

BSc/MSci Mathematics with Economics for 2023/24

All modules are worth 15 credits unless stated otherwise. 120 credits are taken each year. All modules are at level 4, 5, 6 or 7, corresponding roughly to years 1, 2, 3 and 4.

During all years of the degree, you must take a maximum of 150 credits at Level 4. To graduate with the BSc, you must take a minimum of 90 credits at Level 6 or above during your degree. To graduate with the MSci, you must take a minimum of 120 credits at Level 7 during your degree.

Please note that the choice of optional modules available may vary slightly from year to year and is subject to approval by the Mathematics Departmental Tutor and, in the case of modules from other departments, also to approval from that department.

YEAR 1

All modules are compulsory and at Level 4

Term 1		Term 2	
MATH0003	Analysis 1	MATH0004	Analysis 2
MATH0005	Algebra 1	MATH0006	Algebra 2
MATH0010	Mathematical Methods 1	MATH0011	Mathematical Methods 2
MATH0002	Economics 1 (30 credits)	MATH0002	<i>Continued</i>

YEAR 2

Term 1

The modules below are compulsory and are at Level 5

MATH0013 Analysis 3: Complex Analysis
 MATH0014 Algebra 3: Further Linear Algebra
 MATH0016 Mathematical Methods 3

Term 1 and 2

The following module is compulsory at is at Level 5

STAT0001 Economics 2 (30 credits)

Term 2

All students (BSc/MSci)

Choose three modules (45 credits) from the Year 2 options listed below. Your choice of options in the second year has a large impact on what can be chosen in the third year (and fourth year for MSci students): you should look at the third/fourth year options and the module pathways information to help you choose (<https://www.ucl.ac.uk/maths/current-students/current-undergraduates/degree-structures-and-options>). You may replace a maximum of one mathematics module (15 credits) by an outside option.

MSci students

MSci students are strongly advised to take three mathematics options and also to look carefully at the year 3/4 structure to see the implications of your choice of modules in Year 2 for later years.

Year 2 options

MATH0034 Number Theory (Level 5)
 MATH0051 Analysis 4: Real Analysis (Level 6)
 MATH0052 Geometry and Groups (Level 5)
 MATH0053 Algebra 4: Groups and Rings (Level 6)
 MATH0055 Electromagnetism (Level 5)
 MATH0056 Mathematical Methods 4 (Level 6)
 MATH0057 Probability and Statistics (Level 5)
 MATH0058 Computational Methods (Level 5)

Outside options (maximum 15 credits)

If you wish to choose an outside option, i.e. a module from another department, you should first check information with the relevant department, including pre-requisites and registration procedures. No adjustment can be made to timetables for outside options. Although outside options are normally taken in term 2, it is possible to take an outside option in term 1 or through terms 1 and 2 if the timetable works.

The list of modules which appear in the list here are likely to be reasonably suitable but **still require approval from the teaching department**. If you wish to take an outside option which does not appear on this list, then you should contact the Mathematics Departmental Tutor to discuss.

Standard Year 2 outside options

BASC0017	Interdisciplinary Game Theory	(Level 5: Term 2)
BASC0038	Algorithms: Logic and Structures	(Level 4: Term 2)
BASC0047	Machine Reasoning and Expert Systems	(Level 5: Term 2)
ECON0011	Basic Microeconomic Concepts	(Level 4: Term 2)
ECON0044	An Introduction to Applied Economic Analysis	(Level 4: Term 1)
INST0002	Programming 1	(Level 4: Term 2)
LC*:	Language Centre modules	(various levels: term 1 and 2)
MSIN0004	Accounting for Business A4U	(Level 4: Term 1 or Term 2)
MSIN0048	Understanding Management	(Level 4: Term 1 or Term 2)
MSIN0059	Managerial Accounting for Decision Making	(Level 5: Term 1 or Term 2)
MSIN0061	Global Marketing Strategy	(Level 5: Term 2)
PHAS0022	Quantum Physics	(Level 5: Term 1)

These modules are expected to be offered in these terms in 2023-24 but this is not guaranteed and there is no guarantee you will be able to get a place. You should check term and timetable.

YEAR 3

All students (BSc/MSci)

You choose 30 credits of suitable Economics modules (see list of Economics Modules below) and 90 credits (6 modules) from the list of Mathematics Modules below which include all standard year 3 Mathematics options, some year 4 Mathematics options, year 2 Mathematics options not previously taken, three standard Statistics options and the Maths Education module. [From the point of view of BSc students, which modules are in groups 1A, 1B and 2 is irrelevant, although if you wish to keep open the possibility of switching to the MSci, you should follow the MSci rules.] You may substitute up to 30 credits of these Mathematics options with outside option(s), subject to approval. You should ensure that you take enough units at level 6 or 7: in order to graduate with the BSc degree, a minimum of 90 credits, from all years, must be taken at level 6 or 7. Please take advice and look at the module pathways.

MSci students

In addition to the rules above, you must choose one of the three groups 1A, 1B and 2 and choose at least three modules from that group. To give you some flexibility in year 4, you are strongly advised to include at least one module at level 7 this year: to graduate with the MSci you must take at least 120 credits, from all years, at level 7: please have a look at year 4 to see the restrictions created by the fact that there are no level 7 modules offered by the Economics department. You should also choose your modules carefully in the light of which modules you will take in year 4, and which project you will pursue. Please take advice and look at the module pathways

LIST OF MODULES

All modules are at level 6 unless otherwise specified. Level 7 modules are likely to be harder and have a 50% pass mark.

Term 1		Term 2	
Main Year 3 Mathematics options			
MATH0017	Measure Theory	MATH0018	Functional Analysis
MATH0019	Multivariable Analysis	MATH0020	Differential Geometry
MATH0022	Galois Theory	MATH0021	Homological Algebra
MATH0023	Algebraic Topology	MATH0027	Mathematical Methods 5
MATH0025	Mathematics for General Relativity	MATH0028	Combinatorial Optimisation
MATH0026	Biomathematics	MATH0031	Financial Mathematics
MATH0029	Graph Theory and Combinatorics	MATH0035	Algebraic Number Theory
MATH0030	Mathematical Ecology	MATH0036	Elliptic Curves
MATH0032	Introduction to Mathematica	MATH0037	Logic
MATH0033	Numerical Methods	MATH0038	History of Mathematics
		MATH0108	Commutative Rings and Algebras
		MATH0109	Theorem proving in LEAN
Year 4 options open to third years			
MATH0070	Linear Partial Differential Equations (L7)	MATH0069	Probability (L7)
MATH0074	Topology and Groups (L7)	MATH0073	Representation Theory (L7)
MATH0075	Lie Groups and Lie Algebras (L7)	MATH0080	Waves and Wave Scattering
MATH0083	Prime Numbers and their Distribution (L7)	MATH0090	Elliptic PDEs (L7)

MATH0104	Modular Forms (L7)	MATH0092	Variational Methods for PDEs (L7)
		MATH0102	Applied Stochastic Methods (L7)
		MATH0107	Probabilistic methods in Combinatorics (L7)
Stats modules and Maths Education [Note: Although these are counted as Mathematics options, you will need to register with Statistics/IOE and acceptance is not guaranteed]			
STAT0005	Probability and Statistics II	STAT0007	Stochastic Processes
CPAS0012	Mathematical Education for Physical and Mathematical Sciences	STAT0011	Decision and Risk
Mathematics options from Year 2			
		MATH0034	Number Theory (L5)
		MATH0051	Analysis 4: Real Analysis
		MATH0052	Geometry and Groups (L5)
		MATH0053	Algebra 4: Groups and Rings
		MATH0055	Mathematics of EM and Special Relativity (L5)
		MATH0056	Mathematical Methods 4
		MATH0057	Probability and Statistics (L5)
		MATH0058	Computational Methods (L5)

Year 3 Economics options (30 credits)

These are likely to include the following list, which are all at level 6 and 15 credits unless otherwise noted.

<i>Term 1</i>		<i>Term 2</i>	
ECON0023	International Trade	ECON0001	Economics of Financial Markets
ECON0025	Economics of Competition Policy	ECON0040	Behavioural Economics
ECON0027	Game Theory	ECON0047	Economics of Labour
ECON0028	The Economics of Growth	ECON0052	Environmental Economics
ECON0054	Economics of Development	ECON0053	Economics of Tax Policy
		ECON0055	Economics of Science
		ECON0056	Economics of Education
ECON0019	Quantitative Economics and Econometrics (Level 5 and 30 credits)	ECON0019 (continued)	

Groups of modules for MSci students

Group 1A Analysis/PDEs

MATH0017	Measure Theory	MATH0018	Functional Analysis
MATH0019	Multivariable Analysis	MATH0020	Differential Geometry
MATH0029	Graph Theory and Combinatorics	MATH0069	Probability (L7)
MATH0070	Linear Partial Differential Equations (L7)	MATH0092	Variational Methods for PDEs (L7)
MATH0083	Prime Numbers and their Distribution (L7)	MATH0090	Elliptic PDEs (L7)

Group 1B Algebra/Number Theory

MATH0022	Galois Theory	MATH0021	Homological Algebra
MATH0023	Algebraic Topology	MATH0035	Algebraic Number Theory
MATH0029	Graph Theory and Combinatorics	MATH0036	Elliptic Curves
MATH0083	Prime Numbers and their Distribution (L7)	MATH0073	Representation Theory (L7)
MATH0104	Modular Forms (L7)	MATH0108	Commutative Rings and Algebras

Group 2 Applied/Applicable Mathematics/Methods

MATH0025	Mathematics for General Relativity	MATH0027	Mathematical Methods 5
MATH0026	Biomathematics	MATH0028	Combinatorial Optimisation
MATH0030	Mathematical Ecology	MATH0056	Mathematical Methods 4 (L6)
MATH0033	Numerical Methods	MATH0092	Variational Methods for PDEs (L7)
		MATH0102	Applied Stochastic Methods (L7)

Year 3/4 Outside options (at most 30 credits)

If you wish you can choose up to 30 credits of outside options, i.e. modules from other departments, you should first check information with the relevant department, including pre-requisites and registration procedures. No adjustment can be made to timetables for outside options. Although outside options are normally taken in term 2, it is possible to take an outside option in term 1 or through terms 1 and 2 if the timetable works.

The modules which appear here have been taken by Maths students in the past and most are likely to be reasonably suitable. However, there is no guarantee you can take them and they still require

approval from the teaching department. Please note that if you are in year 4, you can only take outside options at Level 6 or 7. If you wish to take an outside option which does not appear on this list, then you should contact the Mathematics Departmental Tutor to discuss.

Standard Year 3 outside options

BENG0019	Engineering Mathematics in Finance	(Term 2: level 5)
COMP0015	Introduction to Programming	(Term 1 or 2: Level 5)
COMP0142	Machine Learning for Domain Specialists	(Term 2: Level 6)
ECON0027	Game Theory	(Term 1: Level 6)
INST0002	Programming 1	(Term 2: Level 4)
INST0060	Foundations of Machine Learning	(Term 1: Level 7)
LC*	Language Centre modules	(Term 1 and 2: various levels)
MSIN0004	Accounting for Business	(Term 1 or 2: Level 4)
MSIN0048	Understanding Management	(Term 1 or 2: Level 4)
MSIN0059	Managerial Accounting for Decision Making	(Term 1 or 2: Level 5)
MSIN0146	Financial Management	(Term 1: Level 6)
PHAS0022	Quantum Physics	(Term 1: Level 5)
STAT0025	Optimisation Algorithms in Operational Research	(Term 1: level 6)

These modules are expected to be offered in 2023-24 but this is not guaranteed and there is no guarantee you will be able to get a place. Please check term.

YEAR 4 (MSci)

The following module is compulsory and is worth 30 credits

MATH0084 (was MATHM901) Project (level 7)

As well as the project, you choose:

- (i) 30 credits from the Economics list, which includes the level 6 options from the list of Year 3 Economics Options as well as

MATH0088 Quantitative and Computational Finance (L7) Term 2
MATH0085 Asset Pricing in Continuous Time (L7) Term 1

- (ii) 60 credits of Standard Year 4 Mathematics options.

It is possible to substitute up to 30 credits of these by suitable outside options or third year mathematics options but all modules taken must be at level 6 or 7.

Please note that you need to take 120 credits at level 7 from all years to graduate with the MSci. Thus if you have not taken any level 7 modules in your third year, you will not be able to take any level 6 options in year 4 and so will have to take MATH0085 and MATH0088 as your Economics options.

Standard Year 4 Mathematics options (level 7)

<i>Term 1</i>		<i>Term 2</i>	
MATH0065	Advanced Modelling Mathematical Techniques	MATH0061	Further Topics in Algebraic Number Theory
MATH0070	Linear Partial Differential Equations	MATH0069	Probability
MATH0071	Spectral Theory	MATH0073	Representation Theory
MATH0072	Riemannian Geometry	MATH0078	Asymptotic Approximation Methods
MATH0074	Topology and Groups	MATH0080	Waves and Wave Scattering
MATH0075	Lie Groups and Lie Algebras	MATH0082	Evolutionary Games and Population Genetics
MATH0076	Algebraic Geometry	MATH0088	Quantitative and Computational Finance
MATH0083	Prime Numbers and their Distribution	MATH0090	Elliptic PDEs
MATH0086	Computational and Simulation Methods	MATH0092	Variational Methods for PDEs
		MATH0102	Applied Stochastic Methods
		MATH0104	Modular Forms
		MATH0107	Probabilistic Methods in Combinatorics

Year 4 Outside options or 3rd year Mathematics modules (at most 30 credits)

If you wish you can choose up to 30 credits of outside options, i.e. modules from other departments, or 3rd year Mathematics modules. If taking a module from another department, you should first check information, including pre-requisites and registration procedures. No adjustment can be made to timetables for outside options.

The modules which appear here have been taken by Maths students in the past and most are likely to be reasonably suitable. However, there is no guarantee you can take them and they still require approval from the teaching department. Please note that you can only take outside options at Level 6 or 7 and you should make sure that you have a total of at least 120 credits at level 7 from this and previous years. If you wish to take an outside option which does not appear on this list, then you should contact the Mathematics Departmental Tutor to discuss.

Year 4 Standard outside options

COMP0142	Machine Learning for Domain Specialists	(Term 2: Level 6)
ECON0027	Game Theory	(Term 1: Level 6)
INST0060	Foundations of Machine Learning	(Term 1: Level 7)
LC*	Language Centre modules	(Term 1 and 2: level 7)
MSIN0146	Financial Management	(Term 1: Level 6)
STAT0025	Optimisation Algorithms in Operational Research	(Term 1: level 6)

These modules are expected to be offered in 2023-24 but this is not guaranteed and there is no guarantee you will be able to get a place. Please check term.

Year 3 Mathematics modules

<i>Term 1</i>		<i>Term 2</i>	
MATH0017	Measure Theory	MATH0018	Functional Analysis
MATH0019	Multivariable Analysis	MATH0020	Differential Geometry
MATH0022	Galois Theory	MATH0021	Homological Algebra
MATH0023	Algebraic Topology	MATH0027	Mathematical Methods 5
MATH0025	Mathematics for General Relativity	MATH0028	Combinatorial Optimisation
MATH0026	Biomathematics	MATH0031	Financial Mathematics
MATH0029	Graph Theory and Combinatorics	MATH0035	Algebraic Number Theory
MATH0030	Mathematical Ecology	MATH0036	Elliptic Curves
MATH0032	Introduction to Mathematica	MATH0037	Logic
MATH0033	Numerical Methods	MATH0038	History of Mathematics
		MATH0054	Analytical Dynamics
		MATH0108	Commutative Rings and Algebras (new)
		MATH0109	Theorem proving in LEAN (new)