Programme Specification
B.Sc. (Hons) Mathematics

Awarding Institution:	The University of Bolton
Teaching Institution:	The University of Bolton
Division and/or Faculty/Institute:	Faculty of Advanced Engineering & Sciences
Professional, statutory or regulatory body recognition:	Professional body: Institute of Mathematics and Its Applications Professional body URL: www.ima.org.uk Status of graduates: Associate Membership Graduates are eligible to apply for associate membership of the IMA. Full membership requires a minimum period of three years training and experience after graduation and a position of responsibility involving the application of mathematical knowledge or training in mathematics
Final award:	B.Sc. (Hons)
Interim awards	None.
Exit or Fallback awards	Cert HE Mathematics Dip HE Mathematics
Programme title	Mathematics
UCAS Code	G100
JACS Code	G100
University Course Codes	Full time MAT0001 Part time MAT5002
QAA Benchmark Statement	Mathematics, Statistics and Operational Research (MSOR)
Other internal and external reference points	QAA Academic Infrastructure, including the Framework for Higher Education Qualifications and the Code of Practice UK Quality Code for Higher Education University of Bolton awards framework London Mathematical Society position statements.

Language of study	English
Mode of study and normal period of study	Full time – 3 years Part time – 4.5 years

Admissions criteria

For entry to the degree by full time mode 'A' level you must have

- the minimum number of UCAS points currently specified by our *Recruitment and Admissions* department
- a pass in 'A' level in Mathematics.
- a pass in GCSE English or equivalent.

If you have passed the IMA Polymaths Certificate then you must have gained at least 900 points out of 1200 on that course in order to gain entry to the degree by either full time or part time study. Mature students without required entry qualifications will always be invited for an informal discussion about the programme. If you have not passed either 'A' level Mathematics or an equivalent qualification then you will be counselled to take the Polymaths Certificate prior to entry to the degree.

If English is not your first language then the minimum IELTS score for overseas students is at least 6.0 (or equivalent).

Applicants who have met the requirement for UCAS points or 900 points on the Polymaths Certificate are offered a place on the course without interview. However, applicants who have either non-standard qualifications or have narrowly failed to meet the standard entry requirements are invited to interview to assess their preparedness for entry to the course. Diagnostic testing involves asking applicants to solve short routine problems of 'A' level standard in an informal one-to-one meeting.

Additional admissions matters

None

Fitness to practise declaration

Not applicable

Aims of the programme

The principal aims of the programme are:

A to open up flexible opportunities for the study of mathematics, and particularly to encourage mature, female, ethnic minority, and part-time students to study the subject at degree level

B to provide a challenging honours degree programme in mathematics enabling students to reach appropriate honours standards

C to provide a route into mathematics teaching at secondary and tertiary level that is accessible to mature and part-time students

D to offer a mathematical education which, regardless of the level of study, equips students with the requisite knowledge, understanding and skills, delivered in the manner most appropriate to their needs

E To build students' confidence in their ability to study mathematics, and to stimulate students' interest in and enjoyment of the subject.

Distinctive features of the programme

- Excellent prospects for graduates, with above average graduate starting salaries
- A programme of study which provides a balance between theory-based and practice-based aspects of the subject
- Our degree is approved by the Institute of Mathematics and its Applications (IMA)
- Small group sizes of around 30 students per class
- Flexible programme offering study by full or part time attendance with classes available daytime and evening
- Progression route via Polymaths certificate for students needing additional preparation before entering the degree

Programme learning outcomes

The Learning Outcomes for the programme are informed by the Quality Assurance Agency's Subject Benchmark for Mathematics Statistics and Operational Research (abbreviated hereafter as *SBMSOR*). Upon completion of the Mathematics degree students will have:

(i) knowledge and understanding of, and the ability to use, mathematical methods and techniques, including calculus, abstract algebra and programming (*SBMSOR*, 3.9)

(ii) knowledge and understanding of the role of logical mathematical argument and deductive reasoning (*SBMSOR*, 3.14)

(iii) general communication, IT and study skills, including mathematical word processing and u the internet, and the ability to write coherently and communicate results clearly *(SBMSOR*, 3.27).

(iv) knowledge and understanding of axiomatic approaches in pure mathematics (*SBMSOR*, 3.15)

(v) knowledge and understanding from a range of major areas of mathematics chosen from abstract and linear algebra, analysis, topology, differential equations and mechanics (*SBMSOR*, 3.12).

(vi) an understanding of modelling techniques, and their conditions and limitations (*SBMSOR*, 3.19).

(vii) general study skills, particularly including the ability to learn independently using a variety media, including books and the Internet (*SBMSOR*, 3.27).

(viii) been prepared for a wide choice of career options through the academic content of the programme and the transferable skills it imparts (*SBMSOR*, 1.24).

K. Knowledge and understanding
On completion of the programme you will be able to demonstrate systematic knowledge and understanding of

1. the use of appropriate mathematical models for modelling real-world problems
2. writing coherent mathematical arguments
3. definitions of abstract concepts
4. the steps of a mathematical proof

C. Cognitive, intellectual or thinking skills
On completion of the programme you will be able to demonstrate the ability to:

1. accurately carry out symbolic manipulation
2. define algebraic structures by means of axioms
3. select the appropriate methods in problem solving
4. understand and use the concepts of approximation and convergence

P. Practical, professional or subject-specific skills
On completion of the programme you will be able to demonstrate the ability to

1. typeset mathematical formalisms
2. program for mathematical applications
3. isolate essential elements of a system and hence describe the system mathematically
4. appreciate the role of mathematician in society

T. Transferable, key or personal skills
On completion of the programme you will be able to demonstrate the ability to:

1. manage your time effectively in order to meet deadlines
2. convey information with clarity and confidence via a presentation
3. organise your own workload
4. locate appropriate resources in the library and online.

Programme structure

Students must pass modules worth a total of 120 credits at each of levels HE4, HE5 and HE6. At levels HE4 and HE5 there is a fixed diet of compulsory modules. At level HE6 students must take the compulsory 40 credit dissertation, and may choose any four from the seven taught HE6 modules available.

Module Code	Module title	Core/ Option/ Elective	Credits	Length (1, 2 or 3 periods)
MAT4001	Mathematical Methods	C	20	1
MAT4002	Abstract Algebra	C	20	1
MAT4003	The Mathematician in Society	C	20	1
MAT4004	Calculus	C	20	1
MAT4005	Structured Programming	C	20	1
MAT4006	Algorithms and Applications	C	20	1

MAT5001	Further Mathematical Methods	C	20	1
MAT5002	Vector Calculus	C	20	1
MAT5003	Dynamics	C	20	1
MAT5004	Real Analysis	C	20	1
MAT5005	Numerical Analysis	C	20	1
MAT5006	Linear Algebra	C	20	1
MAT6001	Further Linear Algebra	O	20	1
MAT6002	Complex Variables	O	20	1
MAT6003	Ring Theory	O	20	1
MAT6004	Numerical Solution of Differential Equations	O	20	1
MAT6005	Fluid Dynamics	O	20	1
MAT6006	Partial Differential Equations	O	20	1
MAT6007	Group Theory	O	20	1
MAT6008	Mathematics Dissertation	C	40	2

Learning and teaching strategies

Each module usually has three hours of classes per week for a semester (September to December or January to June). Each class is of three hours duration, either during a morning, an afternoon, or an evening. Most learning is via classroom teaching to groups of between twenty and thirty students. Because the class sizes are relatively small, rather than operating as formal "lectures", the classes are delivered in a fairly informal and interactive way. You will be invited to participate in discussion of the material presented, and encouraged by tutors to ask questions if something needs to be explained or clarified. We try to include a variety of activities in each class. Some time will be spent with the tutor writing on the board and talking through the material. Some modules include practical computer lab work. Group work includes quiz style exercises where you will be divided into small groups, with each group engaging in discussion to produce the group's answer. Some class time, typically one third of each teaching session, is set aside for tutorial work. Carefully structured exercises designed to supplement the material presented enable you to test and consolidate your knowledge. It is also expected that you work on these exercises outside of class time. Considerable effort has been expended in producing appropriate detailed learning materials for all modules. These are available as PDF files via the University's virtual learning environment *Moodle* as well as in hard-copy form.

In the final year, there are potentially a total of seven HE6 modules offered. However, due to resourcing issues each module will run only if the group size is large enough to be viable.

Learning activities (KIS entry)

	1st	2nd	3rd
Scheduled learning and teaching activities	28%	28%	20%
Guided independent study	72%	72%	80%

Assessment strategy

At level HE4 the modules *Algebra* and *Calculus* have an in-class test mid way through the module and an unseen written exam in the final week. The remaining HE4 modules are assessed by coursework and practical programming exercises.

All taught modules at levels HE5 and HE6 are assessed by either an in-class assignment or a practical programming exercise. These assessments test the first learning outcome for the module, and will be marked and returned promptly (usually within one week) to enable you to see how well you are progressing with the module. There is also an unseen written exam in the final week for each HE5 and HE6 module. This will test the remaining learning outcomes for the module. Your attempts at examinations are not routinely returned to you, but retained by the University. However, if you wish to view your marked script to understand how your mark was determined, then you are welcome to do so. For assessment strategies for individual modules please refer to the Module Descriptors.

Exercises appear at the end of each section of the learning materials for each module. Whilst these do not count toward your module mark, they nevertheless provide formative assessment to test and consolidate your knowledge and understanding of the material presented in the classes. You will be asked to attempt some of these exercises in class, whilst others may be set as homework. Written solutions to most exercises are also given. You may also request that the tutor works through the solutions of a given exercise if you feel that this will be helpful.

Assessment methods (KIS entry)

	Course Year		
	1st	2nd	3rd
Written exams	20%	60%	40%
Coursework	47%	33%	50%
Practical exams	33%	7%	10%

Assessment regulations

- Assessment Regulations for Undergraduate Modular Programmes

Grade Bands and classifications
Standard Statements
1. Undergraduate Honours Degrees

Grade Description	Mark %	Honours Degree Classification

Work of exceptional quality	70+	i
Work of very good quality	60-69	ii.i
Work of good quality	50-59	ii.ii
Work of satisfactory quality	40-49	iii
Borderline fail	35-39	
Fail	Below 35	

Honours classification
You will normally be awarded the honours classification resulting from the application of either Rule ACM20 or Rule ACM6.

Rule ACM20

A weighted average of the marks from modules worth a total of 200 credits at Levels HE5 and HE6 combined, including the marks from modules worth no more than 80 credits at least at Level HE5 (weighted 30 percent) and marks from modules worth at least 120 credits at Level HE6 (weighted 70 percent), which represent the best marks achieved by you at those Levels.

Where the average falls unequivocally into one of the following bands: 48.00 - 49.99, 58.00 - 59.99, 68.00 - 69.99; and you have achieved marks clearly in an honours classification category higher than their average for modules worth at least 110 credits, then you will be awarded an honours degree in the classification category one higher than that indicated by your average.

Rule ACM6 (an alternative if you do not have sufficient marks at Levels HE5 and 6 to apply ACM20)

A simple average of the equally weighted marks from modules worth 120 credits at Level HE6 which represent the best marks achieved by you at that Level.

Where the average falls unequivocally into one of the following bands: 48.00 – 49.99, 58.00 – 59.99, 68.00 – 69.99; and you have achieved marks clearly in an honours classification category higher than their average for modules worth at least 70 credits, then you will be awarded an honours degree in the classification category one higher than that indicated by their average.

Where you have marks available for fewer than 120 credits at Level HE6, honours classification shall normally be based **solely** on a simple average of the available marks for modules at Level HE6, subject to there being marks for a **minimum of 60 credits awarded by the University**. **Upgrading of the honours classification will not normally be available where there are marks available for fewer than 120 credits at Level HE6**,

unless this is explicitly approved.

Role of external examiners

External examiners are appointed for all programmes of study. They oversee the assessment process and their duties include: approving assessment tasks, reviewing assessment marks, attending assessment boards and reporting to the University on the assessment process.

Support for student learning

- The programme is managed by a programme leader
- One class room (currently T3-52) is designated as a Mathematics Resource Room. You are welcome to use this room as a quiet place to work when it is not being used for teaching. There is a collection of mathematics books in the room which you are welcome to make use of.
- Each year a session is arranged to assist second year students in their choice of HE6 modules.
- Induction programme introduces the student to the University and their programme
- Each student has a personal tutor, responsible for support and guidance
- Personal Development Planning (PDP) integrated into all programmes
- Feedback on formative and summative assessments
- A Student Centre providing a one-stop shop for information and advice
- University support services include housing, counselling, financial advice, careers and a disability
- A Chaplaincy
- Excellent library and IT services
- Student Liaison Officers attached to each Faculty
- The Students' Union advice services
- Faculty and Programme Handbooks which provide information about the programme and University regulations
- The opportunity to develop skills for employment
- English language support for International students

Methods for evaluating and enhancing the quality of learning opportunities

- Programme committees with student representation
- Module evaluations by students
- Students surveys, e.g. National Student Survey (NSS)
- Annual quality monitoring and action planning through Programme Quality Enhancement Plans (PQEPs), Data Analysis Report (DARs) Subject Annual Self Evaluation Report (SASERs), Faculty Quality Enhancement Plans (FQEPs), University Quality Enhancement Plan (UQEP)
- Peer review/observation of teaching
- Professional development programme for staff
- External examiner reports
- Institute of Mathematics and its Application programme approval

Other sources of information

Student portal: http://www.bolton.ac.uk/Students/Home
Students Union:
http://www.bolton.ac.uk/Students/AdviceAndSupport/StudentsUnion/Home
Faculty Handbook:
http://www.bolton.ac.uk/Students/
Programme Handbook: (add link)
Student Entitlement Statement:
http://www.bolton.ac.uk/Students/AdviceAndSupport/HomeOLD.aspx
Module database (add link)
Moodle: http://elearning.bolton.ac.uk/course/view.php?id=6023
External examiners reports:
http://www.bolton.ac.uk/Quality/QAEContents/ExternalExaminersReports/Home.aspx

Document control

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Learning outcomes map

Module title	Mod Code	Status	K1	K2	K3	K4	C1	C2	C3	C4	P1	P2	P3	P4	T1	T2	T3	T4
Level HE 4																		
Mathematical Methods	MAT4001	**C**					**TDA**		**TDA**						**DA**		**D**	
Abstract Algebra	MAT4002	**C**		**TD**	**TD**	**TD**	**TDA**	**TDA**							**DA**		**D**	
The Mathematician in Society	MAT4003	**C**									**TD**			**TD**	**TDA**	**TDA**	**T**	**TD**
Calculus	MAT4004	**C**		**D**		**D**	**TDA**								**DA**		**D**	
Structured Programming	MAT4005	**C**							**TDA**	**TDA**		**TDA**			**DA**		**D**	
Algorithms and Applications	MAT4006	**C**										**TDA**			**DA**		**D**	
Level HE 5																		
Further Mathematical Methods	MAT5001	**C**		**D**		**D**	**DA**		**DA**						**DA**		**D**	
Vector Calculus	MAT5002	**C**	**TDA**	**D**		**D**	**DA**		**DA**						**DA**		**D**	
Dynamics	MAT5003	**C**	**TDA**				**DA**		**DA**				**TDA**		**DA**		**D**	
Real Analysis	MAT5004	**C**		**TDA**		**TDA**	**DA**			**TDA**					**DA**		**D**	
Numerical Analysis	MAT5005	**C**		**D**		**D**	**DA**		**DA**	**TDA**		**DA**			**DA**		**D**	
Linear Algebra	MAT5006	**C**		**TDA**	**TDA**	**TDA**	**DA**	**TDA**							**DA**		**D**	
Level HE 6																		
Further Linear Algebra	MAT6001	**O**		**DA**	**DA**	**DA**	**DA**	**DA**							**DA**		**D**	
Complex Variables	MAT6002	**O**		**D**		**D**	**DA**			**DA**					**DA**		**D**	
Ring Theory	MAT6003	**O**		**DA**	**DA**	**DA**	**DA**	**DA**							**DA**		**D**	
Numerical Solution of Differential Equations	MAT6004	**O**					**DA**		**DA**						**DA**		**D**	
Fluid Dynamics	MAT6005	**O**	**DA**				**DA**		**DA**				**DA**		**DA**		**D**	
Partial Differential Equations	MAT6006	**O**	**DA**				**DA**		**DA**	**DA**			**DA**		**DA**		**D**	
Group Theory	MAT6007	**O**		**DA**	**DA**	**DA**	**DA**	**DA**							**DA**		**D**	
Dissertation	MAT6008	**C**									**DA**				**TDA**	**DA**	**D**	**DA**

K. Knowledge and understanding P. Practical, professional and subject specific skills C. Cognitive, Intellectual and thinking skills T. Transferable, key or personal skills

Complete the grid using the following (Developed = D, Taught = T, Assessed = A)

Module listing for __BSc Mathematics_____

Module title	Mod Code	New? ✓	Level	Credits	Type	Core/Option C/O	Pre-requisite module	Assessment 1			Assessment 2		
								Assessment type	Assessment %	Add Y if final item	Assessment type	Assessment %	Final item
Mathematical Methods	MAT4001		**4**	**20**	**STAN**	**C**		**ICA**	**50%**		**ICA**	**50%**	**Y**
Abstract Algebra	MAT4002		**4**	**20**	**STAN**	**C**		**ICA**	**40%**		**EX**	**60%**	**Y**
The Mathematician in Society	MAT4003		**4**	**20**	**STAN**	**C**		**CW**	**50%**		**ICA**	**50%**	**Y**
Calculus	MAT4004		**4**	**20**	**STAN**	**C**		**ICA**	**40%**		**EX**	**60%**	**Y**
Structured Programming	MAT4005		**4**	**20**	**STAN**	**C**		**PRAC**	**50%**		**PRAC**	**50%**	**Y**
Algorithms and Applications	MAT4006		**4**	**20**	**STAN**	**C**		**PRAC**	**50%**		**PRAC**	**50%**	**Y**
Further Mathematical Methods	MAT5001		**5**	**20**	**STAN**	**C**		**ICA**	**40%**		**EX**	**60%**	**Y**
Vector Calculus	MAT5002		**5**	**20**	**STAN**	**C**		**ICA**	**40%**		**EX**	**60%**	**Y**
Dynamics	MAT5003		**5**	**20**	**STAN**	**C**		**ICA**	**40%**		**EX**	**60%**	**Y**
Real Analysis	MAT5004		**5**	**20**	**STAN**	**C**		**ICA**	**40%**		**EX**	**60%**	**Y**
Numerical	MAT5005		**5**	**20**	**STAN**	**C**		**PRAC**	**40%**		**EX**	**60%**	**Y**

Analysis													
Linear Algebra	MAT5006		**5**	**20**	**STAN**	**C**		**ICA**	**40%**		**EX**	**60%**	**Y**
Further Linear Algebra	MAT6001		**6**	**20**	**STAN**	**O**		**ICA**	**40%**		**EX**	**60%**	**Y**
Complex Variables	MAT6002		**6**	**20**	**STAN**	**O**		**ICA**	**40%**		**EX**	**60%**	**Y**
Ring Theory	MAT6003		**6**	**20**	**STAN**	**O**		**ICA**	**40%**		**EX**	**60%**	**Y**
Numerical Solution of Differential Equations	MAT6004		**6**	**20**	**STAN**	**O**		**PRAC**	**30%**		**EX**	**70%**	**Y**
Fluid Dynamics	MAT6005		**6**	**20**	**STAN**	**O**		**ICA**	**40%**		**EX**	**60%**	**Y**
Partial Differential Equations	MAT6006		**6**	**20**	**STAN**	**O**		**ICA**	**40%**		**EX**	**60%**	**Y**
Group Theory	MAT6007		**6**	**20**	**STAN**	**O**		**ICA**	**40%**		**EX**	**60%**	**Y**
Dissertation	MAT6008		**6**	**40**	**DISS**	**C**		**DISS**	**90%**	**Y**	**VIVA**	**10%**	

Assessment types: ICA = Set exercise, taken as in-class assessment, PRAC = practical assessment, EX = written exam.

Bolton Key Core Curriculum requirements

Module Title	Module Code	C/O	Employability											Bolton Values		
			PDP	Communication	Team work	Organisation & Planning	Numeracy	Problem solving	Flexibility & adaptability	Action planning	Self awareness	Initiative	Personal impact & confidence	Inter-nationalisation	Environmental sustainability	Social, public and ethical responsibility
Mathematical Methods	MAT4001			TDA		D	TDA		TD	TD	TD					
Abstract Algebra	MAT4002			TDA		D			TD	TD	TD			TA		
The Mathematician in Society	MAT4003		TDA	TDA	TD	TD	TDA		TD	TD	TD	T	TDA		T	TDA
Calculus	MAT4004			TDA		D		TDA	TD	TD	TD			TA		
Structured Programming	MAT4005			TDA		D		TDA	TD	TD	TD					
Algorithms and Applications	MAT4006			TDA		D			TD	TD	TD					
Further Mathematical Methods	MAT5001			TDA		D		DA	TD	TD	TD	D		TA		
Vector Calculus	MAT5002			TDA		D		TDA	DT	TD	TD	D		TA		
Dynamics	MAT5003			TDA		D		TDA	TD	TD	TD	D		TA		
Real Analysis	MAT5004			TDA		D			TD	TD	TD	D		TA		
Numerical Analysis	MAT5005			TDA		D		DA	TD	TD	TD	D		TA		

Linear Algebra	MAT5006			TDA		D			TD	TD	TD	D		TA		
Further Linear Algebra	MAT6001			DA		D			TD	TD	TD	DA		TA		
Complex Variables	MAT6002			DA		D		TDA	TD	TD	TD	DA		TA		
Ring Theory	MAT6003			DA		D			TD	TD	TD	DA		TA		
Numerical Solution of Differential Equations	MAT6004			DA		D		DA	TD	TD	TD	DA		TA		
Fluid Dynamics	MAT6005			DA		D		TDA	TD	TD	TD	DA		TA		
Partial Differential Equations	MAT6006			DA		D		TDA	TD	TD	TD	DA		TA	DA	
Group Theory	MAT6007			DA		D			TD	TD	TD	DA		TA		
Dissertation	MAT6008		DA	DA		DA			DA	DA	DA	DA	DA			

Complete the grid using the following (Developed = D, Taught = T, Assessed = A)
Learning outcomes map