

Programme Information and PLOs			
Title of the new programme – including any year abroad/ in industry variants			
BSc (Hons) Economics and Mathematics			
Level of qualification			
Please select:	Level 6		
Please indicate if the programme is offered with any year abroad / in industry variants		Year in Industry Please select Y/N	No
		Year Abroad Please select Y/N	No
Department(s): Where more than one department is involved, indicate the lead department			
Lead Department	Economics		
Other contributing Departments:	Mathematics		
Programme Leader			
Dr Evgeniy Zorin			
Purpose and learning outcomes of the programme			
Statement of purpose for applicants to the programme			
<p>In our competitive, fast-moving economic environment, skilled analysts are highly sought-after and command high salaries. The BSc in Economics and Mathematics has been designed for students interested in careers in this field, such as actuarial analysts, chartered accountants, data analysts, financial risk analysts, investment analysts and stockbrokers. The programme provides you with an outstanding opportunity to pursue and relate studies from both disciplines resulting in mastery in Mathematics - and therefore understanding of sophisticated systems and how to find the best strategy in complicated situations - and understanding of applications in Economics and how these reveal the rationales for various abstract mathematical techniques. In addition, this degree has a flexible design, with a very wide choice of optional modules, so you can tailor your studies according to your needs, interests and career plans. Throughout the programme you will be guided by dedicated staff, all of whom are engaged in current research and many of whom are world leaders in their field.</p> <p>By the end of your studies, you will have knowledge and expertise in two disciplines which are of vital importance in the modern world and a qualification valued by employers such as banks, hedge funds and financial consultants. The excellence of our programme, combining the strengths of both the departments of Economics and Mathematics, with York's reputation as a top university, make a BSc degree in Economics and Mathematics at York an outstanding choice.</p>			
Programme Learning Outcomes			
Please provide six to eight statements of what a graduate of the programme can be expected to do.			
Taken together, these outcomes should capture the distinctive features of the programme. They should also be outcomes for which progressive achievement through the course of the programme can be articulated, and which will therefore be reflected in the design of the whole programme.			
PLO	On successful completion of the programme, graduates will be able to:		
1	confidently identify those problems that can be analysed by standard mathematical techniques, and those situations in society where economic principles can provide insight, and be able to apply those techniques and principles successfully.		

2	recognise when an unfamiliar problem is open to pure mathematical investigation and/or mathematical modelling, and be able to adapt and/or synthesise a range of mathematical approaches (including abstraction or numerical approximation) to investigate the problem.
3	deploy the methods of logical and mathematical reasoning used by economists, especially within formal models, with an understanding of the purpose and scope of such models.
4	use logical reasoning to critically analyse statements, arguments or conjectures made by others, and be able to justify the mathematical principles they choose for such a critique.
5	use statistical, econometric and computer-based techniques for analysing data, in applying and testing economic models or in economic and financial forecasting.
6	engage with, and draw on, academic and professional research in Economics, with an ability to distinguish different themes within it, and to synthesise ideas from it.
7	analyse and critically evaluate economic policies, of government and/or other institutions
8	communicate complex mathematical and economic ideas clearly, at a level appropriate for the intended audience.

Programme Learning Outcome for year in industry (where applicable)
 For programmes which lead to the title 'with a Year in Industry' – typically involving an additional year – please provide either a) amended versions of some (at least one, but not necessarily all) of the standard PLOs listed above, showing how these are changed and enhanced by the additional year in industry b) an additional PLO, if and only if it is not possible to capture a key ability developed by the year in industry by alteration of the standard PLOs.

N / A

Programme Learning Outcome for year abroad programmes (where applicable)
 For programmes which lead to the title 'with a Year Abroad' – typically involving an additional year – please provide either a) amended versions of some (at least one, but not necessarily all) of the standard PLOs listed above, showing how these are changed and enhanced by the additional year abroad or b) an additional PLO, if and only if it is not possible to capture a key ability developed by the year abroad by alteration of the standard PLOs.

N / A

Explanation of the choice of Programme Learning Outcomes
 Please explain your rationale for choosing these PLOs in a statement that can be used for students (such as in a student handbook). Please include brief reference to:

i) Why the PLOs are considered ambitious or stretching?
 Each PLO represents a challenge to the student to develop existing skills to a higher level. Through each stage the level of challenge is raised, as more depth or complexity is encountered. In studying economics and mathematics each stage builds naturally on the attainments of the previous one, as foundational ideas are developed into fully fledged theories or methodologies. Those who fully rise to this challenge will be capable of understanding economics and mathematics at the research frontier.

ii) The ways in which these outcomes are distinctive or particularly advantageous to the student:

These PLOs give the student the ability to understand and to critically assess arguments and debates about economics and economic policy, which is of value to any citizen. At the same time, more broadly, they provide abilities and understanding to function in any environment where the precision and clarity of mathematical thinking are valuable. They also represent the development of analytical skills proven to be valued by employers across a wide range of occupations.

iii) How the programme learning outcomes develop students' digital literacy and will make appropriate use of technology-enhanced learning (such as lecture recordings, online resources, simulations, online assessment, 'flipped classrooms' etc)?

The communication elements require students to master digital literacy for visual presentations and for producing projects. In addition, all students will learn some programming, and a number of modules include the opportunity to use mathematics software (such as R, Maple and MatLab).

iv) How the PLOs support and enhance the students' employability (for example, opportunities for students to apply their learning in a real world setting)?

The programme's employability objectives should be informed by the University's Employability Strategy:

<http://www.york.ac.uk/about/departments/support-and-admin/careers/staff/>

The PLOs cover a list of skills which are desired by employers in a wide range of occupations: analytical reasoning, confidence with high level mathematics, clarity of communication, flexible thinking, the ability to learn complex ideas quickly and precisely.

vi) How will students who need additional support for academic and transferable skills be identified and supported by the Department?

Via the disability/student support services procedures and statements of needs, with the oversight of the department's Disability Coordinator and each student's academic supervisor. Students who needs discussing and developing their academic writing can get additional support from the Writing Centre. Also, students have an option to get additional support on mathematics and statistics topics via the Maths Skills Centre.

vii) How is teaching informed and led by research in the department/ centre/ University?

The vast majority of teaching staff are active in research, and through lectures, tutorials and seminars communicate the influence foundational ideas have on making progress in research. Many Stage 2 and Stage 3 option modules include, on their reading lists, research published by the module teachers. Students also explicitly connect with the principles of research through projects (in Intro to Applied Maths and Math Skills 1 & 2) as well as having the option to choose modules which lie close to the research frontier in their final year.

Stage-level progression

Please complete the table below, to summarise students' progressive development towards the achievement of PLOs, in terms of the characteristics that you expect students to demonstrate at the end of each year. This summary may be particularly helpful to students and the programme team where there is a high proportion of option modules.

Note: it is not expected that a position statement is written for each PLO, but this can be done if preferred (please add information in the 'individual statement' boxes). For a statement that applies across all PLOs in the stage fill in the 'Global statement' box.

Stage 0 (if your programme has a Foundation year, use the toggles to the left to show the hidden rows)

Stage 1

On progression from the first year (Stage 1), students will be able to:

Global statement

PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8
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Identify a range of issues and situations in society where economic concepts and principles can provide insight, with some understanding of the application of those concepts and principles. Competently use foundational mathematical techniques	adapt foundational techniques to unfamiliar situations	apply some logical and mathematical methods, including within a range of relatively simple formal models.	create and critique elementary mathematical reasoning and understand the importance of sound reasoning	use some statistical, including computer-based (principally spreadsheet) techniques for analysing economic and financial data.	show familiarity with some important broad themes within economic research, with some knowledge of relevant data and analytical techniques.	understand the basic principles of analysing and evaluating microeconomic and macroeconomic policy, and in broad terms how to apply those principles.	communicate elementary mathematical ideas clearly and concisely, present clear analysis of concepts and data relevant to Stage 1, in a variety of modes including verbal/written and technical.
Stage 2							
On progression from the second year (Stage 2), students will be able to:				<i>Global statement</i>			
PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8
Building on Stage 1, identify a wider range of issues and situations in society where economic concepts and principles can provide insight, with a developing understanding of the application of those concepts and principles. Confidently perform calculations, or use methods, which require the combination of several foundational mathematical techniques, and identify which of those techniques is appropriate.	recognize when some foundational techniques can be applied outside the standard context, and put together two or more techniques to analyse a problem.	building on Stage 1, apply a more sophisticated range of logical and mathematical methods, and with a developing understanding of the purpose and scope of formal models.	reproduce, with understanding and some insight, important examples of logical reasoning or mathematical argument, and create their own arguments for similar situations	building on Stage 1, use econometric techniques and specialist computer applications for analysing economic and financial data, including in applying and testing models.	building on Stage 1, develop further understanding of important broad themes within economic research, with deeper knowledge of relevant data and analytical techniques.	building on Stage 1, a deeper understanding of the principles of analysing and evaluating economic policy, and the range and application of those principles.	building on Stage 1, present clear analysis of concepts and data relevant to Stage 2, in a variety of modes including verbal/written and technical. Write clearly and concisely, with an appropriate balance between mathematics and English, about well-understood mathematical ideas
Stage 3							
(For Integrated Masters) On progression from the third year (Stage 3), students will be able to:				<i>Global statement</i>			
PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8

Optional module lists

If the programme requires students to select option modules from specific lists these lists should be provided below. If you need more space, use the toggles on the left to reveal ten further hidden rows.

Option List A	Option List B	Option List C	Option List D	Option List E	Option List F	Option List G	Option List H
Survival Analysis (H Level) MAT00018H	Mathematical Finance II MAT00016H	Numerical Analysis MAT00041H					
Mathematical Finance I MAT00015H	Cryptography MAT00034H						
Stochastic Processes MAT00030H	Time Series MAT00045H						
Statistical Pattern Recognition MAT00031H	Multivariate Analysis MAT00021H						
Bayesian Statistics MAT00003H							
Generalised Linear Models MAT00017H							

Management and Admissions Information

This document applies to students who commenced the programme(s) in:

2017/18

Interim awards available Interim awards available on undergraduate programmes (subject to programme regulations) will normally be: Certificate of Higher Education (Level 4/Certificate), Diploma of Higher Education (Level 5/Intermediate), Ordinary Degree and in the case of Integrated Masters the Bachelors with honours. Please specify any proposed exceptions to this norm.

Certificate of Higher Education (Level 4/Certificate) generic
Diploma of Higher Education (Level 5/Intermediate) generic

Admissions Criteria

TYPICAL OFFERS
A levels AAA/AAB
IB Diploma Programme
36/35 points including HL 6
in essential subjects
BTEC Extended Diploma
DDD (may vary for
combined programmes)

Length and status of the programme(s) and mode(s) of study

Programme	Length (years)	Status (full-time/part-time) Please select	Start dates/months (if applicable – for programmes that have multiple intakes or start dates that differ from the usual academic year)	Mode				
				Face-to-face, campus-based		Distance learning		Other
BSc in Economics and Mathematics	3	Full-time	n/a	Please select Y/N	Yes	Please select Y/N	No	n/a

Language(s) of study

English.

Language(s) of assessment

English.

Programme accreditation by Professional, Statutory or Regulatory Bodies (PSRB)

Is the programme recognised or accredited by a PSRB		
Please Select Y/N:	No	if No move to next Section if Yes complete the following questions
Name of PSRB		
Are there any conditions on the approval/ accreditation of the programme(s)/ graduates (for example accreditation only for the full award and not any interim award)		
Additional Professional or Vocational Standards		
Are there any additional requirements of accrediting bodies or PSRB or pre-requisite professional experience needed to study this programme?		
Please Select Y/N:	<input type="checkbox"/>	if Yes, provide details
(max 200 words)		
University award regulations		
The University's award and assessment regulations apply to all programmes: any exceptions that relate to this programme are approved by University Teaching Committee and are recorded at the end of this document.		
Are students on the programme permitted to take elective modules?		
https://www.york.ac.uk/media/staffhome/learningandteaching/documents/policies/Framework%20for%20Programme%20Design%20-%20UG.pdf		
Please Select Y/N:	Yes	
Careers & Placements - 'With Placement Year' programmes		
Students on all undergraduate and integrated masters programmes may apply to spend their third year on a work-based placement facilitated by Careers & Placements. Such students would return to their studies at Stage 3 in the following year, thus lengthening their programme by a year. Successful completion of the placement year and associated assessment allows this to be recognised in programme title, which is amended to include 'with Placement Year' (e.g. BA in XYZ with Placement Year'). The Placement Year also adds a Programme Learning Outcome, concerning employability. (See Careers & Placements for details).		

In exceptional circumstances, UTC may approve an exemption from the 'Placement Year' initiative. This is usually granted only for compelling reasons concerning accreditation; if the Department already has a Year in Industry with criteria sufficiently generic so as to allow the same range of placements; or if the programme is less than three years in length.

Programme excluded from Placement Year?	No	If yes, what are the reasons for this exemption:
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Study Abroad (including Year Abroad as an additional year and replacement year)

Students on all programmes may apply to spend Stage 2 on the University-wide North America/ Asia/ Australia student exchange programme. Acceptance onto the programme is on a competitive basis. Marks from modules taken on replacement years count toward progression and classification.

Does the programme include the opportunity to undertake other formally agreed study abroad activities? All such programmes must comply with the Policy on Study Abroad

<https://www.york.ac.uk/staff/teaching/procedure/programmes/design/>

Please Select Y/N:	No
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Additional information

Transfers out of or into the programme

ii) Transfers into the programme will be possible? (please select Y/N)	Yes
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Additional details:

Transfers out permitted subject to approval of accepting BoS transfers in permitted subject to: (i) approval of Economics BoS, (ii) the satisfaction of module prerequisites and (iii) availability of places.

ii) Transfers out of the programme will be possible? (please select Y/N)	Yes
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Additional details:

Transfers out permitted subject to approval of accepting BoS transfers in permitted subject to: (i) approval of Economics BoS, (ii) the satisfaction of module prerequisites and (iii) availability of places.

Exceptions to University Award Regulations approved by University Teaching Committee

Exception	Date approved
Please detail any exceptions to University Award Regulations approved by UTC	

Date on which this programme information was updated:

Please note:

The information above provides a concise summary of the main features of the programme and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if they take full advantage of the learning opportunities that are provided.

Detailed information on the learning outcomes, content, delivery and assessment of modules can be found in the module descriptions.

The University reserves the right to modify this overview in unforeseen circumstances, or where the process of academic development, based on feedback from staff, students, external examiners or professional bodies, requires a change to be made. Students will be notified of any substantive changes at the first available opportunity.

Programme Map

Please note: the programme map below is in interim format pending the development of a University Programme Catalogue.

Programme Map: Module Contribution to Programme Learning Outcomes

Please complete the summary table below which shows how individual modules contribute to the achievement of programme learning outcomes.

Stage	Module		Programme Learning Outcomes							
			PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
			confidently identify those problems that can be analysed by standard mathematical techniques, and those situations in society where economic principles can provide insight, and be able to apply those techniques and principles successfully.	recognise when an unfamiliar problem is open to pure mathematical investigation and/or mathematical modelling, and be able to adapt and/or synthesise a range of mathematical approaches (including abstraction or numerical approximation) to investigate the problem.	deploy the methods of logical and mathematical reasoning used by economists, especially within formal models, with an understanding of the purpose and scope of such models.	use logical reasoning to critically analyse statements, arguments or conjectures made by others, and be able to justify the mathematical principles they choose for such a critique.	use statistical, econometric and computer-based techniques for analysing data, in applying and testing economic models or in economic and financial forecasting.	engage with, and draw on, academic and professional research in Economics, with an ability to distinguish different themes within it, and to synthesise ideas from it.	analyse and critically evaluate economic policies, of government and/or other institutions	communicate complex mathematical and economic ideas clearly, at a level appropriate for the intended audience.
Stage 1	Algebra	Progress towards PLO	competently use the standard algebra of vectors, matrices and related objects	adapt the standard algebraic tools to problems slightly outside the standard format	understand algebraic arguments, methods involved and understand their logical structure	justify the steps and methods used in algebraic arguments		understand how algebraic methods allow the solution of a variety of mathematical problems		present clear and concise solutions to exercises
		By working on (and if applicable, assessed through)	lecture material and exercises, with the support of seminars and formative feedback through marked work, and assessed by examination	exercises and with formative feedback through marked work and the seminars, and assessed by examination	lecture material and exercises, with the support of seminars and formative feedback through marked work, and assessed by examination	lecture material and exercises, with the support of seminars and formative feedback through marked work, and assessed by examination		lecture material, exercises and with the support of seminars		exercises, with the support of seminars and formative feedback through marked work
Stage 1	Calculus	Progress towards PLO	competently use the standard methods of differential and integral calculus	adapt standard calculus tools to problems slightly outside the standard format	understand decomposition of the solution of calculus problems, or their applications, into steps and understand the logical structure of solutions	justify the steps in the solution of calculus problems, or their application		understand how calculus has developed to enable the solution of a variety of mathematical problems		present clear and concise solutions to exercises
		By working on (and if applicable, assessed through)	lecture material and exercises, with the support of seminars and formative feedback through marked work, and assessed by examination	exercises and with formative feedback through marked work and the seminars, and assessed by examination	lecture material and exercises, with the support of seminars and formative feedback through marked work, and assessed by examination	lecture material and exercises, with the support of seminars and formative feedback through marked work, and assessed by examination		lecture material, exercises and with the support of seminars.		exercises, with the support of seminars and formative feedback through marked work
Stage 1	Mathematical Skills 1	Progress towards PLO	achieve competence in working with sets, functions, logic and methods of proof	adapt the standard concepts of set theory and logic to problems slightly outside the standard format	find relevant resources, understand their content and contribute towards the group report as a collaborative effort in exposition	practice different methods of mathematical reasoning		understand how mathematics is used to solve a variety of interesting problems		practice and develop written and oral communication skills
		By working on (and if applicable, assessed through)	lecture material and exercises, with formative feedback through marked work and the tutorials, and assessed by examination	exercises and with formative feedback through marked work and the tutorials, and assessed by examination	the group project	lecture material and exercises, with formative feedback through marked work and the tutorials, and assessed by examination		lecture material, exercises, and the topic of the group project, with support of the tutorials and as assessed by the group project/presentation		the production of the group project and group presentation
Stage 1	Introduction to Probability and Statistics	Progress towards PLO	understand and use standard probability theory and its relation to statistical analysis, and be able to do elementary statistical modelling and analysis	apply the standard methods from the module in unfamiliar situations	understand standard methods of statistical analysis	explain the reasoning behind the standard methods of statistical analysis using their theoretical foundations	understand basic statistical techniques	understand the power of probability and statistics in dealing with data obtained from real-world experiments and surveys		present clear and concise solutions to exercises
		By working on (and if applicable, assessed through)	lecture material and exercises, with the support of seminars and formative feedback through marked work, and assessed by examination	exercises and with formative feedback through marked work and the seminars, and assessed by examination	lecture material and exercises, with the support of seminars and formative feedback through marked work, and assessed by examination	lecture material and exercises, with the support of seminars and formative feedback through marked work, and assessed by examination	lecture material and exercises, with the support of seminars and formative feedback through marked work, and assessed by examination	lecture material, exercises and with the support of seminars		exercises, with the support of seminars and formative feedback through marked work

Programme Map: Module Contribution to Programme Learning Outcomes

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Stage	Module		Programme Learning Outcomes								
			PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	
			confidently identify those problems that can be analysed by standard mathematical techniques, and those situations in society where economic principles can provide insight, and be able to apply those techniques and principles successfully.	recognise when an unfamiliar problem is open to pure mathematical investigation and/or mathematical modelling, and be able to adapt and/or synthesise a range of mathematical approaches (including abstraction or numerical approximation) to investigate the problem.	deploy the methods of logical and mathematical reasoning used by economists, especially within formal models, with an understanding of the purpose and scope of such models.	use logical reasoning to critically analyse statements, arguments or conjectures made by others, and be able to justify the mathematical principles they choose for such a critique.	use statistical, econometric and computer-based techniques for analysing data, in applying and testing economic models or in economic and financial forecasting.	engage with, and draw on, academic and professional research in Economics, with an ability to distinguish different themes within it, and to synthesise ideas from it.	analyse and critically evaluate economic policies, of government and/or other institutions	communicate complex mathematical and economic ideas clearly, at a level appropriate for the intended audience.	
Stage 1	Economics 1	Progress towards PLO	Students will learn about basic theoretical concepts and principles in both Microeconomics and Macroeconomics, in particular consumer theory, production theory, market structures, IS-LM model, aggregate demand and supply and how to apply them to real economic problems		Some understanding of the nature and scope of models in both Microeconomics and Macroeconomics, and an awareness of the assumptions on which these models rely upon				Students' main contact with academic and professional research in Economics will be through expositions of such work in introductory and intermediate-level textbooks	An introductory understanding of basic concepts of welfare economics, in particular consumer surplus, and of fiscal and monetary policies	
		By working on (and if applicable, Assessed through)	formative exercises, supported principally by seminars, that develop these concepts and principles, and apply them to relevant hypothetical situations. This is assessed through exam questions designed to test understanding of these concepts and principles, and how to apply them		formative exercises, supported principally by seminars, that develop the understanding and solutions of a range of relevant models. This is assessed through exam questions designed to test understanding of the construction and solution of such models				Reading and taking notes from introductory and intermediate-level textbooks; exam questions designed to test knowledge of themes in the literature	formative exercises, supported principally by lectures and seminars, that develop the understanding of these concepts and their application. This is assessed through exam questions designed to test understanding of these concepts and their application.	
Stage 1	Economic Data Analysis 1	Progress towards PLO				Introductory familiarity with a range of online datasets, including microeconomic, macroeconomic, financial and historical. Ability to extract and manipulate (e.g. via Excel) such data.	Introductory familiarity with functionality of (principally) Excel in analysing data, e.g. in computing descriptive statistics, although not for statistical testing as such.	Introductory familiarity with a range of data, and its analysis, as used in the research literature, and therefore essential to being able to engage with it.	Introductory familiarity with a range of data, and its interpretation, as relevant to the evaluation of policy (e.g. the redistributive effect of taxation).	Introductory familiarity with a range of data, its interpretation and presentation, skills that are essential for the communication of empirical economic analysis.	
		By working on (and if applicable, Assessed through)				computer-based exercises in practical sessions, supported by lectures, extracting and manipulating such data. Assessed through those same exercises (50%), followed by a written exam (50%).	computer-based exercises in practical sessions, supported by lectures, analysing and interpreting data. Assessed through those same exercises (50%), followed by a written exam (50%).	computer-based exercises in practical sessions, supported by lectures, collating and interpreting such data. Assessed through those same exercises (50%), followed by a written exam (50%).	computer-based exercises in practical sessions, supported by lectures, collating and interpreting such data. Assessed through those same exercises (50%), followed by a written exam (50%).	computer-based exercises in practical sessions, supported by lectures, interpreting and presenting such data. Assessed through those same exercises (50%), followed by a written exam (50%).	
Stage 2	Probability & Statistics	Progress towards PLO	work confidently with a range of statistical tools (both analytically and numerically), statistical inference concepts and techniques, and be able to use probability theory to model a variety of random processes	apply the statistical methods and the framework of applied probabilistic modelling to unfamiliar situations	be able to use statistical methods or models covered in the syllabus	understand and be able to explain when it is appropriate to use statistical methods or models amongst those covered in the syllabus		understand and be able to demonstrate the value and power of applying statistical methods and probabilistic modelling to real life problems		present clear and concise solutions to exercises	

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Stage	Module		Programme Learning Outcomes							
			PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
			confidently identify those problems that can be analysed by standard mathematical techniques, and those situations in society where economic principles can provide insight, and be able to apply those techniques and principles successfully.	recognise when an unfamiliar problem is open to pure mathematical investigation and/or mathematical modelling, and be able to adapt and/or synthesise a range of mathematical approaches (including abstraction or numerical approximation) to investigate the problem.	deploy the methods of logical and mathematical reasoning used by economists, especially within formal models, with an understanding of the purpose and scope of such models.	use logical reasoning to critically analyse statements, arguments or conjectures made by others, and be able to justify the mathematical principles they choose for such a critique.	use statistical, econometric and computer-based techniques for analysing data, in applying and testing economic models or in economic and financial forecasting.	engage with, and draw on, academic and professional research in Economics, with an ability to distinguish different themes within it, and to synthesise ideas from it.	analyse and critically evaluate economic policies, of government and/or other institutions	communicate complex mathematical and economic ideas clearly, at a level appropriate for the intended audience.
		By working on (and if applicable, assessed through)	lecture material and exercises, with the support of seminars and formative feedback through marked work, and assessed by examination	exercises and with formative feedback through marked work and the seminars, and assessed by examination	lecture material and exercises, with the support of seminars and formative feedback through marked work, and assessed by examination	lecture material and exercises, with the support of seminars and formative feedback through marked work, and assessed by examination		lecture material, exercises and with the support of seminars		exercises, with the support of seminars
Stage 2	Linear Algebra	Progress towards PLO	use the standard methods of basic linear algebra and matrix theory, and their theoretical justification through abstract algebra	apply basic linear algebra and matrix theory to a range of unfamiliar situations		prove standard results in abstract linear algebra		appreciate the power of the abstract approach to linear algebra and the variety of uses of linear algebra		present clear and concise solutions to exercises
		By working on (and if applicable, assessed through)	lecture material and exercises, with the support of seminars and formative feedback through marked work, and assessed by examination	exercises and with formative feedback through marked work and the seminars, and assessed by examination		lecture material and exercises, with the support of seminars and formative feedback through marked work, and assessed by examination		lecture material, exercises and with the support of seminars		exercises, with the support of seminars
Stage 2	Vector Calculus	Progress towards PLO	use the standard methods of multi-variable differential and integral calculus to work with functions of many variables and vector fields	apply these standard methods to problems which require a level of interpretation to set up the application				see how the methods of vector calculus arise from important problems in the study of the physical world		present clear and concise solutions to exercises
		By working on (and if applicable, assessed through)	lecture material and exercises, with the support of seminars and formative feedback through marked work, and assessed by examination	exercises and with formative feedback through marked work and the seminars, and assessed by examination				lecture material, exercises and with the support of seminars		exercises, with the support of seminars
Stage 2	Economics 2 - Microeconomics	Progress towards PLO	Some understanding of theoretical concepts and principles of microeconomics, in particular equilibrium (including in games), rationality, risk and information, and experience of their application mainly to economic situations		Some understanding of the nature and scope of models in microeconomics, and an awareness of the assumptions commonly made in such models.			A critical discussion of applications to Microeconomic models such as consumer theory, minimum wage, asymmetric information	An introductory understanding of basic concepts of welfare economics, in particular Pareto efficiency and market failure, and of related policy interventions such as Public sector incentive schemes and the minimum wage.	

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Please complete the summary table below which shows how individual modules contribute to the achievement of programme learning outcomes.

Stage	Module		Programme Learning Outcomes							
			PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
			confidently identify those problems that can be analysed by standard mathematical techniques, and those situations in society where economic principles can provide insight, and be able to apply those techniques and principles successfully.	recognise when an unfamiliar problem is open to pure mathematical investigation and/or mathematical modelling, and be able to adapt and/or synthesise a range of mathematical approaches (including abstraction or numerical approximation) to investigate the problem.	deploy the methods of logical and mathematical reasoning used by economists, especially within formal models, with an understanding of the purpose and scope of such models.	use logical reasoning to critically analyse statements, arguments or conjectures made by others, and be able to justify the mathematical principles they choose for such a critique.	use statistical, econometric and computer-based techniques for analysing data, in applying and testing economic models or in economic and financial forecasting.	engage with, and draw on, academic and professional research in Economics, with an ability to distinguish different themes within it, and to synthesise ideas from it.	analyse and critically evaluate economic policies, of government and/or other institutions	communicate complex mathematical and economic ideas clearly, at a level appropriate for the intended audience.
		By working on (and if applicable, Assessed through)	formative exercises, supported principally by lectures and seminars, that develop these concepts and principles, and apply them to relevant hypothetical situations, and exam questions designed to test understanding of these concepts and principles, and how to apply them		formative exercises, supported principally by lectures and seminars, that develop the construction and solution of a range of relevant models and exam questions designed to test understanding of the construction and solution of such models			formative exercises, supported principally by lectures and seminars, that develop the analysis of models in which these themes are represented and exam questions designed to test understanding of such models	formative exercises, supported principally by lectures and seminars, that develop the understanding of these concepts and their application and exam questions designed to test understanding of these concepts and their application	
Stage 2	Economics 2 - Macroeconomics	Progress towards PLO	Students will learn how macroeconomic phenomena such as growth, inflation and unemployment are co-determined, and responsive to policy choices such as interest rate-setting or fiscal policies		Students will work with mathematical models of the economy in the short-run, medium-run and long-run.			An introductory familiarity with some important themes in macroeconomic research, such as rational expectations and credit restrictions, although with no direct engagement as such with the research literature	Students will deepen their knowledge of monetary, fiscal, trade and growth policies	
		By working on (and if applicable, Assessed through)	Formative exercises, supported principally by lectures and seminars, that develop the analysis of models in which these themes are represented and exam questions designed to test understanding of such models		Formative exercises, supported principally by lectures and seminars, that develop the analysis of models in which these themes are represented and exam questions designed to test understanding of such models			Formative exercises, supported principally by lectures and seminars, that develop the analysis of models in which these themes are represented and exam questions designed to test understanding of such models	Formative exercises, supported principally by lectures and seminars, that develop the understanding of these concepts and their application and exam questions designed to test understanding of these concepts and their application	
Stage 2	Econometrics 2	Progress towards PLO			Students will learn how to use various methods by using them within the applied econometrics project.	By manipulating and assessing the 'quality' of the data provided as part of the applied econometrics project.	By the application of linear regression model techniques to real world data sets students will be able to assess and comment on the underlying economic theory and implied economic relationships.	Through reading of both the recommended texts and own literature searches required for the formative applied econometrics project students are engaged directly with research texts (journal, reports and books) in an active learning manner.		By focussing on the interpretation of the econometric output students are able to explain in words and in relation to economic theory what their estimation results actually mean.

Programme Map: Module Contribution to Programme Learning Outcomes

Please complete the summary table below which shows how individual modules contribute to the achievement of programme learning outcomes.

Stage	Module		Programme Learning Outcomes							
			PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
			confidently identify those problems that can be analysed by standard mathematical techniques, and those situations in society where economic principles can provide insight, and be able to apply those techniques and principles successfully.	recognise when an unfamiliar problem is open to pure mathematical investigation and/or mathematical modelling, and be able to adapt and/or synthesise a range of mathematical approaches (including abstraction or numerical approximation) to investigate the problem.	deploy the methods of logical and mathematical reasoning used by economists, especially within formal models, with an understanding of the purpose and scope of such models.	use logical reasoning to critically analyse statements, arguments or conjectures made by others, and be able to justify the mathematical principles they choose for such a critique.	use statistical, econometric and computer-based techniques for analysing data, in applying and testing economic models or in economic and financial forecasting.	engage with, and draw on, academic and professional research in Economics, with an ability to distinguish different themes within it, and to synthesise ideas from it.	analyse and critically evaluate economic policies, of government and/or other institutions	communicate complex mathematical and economic ideas clearly, at a level appropriate for the intended audience.
		By working on (and if applicable, Assessed through)			By working on of the applied econometrics project.	Part of the applied econometrics project is to comment on 'data issues' with the applied data set provided for the project. This section of the project requires the student to actively engage with the quality of the data provided and to critique it along a number of dimensions such as sample representation, measurement error etc. Further students can manipulate the supplied data to construct additional variables for themselves. Assessed through structured applied econometrics project (30% of final mark)	Formative exercises and a summative project where data supplied through by the module allows application of key econometric techniques and post-estimation diagnostic testing. Assessed through a closed exam (70% of final mark) and a structured applied econometrics project (30% of final mark)	Reading the recommended texts and undertaking literature searches results in a deeper understanding of how to 'use' existing research literature to inform applied econometrics work and also to create a much deeper understanding of the materials as ideas and models need to be drawn from the original text and then applied to the project that has been set. Assessed through structured applied econometrics project (30% of final mark).		Formative exercises and a summative project where estimated models need to be motivated, explained and justified in relation to the underlying economic theory and the post-estimation diagnostic testing. The interpretation (verbal and written) allows key concepts to be explained in terms that are fundamentally accessible to both economists and non-economists alike. Assessed through a closed exam (70% of final mark) and a structured applied econometrics project (30% of final mark).
Stage 3	Cryptography MAT00034H	Progress towards PLO	understand and be able to work with some of the mathematical underpinnings of modern cryptography	apply their current mathematical knowledge to new areas (namely certain cryptographic systems)		follow the reasoning as to why a primality test or a factorisation algorithm works				present clear and concise solutions to exercises
		By working on (and if applicable, assessed through)	lecture material and exercises, with the guidance and support of seminars, and through feedback on marked work, and as assessed through examination	lecture material and exercises, with the guidance and support of seminars, and as assessed through examination		lecture material and exercises, with the guidance and support of seminars, and through feedback on marked work, and as assessed through examination				exercises, with the support of seminars and formative feedback through marked work
Stage 3	Numerical Analysis	Progress towards PLO	students will be able to apply numerical approximation techniques to a range of standard mathematical problems	students will be provided with a range of approximation techniques that can be used in unfamiliar application problems		students will be able to justify which particular numerical method is appropriate in a given context, and in which sense the approximation error is small		students will comprehend the value and power of numerical approximation techniques		students will be able to communicate mathematical arguments in Numerical Analysis in writing
		By working on (and if applicable, assessed through)	lecture materials, computer practicals, assessed computer-based coursework, as well as being assessed in the examination	lecture materials, computer practicals		lecture materials, computer practicals, written coursework, and as assessed through examination		lecture material, computer practicals, coursework		assessed written coursework

Programme Map: Module Contribution to Programme Learning Outcomes

Please complete the summary table below which shows how individual modules contribute to the achievement of programme learning outcomes.

Stage	Module		Programme Learning Outcomes							
			PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
			confidently identify those problems that can be analysed by standard mathematical techniques, and those situations in society where economic principles can provide insight, and be able to apply those techniques and principles successfully.	recognise when an unfamiliar problem is open to pure mathematical investigation and/or mathematical modelling, and be able to adapt and/or synthesise a range of mathematical approaches (including abstraction or numerical approximation) to investigate the problem.	deploy the methods of logical and mathematical reasoning used by economists, especially within formal models, with an understanding of the purpose and scope of such models.	use logical reasoning to critically analyse statements, arguments or conjectures made by others, and be able to justify the mathematical principles they choose for such a critique.	use statistical, econometric and computer-based techniques for analysing data, in applying and testing economic models or in economic and financial forecasting.	engage with, and draw on, academic and professional research in Economics, with an ability to distinguish different themes within it, and to synthesise ideas from it.	analyse and critically evaluate economic policies, of government and/or other institutions	communicate complex mathematical and economic ideas clearly, at a level appropriate for the intended audience.
Stage 3	Bayesian Statistics	Progress towards PLO	students will be able to perform a Bayesian analysis of simple statistical models with a conjugate prior distribution, including derivation of the posterior distribution and simulation from the posterior predictive distribution	students will be able to recognize statistical problems which require the application of the Bayes' rule; and to apply the Bayesian inferential approach to unfamiliar simple statistical models		students will be able to interpret numerical summaries of the posterior and predictive distributions, produced by simulation methods		students will appreciate the power and conceptual simplicity of the Bayesian approach to statistical inference		present clear and concise solutions to exercises
		By working on (and if applicable, assessed through)	lecture material and exercises, with the guidance and support of seminars, and through feedback on marked work, and as assessed through examination	exercises, with the guidance and support of seminars, and through feedback on marked work, and as assessed through examination		lecture material and exercises, with the guidance and support of seminars, and as assessed through examination		lecture material, exercises and seminar discussion		exercises, with the support of seminars and formative feedback through marked work
Stage 3	Generalised Linear Models	Progress towards PLO	students will be able to correctly formulate a generalised linear model and use it appropriately in the context of data analysis	students will be able to recognize when generalised linear models do not fit the available data and adapt their modelling strategy as appropriate		students will be able to conduct inference using the appropriate tools and be aware of the corresponding assumptions and their consequent limitations		students will understand the importance of the generalised linear modelling in a statistician's toolkit and how this relates to other modelling approaches they may have encountered, such as linear modelling or survival analysis		present clear and concise solutions to exercises
		By working on (and if applicable, assessed through)	lecture material and exercises, with the guidance and support of seminars and practical sessions, through feedback on marked work and as assessed through examination	theoretical and practical exercises, with the guidance and support of seminars, and through feedback on marked work, and as assessed through examination		lecture material and exercises, with the guidance and support of seminars and practical sessions, and as assessed through examination		lecture material, exercises and seminar discussion		exercises, with the support of seminars and formative feedback through marked work
Stage 3	Mathematical Finance I	Progress towards PLO	students will be able to analyse portfolio selection and simple investment strategies	students will be able to adapt standard techniques to unfamiliar portfolio optimisation and also forward contracts and options	understand and be able to apply various methods of mathematical finances	students will be able to justify the conclusions of a quantitative analysis of portfolio under risk restrictions and also obtain arbitrage constraints in investment strategies		students will comprehend the power and value of quantitative analysis in the context of mathematical finance		present clear and concise solutions to exercises
		By working on (and if applicable, assessed through)	lecture material and exercises, with the guidance and support of seminars, and through feedback on marked work, and as assessed through examination	exercises, with the guidance and support of seminars, and through feedback on marked work, and as assessed through examination	lecture material and exercises, with the guidance and support of seminars, and as assessed through examination	lecture material and exercises, with the guidance and support of seminars, and as assessed through examination		lecture material, exercises and seminar discussion		exercises, with the support of seminars and formative feedback through marked work

Programme Map: Module Contribution to Programme Learning Outcomes

Please complete the summary table below which shows how individual modules contribute to the achievement of programme learning outcomes.

Stage	Module		Programme Learning Outcomes							
			PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
			confidently identify those problems that can be analysed by standard mathematical techniques, and those situations in society where economic principles can provide insight, and be able to apply those techniques and principles successfully.	recognise when an unfamiliar problem is open to pure mathematical investigation and/or mathematical modelling, and be able to adapt and/or synthesise a range of mathematical approaches (including abstraction or numerical approximation) to investigate the problem.	deploy the methods of logical and mathematical reasoning used by economists, especially within formal models, with an understanding of the purpose and scope of such models.	use logical reasoning to critically analyse statements, arguments or conjectures made by others, and be able to justify the mathematical principles they choose for such a critique.	use statistical, econometric and computer-based techniques for analysing data, in applying and testing economic models or in economic and financial forecasting.	engage with, and draw on, academic and professional research in Economics, with an ability to distinguish different themes within it, and to synthesise ideas from it.	analyse and critically evaluate economic policies, of government and/or other institutions	communicate complex mathematical and economic ideas clearly, at a level appropriate for the intended audience.
Stage 3	Mathematical Finance II	Progress towards PLO	students will be able to analyse the quantitative features of pricing and hedging options	students will be able to adapt standard techniques to unfamiliar option pricing and hedging problems	understand and be able to apply various methods of mathematical finances	students will be able to justify the conclusions of a quantitative analysis of pricing and hedging options		students will comprehend the power and value of quantitative analysis in the context of pricing and hedging options		present clear and concise solutions to exercises
		By working on (and if applicable, assessed through)	lecture material and exercises, with the guidance and support of seminars, and through feedback on marked work, and as assessed through examination	exercises, with the guidance and support of seminars, and through feedback on marked work, and as assessed through examination	lecture material and exercises, with the guidance and support of seminars, and as assessed through examination	lecture material and exercises, with the guidance and support of seminars, and as assessed through examination		lecture material, exercises and seminar discussion		exercises, with the support of seminars and formative feedback through marked work
Stage 3	Multivariate Analysis	Progress towards PLO	students will be able to analyse the quantitative features of multivariate data	students will be able to adapt standard techniques to unfamiliar multivariate data	Students will learn how to perform a qualitative analysis of a multivariate data set	students will be able to justify the conclusions of a qualitative analysis of a multivariate data set		students will comprehend the power and value of quantitative analysis in the context of multivariate data		present clear and concise solutions to exercises
		By working on (and if applicable, assessed through)	lecture material and exercises, with the guidance and support of practicals, and through feedback on marked work, and as assessed through examination	exercises, with the guidance and support of practicals, and through feedback on marked work, and as assessed through examination	lecture material and exercises, with the guidance and support of practicals, and as assessed through examination	lecture material and exercises, with the guidance and support of practicals, and as assessed through examination		lecture material, exercise and practical discussion		exercises, with the support of seminars and formative feedback through marked work
Stage 3	Practical Data Science with R MAT00058H	Progress towards PLO	apply statistical techniques to real world problems	adapt standard statistical techniques to specific problems			justify the conclusions of a data analysis problem			appropriate presentation of statistical analysis in a short report
		By working on (and if applicable, assessed through)	lecture material and exercises, with the guidance and support of seminars, and through feedback on marked work, and as assessed through coursework and examination	exercises, with the guidance and support of seminars, and through feedback on marked work, and assessed through coursework and examination			lecture material and coursework, with the guidance and support of seminars, and assessed through coursework and examination			assessed coursework with the support of seminars and lecture material
Stage 3	Statistical Pattern Recognition	Progress towards PLO	students will acquire a range of pattern recognition techniques that can be applied to real world data analysis, particularly classification problems	students will be able to identify and apply the most appropriate techniques to particular problems	students will learn how to use a range of pattern recognition techniques that can be applied to real world data analysis, particularly classification problems	students will be able to justify the conclusions of a qualitative analysis of a multivariate data set		students will comprehend and appreciate the power of data analysis in the context of real world examples, particularly large chemical and biological datasets		present clear and concise solutions to exercises
		By working on (and if applicable, assessed through)	lecture material and exercises, with the guidance and support of seminars, and through feedback on marked work, and as assessed through examination	exercises in seminars and computer practicals	lecture material and exercises, with the guidance and support of seminars, and through feedback on marked work, and as assessed through examination	lecture material and exercises, with the guidance and support of seminars, and as assessed through examination		lecture material, exercise and practical discussion		exercises, with the support of seminars and formative feedback through marked work

Programme Map: Module Contribution to Programme Learning Outcomes

Please complete the summary table below which shows how individual modules contribute to the achievement of programme learning outcomes.

Stage	Module		Programme Learning Outcomes							
			PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
			confidently identify those problems that can be analysed by standard mathematical techniques, and those situations in society where economic principles can provide insight, and be able to apply those techniques and principles successfully.	recognise when an unfamiliar problem is open to pure mathematical investigation and/or mathematical modelling, and be able to adapt and/or synthesise a range of mathematical approaches (including abstraction or numerical approximation) to investigate the problem.	deploy the methods of logical and mathematical reasoning used by economists, especially within formal models, with an understanding of the purpose and scope of such models.	use logical reasoning to critically analyse statements, arguments or conjectures made by others, and be able to justify the mathematical principles they choose for such a critique.	use statistical, econometric and computer-based techniques for analysing data, in applying and testing economic models or in economic and financial forecasting.	engage with, and draw on, academic and professional research in Economics, with an ability to distinguish different themes within it, and to synthesise ideas from it.	analyse and critically evaluate economic policies, of government and/or other institutions	communicate complex mathematical and economic ideas clearly, at a level appropriate for the intended audience.
Stage 3	Stochastic Processes	Progress towards PLO	students will be able to formulate and analyse mathematical models that take account of the stochastic (random) fluctuations that are always present in the real world. They will acquire a range of mathematical techniques and approximations that can be used to make analytic predictions from stochastic models	students will be able to adapt standard techniques to unfamiliar stochastic dynamical systems	Students will learn several techniques allowing to perform analysis of financial markets in continuous time	students will be able to justify the arguments behind using stochastic models and recognize the difference with deterministic models of behaviour		students will comprehend the power and value of mathematics in making statements and predictions also in the presence of randomness and uncertainty		present clear and concise solutions to exercises
		By working on (and if applicable, assessed through)	lecture material and exercises, with the guidance and support of seminars, and through feedback on marked work, and as assessed through examination	lecture material and exercises, with the guidance and support of seminars, and through feedback on marked work, and as assessed through examination	lecture material and exercises, with the guidance and support of seminars, and through feedback on marked work, and as assessed through examination	lecture material and exercises, with the guidance and support of seminars, and through feedback on marked work, and as assessed through examination		lecture material, exercises and seminar discussion		exercises, with the support of seminars and formative feedback through marked work
Stage 3	Survival Analysis (H Level)	Progress towards PLO	understand and be able to use the standard statistical techniques of survival analysis	apply the methods of survival analysis to unfamiliar data sets	learn methods of survival analysis	explain the criteria for using the statistical models which apply to survival analysis		understand and be able to explain the place of survival analysis as an important sub-field of statistics		present clear and concise solutions to exercises
		By working on (and if applicable, assessed through)	lecture material and exercises, with the guidance and support of practical sessions, and through feedback on marked work, and as assessed in the examination.	exercises, with the guidance and support of practical sessions, and through feedback on marked work	lecture material and exercises, with the guidance and support of practical sessions, and through feedback on marked work, and as assessed in the examination	lecture material and exercises, with the guidance and support of practical sessions, and through feedback on marked work, and as assessed in the examination		lecture material and exercises		exercises, with the support of seminars and formative feedback through marked work
Stage 3	Time Series	Progress towards PLO	students will be able to analyse the quantitative feature of time series models	students will be able to adapt standard techniques to unfamiliar time series models	Develop understanding of a quantitative analysis of a time series model	students will be able to justify the conclusions of a quantitative analysis of a time series model		students will comprehend the power and value of quantitative analysis in the context of time series		present clear and concise solutions to exercises
		By working on (and if applicable, assessed through)	lecture material and exercises, with guidance and support of seminars, and through feedback on marked work, and as assessed through examination	exercises, with guidance and support of seminars, and through feedback on marked work, and as assessed through examination	students will be able to justify the conclusions of a quantitative analysis of a time series model	lecture material and exercises, with the guidance and support of seminars, and as assessed through examination		lecture material, exercise and seminar discussion		exercises, with the support of seminars and formative feedback through marked work

Programme Map: Module Contribution to Programme Learning Outcomes

Please complete the summary table below which shows how individual modules contribute to the achievement of programme learning outcomes.

Stage	Module		Programme Learning Outcomes								
			PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	
			confidently identify those problems that can be analysed by standard mathematical techniques, and those situations in society where economic principles can provide insight, and be able to apply those techniques and principles successfully.	recognise when an unfamiliar problem is open to pure mathematical investigation and/or mathematical modelling, and be able to adapt and/or synthesise a range of mathematical approaches (including abstraction or numerical approximation) to investigate the problem.	deploy the methods of logical and mathematical reasoning used by economists, especially within formal models, with an understanding of the purpose and scope of such models.	use logical reasoning to critically analyse statements, arguments or conjectures made by others, and be able to justify the mathematical principles they choose for such a critique.	use statistical, econometric and computer-based techniques for analysing data, in applying and testing economic models or in economic and financial forecasting.	engage with, and draw on, academic and professional research in Economics, with an ability to distinguish different themes within it, and to synthesise ideas from it.	analyse and critically evaluate economic policies, of government and/or other institutions	communicate complex mathematical and economic ideas clearly, at a level appropriate for the intended audience.	
Stage 3	Microeconomics 3	Progress towards PLO			Students study fundamental models of general equilibrium theory, social choice, game theory, decision making under uncertainty, and asymmetric information. The module builds upon the material covered in Microeconomics 2					Students study the fundamental models of economic behaviour that can be used to analyse the effects of government policies.	Students learn the economic intuition underlying the results obtained from formal economic models.
		By working on (and if applicable, Assessed through)			Problem sets, supported by lectures and seminars. Assessed through exam.					Problem sets, supported by lectures and seminars. Assessed through exam.	Problem sets, supported by lectures and seminars. Assessed through exam.
Stage 3	Macroeconomics 3	Progress towards PLO	Students learn to think about macroeconomics, including policy, in terms of agent heterogeneity, equilibrium, and Pareto optimality.		Students are introduced to a more formal approach to macroeconomics and use mathematical language from the very beginning. There is an emphasis on developing a critical sense regarding the usefulness of each model---that models by their very nature are abstractions and not reality but that fact in itself does not determine whether they are good or bad.				Many fundamental models are developed in appropriate detail---Solow, Ramsey, Diamond, Shapiro-Stiglitz, Search, Stiglitz-Weiss, Kiyotaki-Moore, and Bernanke-Gertler.	The ultimate goal of all the models studied is to gain an insight into policy---even if only to know precisely when intervention is purely for distributional reasons.	Students learn the language of economic theory. This allows them to communicate primarily with trained economists.
		By working on (and if applicable, Assessed through)	models with microeconomic foundations. Assessed through the variety of questions on the summer term exam on which there is no choice.		formal mathematical models of (i) general equilibrium with production and (ii) game theoretical models of credit and labour markets, all developed in lectures, notes/slides that are distributed, and assigned reading. The exercises on nine problem sets, solved completely in practical classes, help students to master the formal approach by the end of their revision period, often by making good use of office hours. Assessed through the summer term exam which tests students ability to solve problems (including proofs) on all of the formal methods developed as there is no choice on it.			taking adequate notes in lectures, then preparing their own notes and using those notes to work on the problem sets. Learning is supported by notes/slides that are distributed and assigned reading including the Stiglitz and Weiss paper. Assessed through the summer term exam which requires problem solving (including proofs) and some short essays.	analysis of fully specified general equilibrium or game theoretic models. Assessed through the summer term exam which requires problem solving (including proofs) and some short essays.	the exercises on nine problem sets which are solved completely in practical classes and complete solutions to which are posted on the VLE. Assessed through the summer term exam which requires students to communicate with an emphasis on mathematics, including the use of diagrams, and verbal explanations.	

Programme Map: Module Contribution to Programme Learning Outcomes

Please complete the summary table below which shows how individual modules contribute to the achievement of programme learning outcomes.

Stage	Module		Programme Learning Outcomes							
			PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
			confidently identify those problems that can be analysed by standard mathematical techniques, and those situations in society where economic principles can provide insight, and be able to apply those techniques and principles successfully.	recognise when an unfamiliar problem is open to pure mathematical investigation and/or mathematical modelling, and be able to adapt and/or synthesise a range of mathematical approaches (including abstraction or numerical approximation) to investigate the problem.	deploy the methods of logical and mathematical reasoning used by economists, especially within formal models, with an understanding of the purpose and scope of such models.	use logical reasoning to critically analyse statements, arguments or conjectures made by others, and be able to justify the mathematical principles they choose for such a critique.	use statistical, econometric and computer-based techniques for analysing data, in applying and testing economic models or in economic and financial forecasting.	engage with, and draw on, academic and professional research in Economics, with an ability to distinguish different themes within it, and to synthesise ideas from it.	analyse and critically evaluate economic policies, of government and/or other institutions	communicate complex mathematical and economic ideas clearly, at a level appropriate for the intended audience.
Stage 3	Applied Economics	Progress towards PLO	Application of economic principles and frameworks to understand important socio economic phenomena, such as intergenerational mobility, migration and labour market outcomes, and the returns to education. Students should be able to identify which economic theories are relevant for an analysis of the defined problem, to identify what is the most reliable form of evidence against which theories can be tested and form informed views on which theory does the weight of available evidence support?		Students should be able to identify which economic theories are relevant for an analysis of the defined problem, to identify what is the most reliable form of evidence against which theories can be tested and form informed views on which theory does the weight of available evidence support?	Students should become familiar with the various types of data used to test economic theories, and how to use this data in the design of empirical strategies for making causal inference in economics.		Students should be able to analyse critically academic and professional research in a selection of topics including macroeconomic stabilization policy, labour economics and human capital theories, with the objective of forming informed views on which theory does the weight of available evidence support?	On completing the module students should be able to make recommendations for policy derivable from theory and empirical evidence.	Clarity of analysis in the topics covered.
		By working on (and if applicable, Assessed through)	Integrated lectures and classroom discussion and critical analysis of important relevant research papers. Assessed through formative essays and unseen written examination.		Integrated lectures and classroom discussion and critical analysis of important relevant research papers. Assessed through formative essays and unseen written examination.	Integrated lectures and classroom discussion and critical analysis of important relevant research papers. Assessed through formative essays and unseen written examination.		Integrated lectures and classroom discussion and critical analysis of important relevant research papers. Assessed through formative essays and unseen written examination.	Integrated lectures and classroom discussion and critical analysis of important relevant research papers. Assessed through formative essays and unseen written examination.	Classroom discussion and critical analysis of important relevant research papers. Assessed through formative essays and unseen written examination.
Stage 3	Social Policy	Progress towards PLO	The module demonstrates how economic concepts and principles can be applied to various issues in social policy, such as income maintenance, retirement pensions, education, housing and social care.		Formal economic models are used to analyse all of the social policy issues covered in the module.			A wide range of relevant academic research is discussed within the module, and students are encouraged to adopt a critical and comparative approach.	Various policy questions are raised and evaluated during the module, in areas such as income maintenance, retirement pensions, education and housing.	The module is essay-based and promotes clear exposition of the subject matter, backed by appropriate use of economic theory and evidence.
		By working on (and if applicable, Assessed through)	Formative essay work, supported by lectures and seminars, that addresses these social policy issues from an economic perspective. Assessed through essay questions in the summer-term exam.		Formative essay work, supported by lectures and seminars, that gives opportunities for students to make use of formal economic models. Assessed through essay questions in the summer-term exam.			Formative essay work, supported by lectures and seminars, that requires students to read the academic literature and demonstrate their knowledge of it. Assessed through essay questions in the summer-term exam.	Formative essay work, supported by lectures and seminars, that permits students to practice and improve their explanatory skills. Assessed through essay questions in the summer-term exam.	Formative essay work, supported by lectures and seminars, that helps students to practice and improve their explanatory skills. Assessed through essay questions in the summer-term exam.

Programme Map: Module Contribution to Programme Learning Outcomes

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Stage	Module		Programme Learning Outcomes							
			PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
			confidently identify those problems that can be analysed by standard mathematical techniques, and those situations in society where economic principles can provide insight, and be able to apply those techniques and principles successfully.	recognise when an unfamiliar problem is open to pure mathematical investigation and/or mathematical modelling, and be able to adapt and/or synthesise a range of mathematical approaches (including abstraction or numerical approximation) to investigate the problem.	deploy the methods of logical and mathematical reasoning used by economists, especially within formal models, with an understanding of the purpose and scope of such models.	use logical reasoning to critically analyse statements, arguments or conjectures made by others, and be able to justify the mathematical principles they choose for such a critique.	use statistical, econometric and computer-based techniques for analysing data, in applying and testing economic models or in economic and financial forecasting.	engage with, and draw on, academic and professional research in Economics, with an ability to distinguish different themes within it, and to synthesise ideas from it.	analyse and critically evaluate economic policies, of government and/or other institutions	communicate complex mathematical and economic ideas clearly, at a level appropriate for the intended audience.
Stage 3	Labour Economics	Progress towards PLO	Students will develop an understanding of how the theoretical and applied toolkit of the modern economist (including micro- and macroeconomic analysis, as well as econometrics) can be used to analyse labour market outcomes, such as unemployment, wage inequality, trade unionism and labour demand.		Students will be introduced to a range of formal models used to explain labour market phenomena. The main objective is to present labour economics as a method of analysis and to establish clear links to events in the economy.	Students will be introduced to a range of secondary data sources – students will become aware of the pros and cons of various types of data used to explore theories, and how to use this data in the design of empirical strategies for making casual inference in economics.	Students will be introduced to a range of statistical and econometrics techniques used to evaluate theories, and how to use related evidence in the design of relevant implied policy.	Students will be encouraged to analyse critically academic and professional research across a selection of topics in labour economics.	On completing the module students should be able to make recommendations for relevant labour market policy derivable from theory and empirical evidence.	Student will be encouraged to generate holistic arguments: combining theory, a critical approach to empirical evidence, and an awareness of the costs and benefits of alternative policy regimes.
		By working on (and if applicable, Assessed through)	Students will read a variety of carefully selected recommended readings, including a core of recommended core text material and a range of selected journal articles. In lectures students will take be presented with (and expected to append via their additional readings) course notes summarising and synthesising the ideas presented in the lectures. Students will present at, as well as participate in, seminars organised within the module in which they will develop their understanding of how economic principles and methods can be usefully applied in understanding political decision-making and outcomes. Assessed through formative seminar presentations and reports; class room discussion; and unseen written examination.		Integrated lectures and classroom discussion and critical analysis of important relevant research papers. Assessed through formative seminar presentations and reports; class room discussion; and unseen written examination.	Integrated lectures and classroom discussion and critical analysis of important relevant research papers. Assessed through formative seminar presentations and reports; class room discussion; and unseen written examination.	Integrated lectures and classroom discussion and critical analysis of important relevant research papers. Assessed through formative seminar presentations and reports; class room discussion; and unseen written examination.	Integrated lectures and classroom discussion and critical analysis of important relevant research papers. Assessed through formative seminar presentations and reports; class room discussion; and unseen written examination.	Integrated lectures and classroom discussion and critical analysis of important relevant research papers. Assessed through formative seminar presentations and reports; class room discussion; and unseen written examination.	Integrated lectures and classroom discussion and critical analysis of important relevant research papers. With a particular emphasis on their seminar presentations. Assessed through formative seminar presentations and reports; class room discussion; and unseen written examination.
Stage 3	Health Economics	Progress towards PLO	Critical application of economic concepts and principles to issues in health and health care		Formal modelling of health decision-making and provision mechanisms.		Interpretation of health data, and of relevant econometric models and analysis	An understanding of the principal methods and themes in the Health Economics research literature	An understanding of theoretical and empirical issues in the evaluation of health policy	The ability to clearly explain theoretical principles and empirical findings in Health Economics at this level.

Programme Map: Module Contribution to Programme Learning Outcomes

Please complete the summary table below which shows how individual modules contribute to the achievement of programme learning outcomes.

Stage	Module		Programme Learning Outcomes							
			PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
			confidently identify those problems that can be analysed by standard mathematical techniques, and those situations in society where economic principles can provide insight, and be able to apply those techniques and principles successfully.	recognise when an unfamiliar problem is open to pure mathematical investigation and/or mathematical modelling, and be able to adapt and/or synthesise a range of mathematical approaches (including abstraction or numerical approximation) to investigate the problem.	deploy the methods of logical and mathematical reasoning used by economists, especially within formal models, with an understanding of the purpose and scope of such models.	use logical reasoning to critically analyse statements, arguments or conjectures made by others, and be able to justify the mathematical principles they choose for such a critique.	use statistical, econometric and computer-based techniques for analysing data, in applying and testing economic models or in economic and financial forecasting.	engage with, and draw on, academic and professional research in Economics, with an ability to distinguish different themes within it, and to synthesise ideas from it.	analyse and critically evaluate economic policies, of government and/or other institutions	communicate complex mathematical and economic ideas clearly, at a level appropriate for the intended audience.
		By working on (and if applicable, Assessed through)	Reading and discussion of key references, and writing formative essays, supported by lectures and seminars Assessed through exam questions testing this aspect of the module		Reading and discussion of key references, and writing formative essays, supported by lectures and seminars Assessed through exam questions testing this aspect of the module		Reading and discussion of key references, and writing formative essays, supported by lectures and seminars Assessed through exam questions testing this aspect of the module	Reading and discussion of key references, and writing formative essays, supported by lectures and seminars Assessed through exam questions testing this aspect of the module	Reading and discussion of key references, and writing formative essays, supported by lectures and seminars Assessed through exam questions testing this aspect of the module	Reading and discussion of key references, and writing formative essays, supported by lectures and seminars Assessed through exam questions testing this aspect of the module
Stage 3	Mathematical Economics	Progress towards PLO	The module adds to and refines the general training provided over the previous two years. Students learn to think about questions in several areas of social problems—policy for international trade, industrial competition, collective action, design of rules etc in terms of formal models mainly using Game Theory.		Students are introduced to formal mathematical models and tools of Game Theory: i.e., the theory of generalized interactive optimization. There is a marked increase in the level of abstraction. There is also emphasis on developing a critical sense regarding the usefulness of the models—that models by their very nature are abstractions and not reality.			Slightly simplified versions of many fundamental models are developed in appropriate detail. Some of the seminar problems are also simplified versions of results from research papers. And at least one original research paper (on proving the Gibbard-Satterthwaite Theorem) is assigned.	Students are introduced to mathematical analysis of policies in the areas of industrial competition, international trade, design of institutions etc within a game theoretic framework.	Students learn the formal language of economic theory through lectures, assigned readings, and working on the problem sets, thereby permitting them to communicate primarily with trained economic theorists.
		By working on (and if applicable, Assessed through)	Progress is supported through lectures, assigned reading, lecture slides that are distributed and homework assignments. Assessed indirectly through the variety of questions in the summer term exam.		The lecture material takes an abstract formal approach from the very beginning. The assigned readings also help students get used to the abstract mathematical language. Working on the problems for seminar classes also allow the students to master the abstract approach by the end of their revision period. The summer term exam test students on all these aspects.			Readings are assigned. Six problem sets are distributed and solved in seminar classes, often in interactive manners to stimulate student engagement. Assessed through the summer term exam—which requires problem solving.	Progress is supported through lectures, assigned reading, lecture slides that are distributed and homework assignments. Assessed indirectly through the variety of questions in the summer term exam.	Lectures, assigned readings, and working on the problem sets. The summer term exam requires students to communicate with a strong emphasis on mathematical rigour.

Programme Map: Module Contribution to Programme Learning Outcomes

Please complete the summary table below which shows how individual modules contribute to the achievement of programme learning outcomes.

Stage	Module		Programme Learning Outcomes							
			PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
			confidently identify those problems that can be analysed by standard mathematical techniques, and those situations in society where economic principles can provide insight, and be able to apply those techniques and principles successfully.	recognise when an unfamiliar problem is open to pure mathematical investigation and/or mathematical modelling, and be able to adapt and/or synthesise a range of mathematical approaches (including abstraction or numerical approximation) to investigate the problem.	deploy the methods of logical and mathematical reasoning used by economists, especially within formal models, with an understanding of the purpose and scope of such models.	use logical reasoning to critically analyse statements, arguments or conjectures made by others, and be able to justify the mathematical principles they choose for such a critique.	use statistical, econometric and computer-based techniques for analysing data, in applying and testing economic models or in economic and financial forecasting.	engage with, and draw on, academic and professional research in Economics, with an ability to distinguish different themes within it, and to synthesise ideas from it.	analyse and critically evaluate economic policies, of government and/or other institutions	communicate complex mathematical and economic ideas clearly, at a level appropriate for the intended audience.
Stage 3	Industrial Economics	Progress towards PLO	Learning and understanding fundamental concepts of imperfectly competitive markets and strategic behaviour exhibited by players in such markets; understanding how functioning of such markets differ from the perfect or "ideal" world thereby understanding the causes of market failures and the sources of market power and rent extractions.		Students will study fundamental models of non-cooperative behaviour amongst firms, and further advanced and recent topics such as spatial competition, mergers, vertical relations and networks. Students build their knowledge based on materials covered in Microeconomics 2 and Game Theory.	Whilst this skill is not essential for this module, students will be able to develop an understanding of empirical Industrial Economics by reading various case studies and analysing some empirical facts.		Students will be introduced to newest developments in the field of Industrial Economics, they will also be taught about 'old' ideas that provide the building blocks for today's Industrial Economics. This will equip them with the ability to understand the similarities and differences between different schools of thoughts.	Students will study various models of imperfect market structure and performances that will prove to be fundamental in evaluating and analysing Government's policies.	On completion of this module, students should have enough knowledge to explain various concepts, ideas, and measures used in Industrial Economics; they will have deepened their knowledge of functioning of imperfectly competitive markets and issues arising in such markets through the rigorous mathematical and game-theoretic models taught in the module. They will have developed enough economic intuition to apply theory to real-life examples.
		By working on (and if applicable, Assessed through)	Reading and understanding selected chapters from textbooks and references and just not relying on lecture notes. Students will be required to work on their own in order to enhance their understanding of the materials taught that cannot happen solely by relying on lecture notes. Taking notes that summarise and explain ideas in students' own way and not just relying on lectures notes and 'model' answers to seminar problems. Assessed informally through the feedback provided on submitted assignments and formally through answering (mainly) technical questions requiring independent thinking, during the summer term exam.		Reading and understanding selected chapters from textbooks and references and just not relying on lecture notes. By working on problem sets supported by lectures and seminars. Taking notes that summarise and explain ideas in students' own way and not just relying on lectures notes and 'model' answers to seminar problems. Assessed informally through the feedback provided on submitted assignments and formally through answering (mainly) technical questions requiring independent thinking, during the summer term exam.	Reading of various case studies and empirical facts (e.g. by exploring recent merger cases and reasons behind such behaviour)		Reading and understanding selected chapters from textbooks and references and just not relying on lecture notes. By working on problem sets supported by lectures and seminars. Taking notes that summarise and explain ideas in students' own way and not just relying on lectures notes and 'model' answers to seminar problems. Assessed informally through the feedback provided on submitted assignments and formally through answering (mainly) technical questions requiring independent thinking, during the summer term exam.	Reading and understanding selected chapters from textbooks and references and just not relying on lecture notes. By working on problem sets supported by lectures and seminars. Taking notes that summarise and explain ideas in students' own way and not just relying on lectures notes and 'model' answers to seminar problems. Assessed informally through the feedback provided on submitted assignments and formally through answering (mainly) technical questions requiring independent thinking, during the summer term exam.	Assessed informally through the feedback provided on submitted assignments and formally through answering (mainly) technical questions requiring independent thinking, during the summer term exam.

Programme Map: Module Contribution to Programme Learning Outcomes

Please complete the summary table below which shows how individual modules contribute to the achievement of programme learning outcomes.

Stage	Module		Programme Learning Outcomes							
			PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
			confidently identify those problems that can be analysed by standard mathematical techniques, and those situations in society where economic principles can provide insight, and be able to apply those techniques and principles successfully.	recognise when an unfamiliar problem is open to pure mathematical investigation and/or mathematical modelling, and be able to adapt and/or synthesise a range of mathematical approaches (including abstraction or numerical approximation) to investigate the problem.	deploy the methods of logical and mathematical reasoning used by economists, especially within formal models, with an understanding of the purpose and scope of such models.	use logical reasoning to critically analyse statements, arguments or conjectures made by others, and be able to justify the mathematical principles they choose for such a critique.	use statistical, econometric and computer-based techniques for analysing data, in applying and testing economic models or in economic and financial forecasting.	engage with, and draw on, academic and professional research in Economics, with an ability to distinguish different themes within it, and to synthesise ideas from it.	analyse and critically evaluate economic policies, of government and/or other institutions	communicate complex mathematical and economic ideas clearly, at a level appropriate for the intended audience.
Stage 3	International Economics	Progress towards PLO	Application of economic principles and frameworks to understand the causes and consequences of international trade, the pattern of trade between nations, and how international transactions affect the domestic economy and the conduct of national economic policies at full employment and over the business cycle.		Students should be able to apply formal models to explain international trade and the gains from trade, trade policy and business cycle fluctuations in the global economy. The main objective is to present international economics as a method of analysis and to establish clear links to events in the global economy.			Students should be able to analyse critically academic and professional research in a selection of topics including the political economy of trade, macroeconomic stabilization policy, and the cost and benefits of different exchange rate regimes and the implication of this choice for the economy?	On completing the module students should be able to make recommendations for policy derivable from theory and empirical evidence about trade and industrial policy in the global economy, the choice of exchange rate regimes and the implication of this choice for the economy, the common features of financial and currency crises as well as policy measures to avoid them.	Clarity of analysis in the topics covered.
		By working on (and if applicable, Assessed through)	Integrated lectures and classroom discussion, solving in groups formative problem sets. Assessed through formative problem sets and unseen written examination.		Integrated lectures and classroom discussion and critical analysis of important relevant research papers. Assessed through formative problem sets and unseen written examination.			Integrated lectures and classroom discussion, solving in groups formative problem sets. Assessed through formative problem sets and unseen written examination.	Integrated lectures and classroom discussion, solving in groups formative problem sets. Assessed through formative problem sets and unseen written examination.	Integrated lectures and classroom discussion, solving in groups formative problem sets. Assessed through formative problem sets and unseen written examination.
Stage 3	Monetary Economics	Progress towards PLO	Students learn to think about money, as well as monetary and fiscal policy, in terms agent heterogeneity, equilibrium, and Pareto optimality.		Students are introduced to an abstract approach to economics and use abstract mathematical language from the very beginning. There is an emphasis on developing a critical sense regarding the usefulness of each model---that models by their very nature are abstractions and not reality but that fact in itself does not determine whether they are good or bad.			Many fundamental models are developed in appropriate detail---Arrow-Debreu, Sequence Economies, Grandmont-Younes, Bewley, Overlapping Generations, Lucas Money Neutrality, Diamond Delegated Monitoring, and Diamond and Dybvig.	The ultimate goal of all the models studied is to gain an insight into policy---even if only to know precisely when intervention is purely for distributional reasons.	Students learn the formal language of economic theory. This allows them to communicate primarily with trained economic theorists.

Programme Map: Module Contribution to Programme Learning Outcomes

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Stage	Module		Programme Learning Outcomes								
			PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	
			confidently identify those problems that can be analysed by standard mathematical techniques, and those situations in society where economic principles can provide insight, and be able to apply those techniques and principles successfully.	recognise when an unfamiliar problem is open to pure mathematical investigation and/or mathematical modelling, and be able to adapt and/or synthesise a range of mathematical approaches (including abstraction or numerical approximation) to investigate the problem.	deploy the methods of logical and mathematical reasoning used by economists, especially within formal models, with an understanding of the purpose and scope of such models.	use logical reasoning to critically analyse statements, arguments or conjectures made by others, and be able to justify the mathematical principles they choose for such a critique.	use statistical, econometric and computer-based techniques for analysing data, in applying and testing economic models or in economic and financial forecasting.	engage with, and draw on, academic and professional research in Economics, with an ability to distinguish different themes within it, and to synthesise ideas from it.	analyse and critically evaluate economic policies, of government and/or other institutions	communicate complex mathematical and economic ideas clearly, at a level appropriate for the intended audience.	
		By working on (and if applicable, Assessed through)	models with microeconomic foundations. Assessed through the variety of questions on the summer term exam on which there is no choice.		formal mathematical models of (i) general equilibrium with money and (ii) game theoretical models of liquidity, and on some nonlinear programming, all developed in lectures, notes/slides that are distributed, and assigned reading. The exercises on eight problem sets, solved completely in practical classes, help students to master the abstract approach by the end of their revision period, often by making good use of office hours. Assessed through the summer term exam which tests students ability to solve problems (including proofs) on all of the formal methods developed as there is no choice on it.			taking adequate notes in lectures, then preparing their own notes and using those notes to work on the problem sets. Learning is supported by notes/slides that are distributed and assigned reading including the Diamond and Dybvig paper. Assessed through the summer term exam which requires problem solving (including proofs) and some short essays.	monetary and regulatory policy analysis within a fully specified general equilibrium or game theoretic framework. Assessed through the summer term exam which requires problem solving (including proofs) and some short essays.	the exercises on eight problem sets which are solved completely in practical classes and complete solutions to which are posted on the VLE. Assessed through the summer term exam which requires students to communicate with a strong emphasis on mathematical rigour. There are a few short essay questions as well.	
Stage 3	Alternative Perspectives in Economics	Progress towards PLO	The module investigates how various economic concepts and principles have been developed by different schools of economic thought, including institutionalism, Marxian economics, Post Keynesianism and Austrian economics.		Formal theories and models drawn from different schools of economic thought are used to analyse all of the economic issues covered in the module.			A wide range of academic research from different schools of economic thought is discussed within the module, and students are encouraged to adopt a critical and comparative approach.	Various policy questions are raised and evaluated during the module, in areas such as work organisation, employment policy, control of inflation, monetary policy, and economic growth.	The module is essay-based and promotes clear exposition of the subject matter, backed by appropriate use of economic theory and evidence.	
		By working on (and if applicable, Assessed through)	Formative essay work, supported by lectures and seminars, that discusses the contrasting treatment of economic issues by different schools of economic thought. Assessed through essay questions in the summer-term exam.		Formative essay work, supported by lectures and seminars, that gives opportunities for students to make use of various economic theories and models. Assessed through essay questions in the summer-term exam.			Formative essay work, supported by lectures and seminars, that requires students to read the academic literature and demonstrate their knowledge of it. Assessed through essay questions in the summer-term exam.	Formative essay work, supported by lectures and seminars, that permits discussion and evaluation of policy questions. Assessed through essay questions in the summer-term exam.	Formative essay work, supported by lectures and seminars, that helps students to practice and improve their explanatory skills. Assessed through essay questions in the summer-term exam.	
Stage 3	Principles of Corporate Finance and Derivative Securities	Progress towards PLO	Understanding how corporations operate, the economic rationale for business decision-making process		Some understanding of asset and derivatives models. Models of pricing bonds and equity.		Some understanding of how financial time series data can be characterized mathematically. We focus in particular on S&P500 returns and on option prices on S&P500.	Some understanding of how financial time series data can be characterized statistically.	Some understanding of asset pricing models used in the existing literature and the ability to compare and analyse them.	Analysis of a business model of corporations, firm value maximization, the role of taxes and financial leverage	Analysis of capital budgeting decisions, investment project profitability and risk

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			PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
			confidently identify those problems that can be analysed by standard mathematical techniques, and those situations in society where economic principles can provide insight, and be able to apply those techniques and principles successfully.	recognise when an unfamiliar problem is open to pure mathematical investigation and/or mathematical modelling, and be able to adapt and/or synthesise a range of mathematical approaches (including abstraction or numerical approximation) to investigate the problem.	deploy the methods of logical and mathematical reasoning used by economists, especially within formal models, with an understanding of the purpose and scope of such models.	use logical reasoning to critically analyse statements, arguments or conjectures made by others, and be able to justify the mathematical principles they choose for such a critique.	use statistical, econometric and computer-based techniques for analysing data, in applying and testing economic models or in economic and financial forecasting.	engage with, and draw on, academic and professional research in Economics, with an ability to distinguish different themes within it, and to synthesise ideas from it.	analyse and critically evaluate economic policies, of government and/or other institutions	communicate complex mathematical and economic ideas clearly, at a level appropriate for the intended audience.
		By working on (and if applicable, Assessed through)	Formative exercises and asset pricing simulations accompanied by lectures, seminars and practical examples. Assessed through exam exercises and questions targeted to testing the application of the pricing techniques.		Formative exercises and asset pricing simulations accompanied by lectures, seminars and practical examples. Assessed through exam exercises and questions targeted to testing the application of the pricing techniques.	Formative exercises and asset pricing simulations accompanied by lectures, seminars and practical examples. Assessed through exam exercises and questions targeted to testing the pricing techniques.	Formative exercises and asset pricing simulations accompanied by lectures, seminars and practical examples. Assessed through exam exercises and questions targeted to testing the pricing techniques.	Formative exercises and asset pricing simulations accompanied by lectures, seminars and practical examples. Assessed through exam exercises and questions targeted to testing the pricing techniques.	Formative exercises and asset pricing simulations accompanied by lectures, seminars and practical examples. Assessed through exam exercises and questions targeted to testing the pricing techniques.	Formative exercises and asset pricing simulations accompanied by lectures, seminars and practical examples. Assessed through exam exercises and questions targeted to testing the application of the pricing techniques.
Stage 3	Structure and Regulation of Financial Markets	Progress towards PLO	This module uses economic principles developed in previous modules to understand the causes and consequences of financial market failure and the way these can be mitigated by regulation. It applies the theory of asymmetric information to financial institutions, relating the analysis to current developments, with particular reference to the British financial system. It also applies theories of agency capture and moral hazard to the regulator.		Students use a series of increasingly challenging mathematical models of capital, insurance and banking markets to analyse these markets. There is an emphasis on developing a critical sense regarding the usefulness of each model—that models by their very nature are simplifications of reality and require the use of judgement in their selection and use.			The basic models are studied in detail—notably the King-Roell capital market model, the Rothschild and Stiglitz insurance model, the Diamond Delegated Monitoring, and Diamond and Dybvig models.	The students apply these models, their institutional knowledge and their judgement to specific issues raised by the global financial crisis. They need to research the institutional background, identify the appropriate model and show how it can be applied, taking account of any unrealistic features.	The students need to understand and explain both the institutional background and theoretical models and their limitations in order to contribute to group presentations on current issues in this area .
		By working on (and if applicable, Assessed through)	Integrated lectures and classroom discussion, the latter working in groups on formative problem sets and policy issues. Assessed through formative problem sets, presentations and unseen written examination.		Integrated lectures and classroom discussion of relevant academic journal articles. Students learn to identify the appropriate economic model show how it can be applied, taking account of any unrealistic features. Assessed through formative problem sets, presentations and unseen written examination.			The students use the material provided in the lectures and their directed reading to solve numerical problems based on these models in Autumn term seminars. The first examination question (which is unseen, compulsory and carries 25% of the total mark), is based on one of these models.	The students organise themselves into groups that lead the discussion of topics in the Spring term seminars, choosing from a list of topics that is circulated in advance. The seminar tutor gives written feedback on both content and presentation. The students chose two out of five optional questions in Section B of the examination, which include model-based policy questions related to the Spring term seminars.	The students organise themselves into groups that lead the discussion of topics in the Spring term seminars, choosing from a list of topics that is circulated in advance. The seminar tutor gives written feedback on both content and presentation.

Programme Map: Module Contribution to Programme Learning Outcomes

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			PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
			confidently identify those problems that can be analysed by standard mathematical techniques, and those situations in society where economic principles can provide insight, and be able to apply those techniques and principles successfully.	recognise when an unfamiliar problem is open to pure mathematical investigation and/or mathematical modelling, and be able to adapt and/or synthesise a range of mathematical approaches (including abstraction or numerical approximation) to investigate the problem.	deploy the methods of logical and mathematical reasoning used by economists, especially within formal models, with an understanding of the purpose and scope of such models.	use logical reasoning to critically analyse statements, arguments or conjectures made by others, and be able to justify the mathematical principles they choose for such a critique.	use statistical, econometric and computer-based techniques for analysing data, in applying and testing economic models or in economic and financial forecasting.	engage with, and draw on, academic and professional research in Economics, with an ability to distinguish different themes within it, and to synthesise ideas from it.	analyse and critically evaluate economic policies, of government and/or other institutions	communicate complex mathematical and economic ideas clearly, at a level appropriate for the intended audience.
Stage 3	Applied Econometrics	Progress towards PLO	The course draws on concepts from economic theory such as long run economic equilibrium, and applies and tests such concepts by using formal models		The students are taught a number of different models, their properties are analysed and discussed based on logical and mathematical reasoning, together with their scope and usage (including any advantages and disadvantages). Their use is also demonstrated through empirical applications.	Teaching the students how to understand the important features and properties of economic data, for example whether the data is stationary/non-stationary, whether it exhibits trends; how to model the data given these characteristics; and how to perform the necessary operations to organise and manipulate the data.	The main purpose of this module is to equip students with good practical skills needed to apply econometric techniques (estimation and testing) and interpret the econometric results	Equipping the students with the required econometrics skills to understand more of the econometric evidence published in academic journals and books and synthesize ideas from this. Training them to demonstrate analytical and critical thinking.	By providing the necessary tools to be able to formulate economic and financial policy questions into testable hypotheses	By providing the tools to analyse the data and estimate the appropriate models and training them to interpret the results and communicate them in a technical and non-technical manner.
		By working on (and if applicable, Assessed through)	Testing for long run relationships between variables (i.e. cointegration), formulation of error correction models Assessed through examination		Presenting and analysing stationary dynamic ARMA models, error correction models, binary choice models and panel data models Assessed through examination.	Testing for stationarity/non-stationarity by means of unit roots Assessed through formative seminar work and summative examination	The use of state-of-the-art statistical software for the analysis of stationary ARMA models and forecasting; non-stationary models; binary choice models; panel data models Assessed through examination.	Estimation and interpretation of the results from various models including time series, binary choice models and panel data models.	Applying significance tests in the context of time series, binary choice and panel data models; testing for cointegration; error correction models	Estimation of time series; cross section and panel data models and interpretation of the results Assessed through formative seminar work and summative examination
Stage 3	Econometric Methods for Research	Progress towards PLO			By applying a number of different econometric models and methods, students will be able to show that many economic phenomena can be represented, characterised and hence better understood in terms of these models.		Teaching students what type of econometric specification and type of estimation and or test statistics is required for different type of data	Improving understanding of key terms, concepts and arguments used in the applied and some (basic) theoretical econometrics.		
		By working on (and if applicable, Assessed through)			Key results in mathematical statistics, probability theory and econometric theory, as explained during lectures and reinforced through self-study and consideration of problem sets. Assessed through the student's ability, under examination conditions, to apply these results to new problems.		Establishing the statistical properties of different estimators and test statistics, using law of large numbers, central limit theorems and other key ideas based on asymptotic theory. Explained during lectures and reinforced through self-study and consideration of problem sets. Assessed through the student's ability, under examination conditions, to derive key results properties of new econometric models.	definitions and applications of estimators and test statistics and their asymptotic properties through specific problem sets and exercises Assessed through the student's ability, under examination conditions, to define and to explain key concepts..		

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Stage	Module		Programme Learning Outcomes							
			PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
			confidently identify those problems that can be analysed by standard mathematical techniques, and those situations in society where economic principles can provide insight, and be able to apply those techniques and principles successfully.	recognise when an unfamiliar problem is open to pure mathematical investigation and/or mathematical modelling, and be able to adapt and/or synthesise a range of mathematical approaches (including abstraction or numerical approximation) to investigate the problem.	deploy the methods of logical and mathematical reasoning used by economists, especially within formal models, with an understanding of the purpose and scope of such models.	use logical reasoning to critically analyse statements, arguments or conjectures made by others, and be able to justify the mathematical principles they choose for such a critique.	use statistical, econometric and computer-based techniques for analysing data, in applying and testing economic models or in economic and financial forecasting.	engage with, and draw on, academic and professional research in Economics, with an ability to distinguish different themes within it, and to synthesise ideas from it.	analyse and critically evaluate economic policies, of government and/or other institutions	communicate complex mathematical and economic ideas clearly, at a level appropriate for the intended audience.
Stage 3	Bubbles, Panics and Crashes	Progress towards PLO	Application of economic definitions, principles and establish potential explanations for the economic phenomena of bubbles, panics and crashes		some understanding of the nature and scope of models in economic history, including an awareness of the assumptions (and their plausibility) in such models	use of key data series used in economic history and economics, such as the Maddison data base, International Financial Statistics etc.		students will understand and evaluate the main ideas of the important schools of economic history and the contributions of some classic papers in the literature on financial crises (both historical and theoretical)	Policy choices and their effectiveness form part of the discussion of most of the topics covered in the module	students will be required to provide extended written expositions in which they achieve an appropriate balance of verbal arguments and diagrammatic explanations. Their expositions will also demonstrate the ability to select the material most relevant to the specific question asked and to apply it to this question.
		By working on (and if applicable, Assessed through)	Discussion of the above in lectures and then presentations by students of specific examples and discussion of findings in seminars Assessed through formative essays and then unseen written examination in which students expected to introduce, recognise, differentiate between, use and discuss such concepts and principles.		formative exercises, supported principally by lectures and seminars, that develop the construction and solution of a range of relevant models Assessed through exam questions designed to test the understanding of construction, application and historical relevance of such models	Discussion of this material in lectures using the web sites during the lecture, and then choice by students of relevant data in their presentations – with discussion of reliability etc of such information Assessed first through formative essays and then by unseen written examination. Relevance and reliability of data part of criteria for marks in unseen written examination.		reading a variety of carefully selected recommended textbook references and journal articles, not following a single textbook Assessed through writing essays in the summer-term exam drawing on this literature	discussion of strategies of governments (including the different players on the national level) in student work and in discussion during the seminars Assessed first through formative essays and then by questions in unseen written examination.	writing formative essays as if for readers who are not already fully cognizant with the subject, such as fellow economics students from the year below Assessed through writing essays in the summer-term exam
Stage 3	International Economic Growth and Development	Progress towards PLO	Application of economic definitions, principles and establish potential explanations for economic growth and development in the international economy. Examples include how and why Rostow and GCR stages of growth theory help explain the 'miracle' of Chinese economic growth, how and why Lewis and Todaro models of push and pull in relation to rural agriculture to urban industry help explain the paradox of India's growth performance and how and why differential application of the Washington consensus helps explain differential performance amongst countries in Latin America.		Understanding of the merits and disadvantages of formal models to each of above concepts in lectures. Example here is the comparison of different economic models to explain performance in Sub Saharan Africa – discussion in lecture of which models best explain that performance and which variables are significant – and crucially why some variables are not significant.	Use of data from key NGOs, as, for example, IMF, ILO, WHO, OECD and World Bank and from national governments.. Example here is the 'reliability' of Chinese economic data. Another is the robustness of the data compiled in the Global Competitiveness Report.	Discussion of robustness given in academic literature and NGO reports of models and econometric results as indicated in PLO3	Discussion of such issues in lectures; reference to work conducted by NGOs and published in the academic literature in lectures, key findings of academic literature in lectures. Example here is the pro/anti Washington consensus debate in relation to South America and the contrasting 'explanation' of populism. A second is the debate between 'geography' and 'institutions' as explanations of performance in sub-Saharan Africa.	Policy choices and effectiveness form part of the discussion of most of the topics covered in the module. The role of the state a crucial element in understanding growth in India, China, South America, and Eastern Europe.	Clarity of analysis in the topics covered.

Programme Map: Module Contribution to Programme Learning Outcomes

Please complete the summary table below which shows how individual modules contribute to the achievement of programme learning outcomes.

Stage	Module		Programme Learning Outcomes							
			PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
			confidently identify those problems that can be analysed by standard mathematical techniques, and those situations in society where economic principles can provide insight, and be able to apply those techniques and principles successfully.	recognise when an unfamiliar problem is open to pure mathematical investigation and/or mathematical modelling, and be able to adapt and/or synthesise a range of mathematical approaches (including abstraction or numerical approximation) to investigate the problem.	deploy the methods of logical and mathematical reasoning used by economists, especially within formal models, with an understanding of the purpose and scope of such models.	use logical reasoning to critically analyse statements, arguments or conjectures made by others, and be able to justify the mathematical principles they choose for such a critique.	use statistical, econometric and computer-based techniques for analysing data, in applying and testing economic models or in economic and financial forecasting.	engage with, and draw on, academic and professional research in Economics, with an ability to distinguish different themes within it, and to synthesise ideas from it.	analyse and critically evaluate economic policies, of government and/or other institutions	communicate complex mathematical and economic ideas clearly, at a level appropriate for the intended audience.
		By working on (and if applicable, Assessed through)	Discussion of the above in lectures and then presentations by students of specific examples and discussion of findings in seminars Assessed through formative essays and then unseen written examination in which students expected to introduce, recognise, differentiate between, use and discuss such concepts and principles.		Discussion of the above in presentations by students of specific examples and discussion of findings in seminars Assessed through formative essays plus unseen written examination in which students expected to use insights but recognise potential weaknesses in formal models.	Discussion of this material in lectures using the web sites during the lecture, and then choice by students of relevant data in their presentations – with discussion of reliability etc of such information Assessed first through formative essays and then by unseen written examination. Relevance and reliability of data part of criteria for marks in unseen written examination.	Introduction to this in the lecture and then discussion of above in student presentations and wider discussion in seminars. Assessed first through formative essays and then unseen written examination. Awareness of robustness of findings expected in unseen written exam	Discussion of above in student presentations and in open discussion in seminars. Assessed first through formative essays and then unseen written examination. Awareness of robustness of findings expected in unseen written exam	Discussion of strategies of governments and NGOs in lectures, in student work and in discussion during seminars. Assessed first through formative essays and then by questions in unseen written examination.	Clarity of analysis is a key requirement of formative and summative work.
Stage 3	Political Economics	Progress towards PLO	Students will develop an understanding of how the quantitative toolkit of the modern economist (including both micro- and macroeconomic analysis, as well as econometrics) may be used to analyse political decisions and outcomes, such as the income redistribution, economic efficiency, public debt, and corruption across different political and electoral institutions.		Students are introduced to a variety of formal political economics models including the Median Voter Theorem and the economics of constitutions based on Persson and Tabellini (2000). Emphasis will be on developing a critical sense regarding the usefulness of each model – that models by their very nature are abstractions and not reality but that fact in itself does not determine whether they are good or bad. A critical understanding of the scope of such models will be developed through exposure to empirical literature testing some of the hypotheses generated in the literature	Students will develop an understanding of how political and economic data may be used to test theories for example concerned with redistribution and corruption.	Students will learn to identify the most appropriate econometric techniques to address recurrent challenges in empirically testing the predictions of political economics models using micro- and macrodata.	Students will understand and evaluate the main ideas of the important schools of political economics and the contributions of some classic papers in the literature.	Students consider how political economic concerns influence decisions regarding economic and fiscal policies and their outcomes under different institutional environments, such as the existence of democracy and how votes are aggregated	Students will improve their written expositions and presentation skills of arguments involving mathematical derivations and diagrammatic elements. Their expositions will also demonstrate the ability to select the material most relevant to the specific question asked and to apply it to that question.

Programme Map: Module Contribution to Programme Learning Outcomes

Please complete the summary table below which shows how individual modules contribute to the achievement of programme learning outcomes.

Stage	Module		Programme Learning Outcomes							
			PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
			confidently identify those problems that can be analysed by standard mathematical techniques, and those situations in society where economic principles can provide insight, and be able to apply those techniques and principles successfully.	recognise when an unfamiliar problem is open to pure mathematical investigation and/or mathematical modelling, and be able to adapt and/or synthesise a range of mathematical approaches (including abstraction or numerical approximation) to investigate the problem.	deploy the methods of logical and mathematical reasoning used by economists, especially within formal models, with an understanding of the purpose and scope of such models.	use logical reasoning to critically analyse statements, arguments or conjectures made by others, and be able to justify the mathematical principles they choose for such a critique.	use statistical, econometric and computer-based techniques for analysing data, in applying and testing economic models or in economic and financial forecasting.	engage with, and draw on, academic and professional research in Economics, with an ability to distinguish different themes within it, and to synthesise ideas from it.	analyse and critically evaluate economic policies, of government and/or other institutions	communicate complex mathematical and economic ideas clearly, at a level appropriate for the intended audience.
		By working on (and if applicable, Assessed through)	Students will read a variety of carefully selected recommended readings, predominantly consisting of journal articles. In lectures students will take notes summarising and synthesise the ideas presented in the lectures. Following up lectures with appropriate reading. Writing formative essays. Students will also present at, as well as participate in, seminars organised within the module in which they will develop their understanding of how economic principles and methods can be usefully applied in understanding political decision-making and outcomes.. Students will demonstrate their capacity to apply economic concepts and principles to political decision-making and outcomes in summative essays in the final exam.		Part of the lectures and practicals will be devoted to fully develop the formal models with the students. The notes that are distributed and the assigned reading help students get used to the abstract mathematical language. The practicals help allowing students to master the abstract approach by the end of their revision period. Students will demonstrate their knowledge of the formal reasoning used by economists to analyse political processes in summative essays in the final exam.	Many of the key readings in the module reading list contains empirical work, describing how data is compiled and analysed with the purpose of testing particular political-economic theories. Practical lectures will cover the example of how data are located and used to test theories of fiscal policy under different constitutional arrangements.	In lectures and practicals students consider a variety of applications of state-of-art statistical and econometric techniques to test hypotheses relating to political economics issues. Assessed through the essay questions in the summer term exam, some of which will directly ask students to identify empirical strategies to test particular hypotheses.	Students will be reading a variety of carefully selected recommended textbook and journal articles, not following a single textbook. Writing formative essays which give the student's own considered view, not just mechanically reporting the views of the original authors. Assessed through essay questions in the summer term exam.	Students will be reading a variety of carefully selected journal articles, analysing and evaluating economic and financial policies under different institutional environments. Assessed through the essay questions in the summer term exam.	Students will be writing formative essays training them for the final written assessment. They will give mandatory 30-minute presentations in the seminars of the module introducing their peers to recent political economic academic papers. Assessed through essay questions in the summer term exam.
Stage 3	Experimental Economics	Progress towards PLO	Subjecting economic principles to experimental testing gives an important perspective on those principles, and on their empirical application and plausibility.		The discipline of devising an experimental test of a model gives an important perspective on the nature and scope of economic models.	An understanding of the nature of experimental data, its strengths and weaknesses		An understanding of the principal methods and themes in the rapidly growing experimental research literature		Clear explanation of experimental design and methods, including in a manner that is intelligible to non-economists.

Programme Map: Module Contribution to Programme Learning Outcomes

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Stage	Module		Programme Learning Outcomes							
			PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
			confidently identify those problems that can be analysed by standard mathematical techniques, and those situations in society where economic principles can provide insight, and be able to apply those techniques and principles successfully.	recognise when an unfamiliar problem is open to pure mathematical investigation and/or mathematical modelling, and be able to adapt and/or synthesise a range of mathematical approaches (including abstraction or numerical approximation) to investigate the problem.	deploy the methods of logical and mathematical reasoning used by economists, especially within formal models, with an understanding of the purpose and scope of such models.	use logical reasoning to critically analyse statements, arguments or conjectures made by others, and be able to justify the mathematical principles they choose for such a critique.	use statistical, econometric and computer-based techniques for analysing data, in applying and testing economic models or in economic and financial forecasting.	engage with, and draw on, academic and professional research in Economics, with an ability to distinguish different themes within it, and to synthesise ideas from it.	analyse and critically evaluate economic policies, of government and/or other institutions	communicate complex mathematical and economic ideas clearly, at a level appropriate for the intended audience.
		By working on (and if applicable, Assessed through)	Reading and reviewing a selection of relevant literature, and a (group) project designing a hypothetical novel experiment. Supported by lectures, seminars and workshops. Assessed through the submitted project, presenting the designed experiment, while also demonstrating a broader understanding of the experimental perspective on economic principles.		Reading and reviewing a selection of relevant literature, and a (group) project designing a hypothetical novel experiment. Supported by lectures, seminars and workshops. Assessed through the submitted project, presenting the designed experiment, while also demonstrating a broader understanding of the experimental perspective on the nature and scope of economic models.	Reading and reviewing a selection of relevant literature, and a (group) project designing a hypothetical novel experiment. Supported by lectures, seminars and workshops. Assessed through the submitted project, presenting the designed experiment, while also demonstrating a broader understanding of the nature, strengths and weaknesses of experimental data.		Reading and reviewing a selection of relevant literature, and a (group) project designing a hypothetical novel experiment. Supported by lectures, seminars and workshops. Assessed through the submitted project, presenting the designed experiment, while also demonstrating a broader understanding of the methods and themes of experimental research		Reading and reviewing a selection of relevant literature, and a (group) project designing a hypothetical novel experiment. Supported by lectures, seminars and workshops. Assessed through the submitted project, presenting the designed experiment, while also demonstrating clarity of explanation, including a synopsis assessed specifically for its intelligibility to non-economists.
Stage 3	Financial and Time Series Econometrics	Progress towards PLO			Students continue to be exposed to using models (e.g., CAPM).		Students consolidate their competence with current statistical techniques, and are introduced to new techniques, designed to optimally cater for time series data, which is the typical format of financial data.		assess impact of monetary policy decisions on key macro interest rates.	communication with a strong emphasis on mathematical rigour, while linking statistical findings to economic interpretation.
		By working on (and if applicable, Assessed through)			Students will be invited to critically evaluate models using rigorous statistical techniques. Assessed through exam questions designed to test understanding of this.		Computer based techniques for analysis data and models and for financial forecasting are introduced and applied throughout. Topics will include: the theoretical and empirical investigation of market returns; the use of (G)ARCH models for the evaluation of the Value at Risk of a portfolio; the evaluation of the information content in the term structure of interest rates for the purpose of forecasting future short term rates; Capital Asset Pricing Model (CAPM). Assessed through exam questions designed to test understanding of this.		the statistical properties of the term structures of interest rates. Assessed through exam questions designed to test understanding of this.	By studying simple proofs in detail, students will learn how to present arguments with mathematical precision. Students will also be presented with real data in a vast range of applications; they will be invited to interpret these data in the light of economic theory, and provide sensible description. The exam requires students to communicate with a strong emphasis on mathematical rigour, but also to link the statistical findings to a economic interpretation.