and Linear Elasticity
Sem 2	20 credits	20 credits	20 credits

Year 4			
Sem 1	Business and Industrial Mathematics	Inviscid Fluid Dynamics	Statistics
Sem 2	20 credits	20 credits	20 credits

Year 5			
Sem 1	Level 3 option	Level 3 option	Mathematical Methods 3
Sem 2	20 credits	20 credits	20 credits

Year 6		
Sem 1	Project	Level 3 option
Sem 2	40 credits	20 credits

Full listing of module titles and credits, with percentage of module that is continuous assessment:

Level	Module Title	CRN	Credit Value	Cont. Assess %
4	Mathematical Methods 1	new	20	50
	Mathematical Modelling	new	20	50
	Mechanics and Vector Calculus	new	20	50
	Linear Algebra	new	20	50
	Probability	new	20	50
	Analysis	new	20	50
5	Mathematical Methods 2	new	20	40
	Numerical Analysis	new	20	40
	Business and Industrial Mathematics	new	20	100
	Inviscid Fluid Dynamics	new	20	40
	Tensor Algebra and Linear Elasticity	new	20	40
	Statistics	new	20	40
6	Mathematical Methods 3	new	20	30
	Project	new	40	100
	Viscous Fluid Dynamics	new	20	30
	Continuum Mechanics	new	20	30
	Operational Research	new	20	30
	Artificial Intelligence and Neural Networks	new	20	30
	Mathematical Statistics	new	20	30

The choice of weightings for the assignments over the programme levels has the following rationale.

During year 1 (level 4) the percentage of continuous assessments is 50 percent, with three spot tests taken mid-semester 1 and 2, and end of semester 1. This eases the load on the final examination by spreading the assessments throughout the important (for retention) first year.

During year 2 (level 5) the percentage of continuous assessments for all but one module is 40 percent, with the number of continuous assessments reduced to two. These take a different form, being open-book detailed problems and handed in after a few weeks. The one module that is not 40 percent, Business and Industrial Mathematics, is instead 100 percent coursework. This means that the end of year examinations as a percentage of the total year 2 mark remains close to 50 percent.

During the final year (level 6) the percentage of continuous assessments for all but one module is 30 percent, with the number of continuous assessments being one. This assignment will be investigative or research based requiring literature review. The one module that is not 30 percent, the Project, is 100 percent coursework and is a total of 40 credits. This means that the end of year examinations as a percentage of the total final year mark is 50 percent.

In this way, the percentage mark for the end of examinations is 50 percent of the total in all years to ensure there is no excessive load impact during this period.
Also, the type of assessment for each year is consistent with expectations for each respective year.

17	Requirements for progression at each level, plus the criteria on which the final award is based	Progression is governed by the Academic Regulations for Taught Programmes

Stage 2 Detailed approval Sections 18 – 25

18	JACS (Joint Academic Coding System) code and any other relevant code	*G100*
19	Relevant Subject Benchmarking statements (and any other reference points)	Benchmark statements for Mathematics, Statistics and Operational Research (MSOR).
20	Programme content	See module specifications
21	Intended learning outcomes	The programme provides opportunities for students to develop and demonstrate knowledge and understanding, skills and other attributes in the following areas. There are applicable generic benchmark statements for programmes in statements for Mathematics, Statistics and Operational Research (MSOR). There are also descriptors for FHEQ level H. The following presents the intended learning outcomes and provides references to the related outcomes from these related benchmarks. Programme learning outcomes are also mapped to individual modules.

Knowledge and Understanding
On successful completion the student will be able to:
have attained
A1 Breadth of mathematics (MSOR 1.2.3, 1.6, 2.2.1-2.2.5, FHEQ i, a)
A2 The fundamental concepts, principles and theories in Mathematics (MSOR 2.4.2, FHEQ ii, i, a)
A3 Management techniques that are relevant to mathematicians (MSOR 2.8.1, FHEQ a)
A4 Detailed knowledge and understanding of the essential facts, concepts, principles and theories in the field of mathematics (MSOR 3.2.7, FHEQ i, a)
A5 Principles of numerical mathematics and computer modelling (MSOR 3.2.5-3.2.6, FHEQ a)

Level	Module Title	Knowledge & Understanding				
		A1	A2	A3	A4	A5
4	Mathematical Methods 1	x	x			
	Mathematical Modelling	x	x			x
	Mechanics and Vector Calculus	x	x			
	Linear Algebra	x	x			
	Probability	x	x			
	Analysis	x	x			
5	Mathematical Methods 2	x	x			
	Numerical Analysis					x
	Business and Industrial Applications	x	x	x		
	Inviscid Fluid Dynamics				x	
	Tensor Algebra and Linear Elasticity				x	
	Statistics	x			x	
6	Mathematical Methods 3	x				
	Project			x	x	x
	Viscous Fluid Dynamics				x	
	Continuum Mechanics				x	
	Operational Research				x	
	Artificial Intelligence and Neural Networks				x	x
	Mathematical Statistics				x	x

Intellectual Skills

B1 Analyse and solve technical problems (MSOR 1.2.3, 3.4.1, FHEQ iii, b)

B2 Design a model or system to meet a need (MSOR 3.2.6, 3.4.1, FHEQ b)

B3 Awareness of the assumptions and validity of arguments in the development of models (MSOR 3.2.4, FHEQ iv, b)

B4 Formulate and test hypotheses (MSOR 3.2.4-3.2.6, FHEQ iv, b)

B5 Evaluate the accuracy of models (MSOR 3.2.2 3.2.4, FHEQ iv, b)

Level	Module Title	Intellectual Skills				
		B1	B2	B3	B4	B5
4	Mathematical Methods 1	x				
	Mathematical Modelling	x				
	Mechanics and Industrial Applications	x				
	Linear Algebra	x		x	x	x
	Probability	x				
	Analysis	x		x	x	x
5	Mathematical Methods 2	x				
	Numerical Analysis	x	x	x	x	x
	Business and Industrial Mathematics	x	x	x		
	Inviscid Fluid Dynamics	x	x			
	Tensor Algebra and Linear Elasticity	x	x			
	Statistics	x	x			x
6	Mathematical Methods 3	x	x			
	Project	x	x	x	x	x
	Viscous Fluid Dynamics	x				
	Continuum Mechanics	x	x			
	Operational Research	x				
	Artificial Intelligence and Neural Networks	x	x			
	Mathematical Statistics	x	x			x

Practical Skills

C1 Write computer programs (MSOR 3.2.5)
C2 Use computational tools and packages (MSOR 3.2.5-3.2.6)
C3 Prepare technical reports (MSOR 3.4.3, FHEQ iii, v, c)
C4 Give technical presentations (MSOR 3.4.3, FHEQ iii, c)
C5 Use scientific literature effectively (MSOR 3.4.3, FHEQ iii, v, c)

Level	Module Title	Practical Skills				
		C1	C2	C3	C4	C5
4	Mathematical Methods 1					
	Mathematical Modelling	x	x			
	Mechanics and Industrial Applications			x		
	Linear Algebra					
	Probability					
	Analysis					
5	Mathematical Methods 2					
	Numerical Analysis					
	Business and Industrial Mathematics			x	x	
	Inviscid Fluid Dynamics					
	Tensor Algebra and Linear Elasticity					
	Statistics		x			
6	Mathematical Methods 3					
	Project	x	x	x	x	x
	Viscous Fluid Dynamics					
	Continuum Mechanics					
	Operational Research					
	Artificial Intelligence and Neural Networks		x			
	Mathematical Statistics					

Transferable/Key skills

On completion the student will be able to*:*

D1 Apply mathematical skills (MSOR 1.7.1, FHEQ d)

D2 Use information technology (MSOR 3.4.3, FHEQ d)

D3 Communication, business skill and entrepreneurship (MSOR 3.4.3, FHEQ d)

D4 Manage resources, time and own learning (MSOR 3.4.3, FHEQ d)

D5 Problem solving (MSOR 3.2.4, FHEQ d)

Level	Module Title	Key Skills				
		D1	D2	D3	D4	D5
4	Mathematical Methods 1	x				x
	Mathematical Modelling	x	x			x
	Mechanics and Industrial Applications	x				x
	Linear Algebra	x				x
	Probability	x				x
	Analysis	x				x
5	Mathematical Methods 2	x				x
	Numerical Analysis	x				x
	Business and Industrial Mathematics	x	x	x	x	x
	Inviscid Fluid Dynamics	x				x
	Tensor Algebra and Linear Elasticity	x				x
	Statistics	x	x			x
6	Mathematical Methods 3	x				x
	Project	x	x	x	x	x
	Viscous Fluid Dynamics	x				x
	Continuum Mechanics	x				x
	Operational Research	x				x
	Artificial Intelligence and Neural Networks	x	x			x
	Mathematical Statistics	x	x			x

22	Teaching, learning and assessment strategies	**Knowledge and Understanding** Acquisition is through a combination of lectures, tutor-led tutorials and group projects at levels 4 and 5. In addition, an individual project further emphasises A4-A5 in level 6. Acquisition of A5 is through group and individual project work, and lectures throughout the course. Testing of the knowledge base is through a combination of unseen written examinations (A1-5) and assessed coursework (A1-5) in the form of essays (A3, 4), and project reports and presentations (A2-5). **Intellectual Skills** Intellectual skills are developed through the teaching and learning programme outlined above. Analysis and problem solving skill are developed through the use of example papers (regular question sheets issues by course lecturers) and through project work. Research and design skills are further developed through coursework activities and design projects. Analysis and problem solving skills are assessed through unseen examinations (B1) and coursework assignments (B1, 3). Modelling skills are assessed through coursework reports (B2-5) and project reports (B2-5) and presentation (B2-5). **Practical Skills** Practical skills are developed through the teaching and learning programme outlined above. Computing skills (C1-2) are developed through computing laboratory sessions and project work. Skills C4 and C5 are developed through feedback on reports written and presentations made as part of coursework assignments. Practical skills are assessed through computing laboratory tests (C1-2), coursework reports (C3 C5) and project reports (C3 C5) and presentations (C4). **Transferable/Key Skills** Transferable and key skills are generally incorporated within modules and related to relevant assessments as appropriate. Examples of teaching and learning strategies include lectures, tutorials, seminars and presentations. Skill D3 is assessed through coursework reports, presentations and oral examinations. Skill D1 is assessed primarily through examinations. The other skills are not formally assessed. **Assessment** The module specifications include a wide range of modes of assessment, computing work, assignment and project work, chosen in the context of the learning outcomes to be assessed in the respective modules.
23	Assessed professional experience	Students will have the option of an industrial placement year following level 5.
24	Special features of programme	The programme has a business and industry thread running through the levels, where there is exposure to the type of mathematical problems addressed by business and industry. In particular, at level 5 there are seminars from outside speakers and an opportunity for the students to investigate a mathematical application in industry and business of their choice. The programme also includes a unique 40 credit project at level 6 where the student can choose one of the challenging cutting edge topics concerning society at the present time. It is anticipated these

		topics will be reviewed as society's needs change. It is hoped that this will encourage interest and engage students as well as demonstrating the practical importance and relevance of the programme to the jobs market of the mathematical techniques they have developed in the previous years of study.
25	Arrangements for student support	The University has a wide range of student support services, including a Health Service, Nursing, Chaplaincy, Student Advice Centre, Student Assistance Office, Tutor Advisor Scheme, academic learning skills support, Personal Development Plan (PDP) and Careers Service. Library and computing support is provided by the Information Services Division (ISD). Services include ICT and information literacy skills training, and the management of the University's Virtual Learning Environment (Blackboard) for e-learning. Module coordinators will be encouraged to place lecture notes, tutorial sheets and all teaching support material on Blackboard. In particular, there is a drop-in centre MathScope to help students with mathematics problems. In line with the University's Code of Practice on Personal Tutoring all students have access to a member of staff who can provide personal guidance and suggest other sources of help.

Form PS Appendix: **Programme specification: responsibility for approval and amendment**

		PROGRAMME APPROVAL		AMENDMENT*		
		PARSC/APPC outline approval	PARSC detailed approval	School	PARSC	APPC
1	Awarding institution/body	✓				✓
2	Taught at	✓				✓
3	Faculty and School(s) responsible for the programme	✓				✓
4	Links with partner institutions	✓				✓
5	Programme accredited by	✓			✓	✓
6	Final Award and Intermediate Terminating Qualifications	✓				✓
7	The FHEQ (Framework for Higher Education) level of the qualification	✓				✓
8	Programme title	✓				✓
9	Length of programme (in each mode)	✓				✓
10	Mode(s) of attendance/delivery	✓				✓
11	Year of commencement	✓	**+**		✓	
12	Funded by	✓				✓
13	Aims of programme *****	✓	**+**	(✓)	(✓)	(✓)
14	Entrance requirements		✓		✓	
15	For programmes not wholly 'owned' by one School the allocation of responsibility for the administration of the programme*****	✓			(✓)	(✓)
16	Programme structure*****	✓	**+**	(✓)	(✓)	(✓)
17	Requirements for progression at each level, plus the criteria on which the final award is based	✓				✓
18	JACS (Joint Academic Coding System) code any other relevant code		✓		✓	
19	Relevant Subject Benchmarking statements (and any other reference points)		✓		✓	
20	Programme content*****		✓	(✓)	(✓)	
21	Intended learning outcomes*****		✓	(✓)	(✓)	
22	Teaching, learning and assessment strategies*****		✓	(✓)	(✓)	
23	Assessed professional experience		✓		✓	
24	Special features of programme		✓	✓		
25	Arrangements for student support		✓		✓	

+ *PARSC may approve these sections at the detailed approval stage when minor changes are introduced after outline approval*

******* *the locus of responsibility for approving a programme amendment which falls into more than one category depends on the scope of the proposed amendment and its combination with other categories of amendment. Refer to guidance (including Programme Design, Approval and Amendment procedures paras 5.7 and 5.8 for changes to module specifications).*