

# Mathematics and Economics BSc (Hons)

## COURSE DETAILS

- A level requirements: [ABB](#)
- UCAS code: GL11
- Study mode: Full-time
- Length: 3 years

## KEY DATES

- Apply by: [29 January 2025](#)
- Starts: 22 September 2025

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## Course overview

Economics and Mathematics are two subjects that compliment each other and will offer a firm foundation for your future career. At Liverpool you will have a choice of modules meaning you can tailor your degree to your strengths and interests.

## INTRODUCTION

Mathematics is a fascinating, beautiful and diverse subject to study. It underpins a wide range of disciplines; from physical sciences to social science, from biology to business and finance. At Liverpool, our programmes are designed with the needs of employers in mind, to give you a solid foundation from which you may take your career in any number of directions.

A Mathematics degree at the University of Liverpool is an excellent investment in your future. We have a large department with highly qualified staff, a first-class reputation in teaching and research, and a great city in which to live and work.

Economics and mathematics are both highly relevant subjects in today's world. The two subjects come very much hand-in-hand and offer a firm foundation for your future career. This degree combines them in about equal measure, with considerable flexibility in the choice of modules after the first year. Modules covered include microeconomics, macroeconomics, statistics, numbers, groups and codes, as well as core mathematics modules.

## WHAT YOU'LL LEARN

- Problem solving
- Critical thinking
- Teamwork

- How to present and communicate clearly



# Course content

Discover what you'll learn, what you'll study, and how you'll be taught and assessed.

## YEAR ONE

All modules taken in the first year are compulsory.

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### COMPULSORY MODULES

#### **CALCULUS I (MATH101)**

**Credits: 15 / Semester: semester 1**

At its heart, calculus is the study of limits. Many quantities can be expressed as the limiting value of a sequence of approximations, for example the slope of a tangent to a curve, the rate of change of a function, the area under a curve, and so on. Calculus provides us with tools for studying all of these, and more. Many of the ideas can be traced back to the ancient Greeks, but calculus as we now understand it was first developed in the 17th Century, independently by Newton and Leibniz. The modern form presented in this module was fully worked out in the late 19th Century. MATH101 lays the foundation for the use of calculus in more advanced modules on differential equations, differential geometry, theoretical physics, stochastic analysis, and many other topics. It begins from the very basics – the notions of real number, sequence, limit, real function, and continuity – and uses these to give a rigorous treatment of derivatives and integrals for real functions of one real variable.

#### **CALCULUS II (MATH102)**

**Credits: 15 / Semester: semester 1**

This module, the last one of the core modules in Year 1, is built upon the knowledge you gain from MATH101 (Calculus I) in the first semester. The syllabus is conceptually divided into three parts: Part I, relying on your knowledge of infinite series, presents a thorough study of power series (Taylor expansions, binomial theorem); part II begins with a discussion of functions of several variables and then establishes the idea of partial differentiation together with its various applications, including chain rule, total differential, directional derivative, tangent planes, extrema of functions and Taylor expansions; finally, part III is on double integrals and their applications, such as finding centres of mass of thin bodies. Undoubtedly, this module, together with the other two core modules from Semester 1 (MATH101 Calculus I and MATH103 Introduction to linear algebra), forms an integral part of your ability to better understand modules you will be taking in further years of your studies.

## **INTRODUCTION TO LINEAR ALGEBRA (MATH103)**

**Credits: 15 / Semester: semester 1**

Linear algebra is the branch of mathematics concerning vector spaces and linear mappings between such spaces. It is the study of lines, planes, and subspaces and their intersections using algebra.

Linear algebra first emerged from the study of determinants, which were used to solve systems of linear equations. Determinants were used by Leibniz in 1693, and subsequently, Cramer's Rule for solving linear systems was devised in 1750. Later, Gauss further developed the theory of solving linear systems by using Gaussian elimination. All these classical themes, in their modern interpretation, are included in the module, which culminates in a detailed study of eigenproblems. A part of the module is devoted to complex numbers which are basically just planar vectors. Linear algebra is central to both pure and applied mathematics. This module is an essential pre-requisite for nearly all modules taught in the Department of Mathematical Sciences.

## **INTRODUCTION TO STATISTICS USING R (MATH163)**

**Credits: 15 / Semester: semester 1**

Students will learn fundamental concepts from statistics and probability using the R programming language and will learn how to use R to some degree of proficiency in certain contexts. Students will become aware of possible career paths using statistics.

## **PRINCIPLES OF MICROECONOMICS (ECON121)**

**Credits: 15 / Semester: semester 1**

The module acquaints the student with a foundation in neo-classical microeconomics. The module equips students with the knowledge and mathematical tools to approach fundamental problems in microeconomic analysis. Students are introduced to the importance of theoretical models and their role. The module is supported by a customized textbook. Students who engage fully with this course will receive a solid foundation in microeconomics, which forms the foundation of all future courses in microeconomics and related subjects.

## **MATHEMATICAL IT SKILLS (MATH111)**

**Credits: 15 / Semester: semester 1**

This module introduces students to powerful mathematical software packages such as Maple and Matlab which can be used to carry out numerical computations or to produce a more complicated sequence of computations using their programming features. We can also do symbolic or algebraic computations in Maple. These software packages have built-in functions for solving many kinds of equations, for working with matrices and vectors, for differentiation and integration. They also contain functions which allow us to create visual representations of curves and surfaces from their mathematical descriptions, to work interactively, generate graphics and create mathematical documents. This module will teach students many of the above-mentioned features of mathematical software packages. This knowledge will be helpful in Years 2, 3 and 4 when working on different projects, for example in the modules MATH266 and MATH371.

## **PRINCIPLES OF MACROECONOMICS (ECON123)**

**Credits: 15 / Semester: semester 1**

This module complements and builds on Principles of Microeconomics and provides a foundation for further studies in macroeconomics. It introduces concepts and theories of economics which help understand changes in the macroeconomic environment and enables students to explain and analyse the formulation of government macroeconomic policy.

## **INTRODUCTION TO FINANCE (ACF1103)**

**Credits: 15 / Semester: semester 1**

This module introduces students to fundamental concepts in finance. The course aims to provide a firm foundation for the students to build on later on in the second and third years of their programmes, by covering basic logical and rational analytical tools that underpin financial decisions. The course covers topics such as the structure of firms and time value of money. Building on these notions, we then discuss the valuation of simple securities such as bonds and equities. The course also introduces students to project appraisal techniques.

*Programme details and modules listed are illustrative only and subject to change.*

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## **YEAR TWO**

Choose one module from: ECON211, ECON224, ECON241, ULMS254. Choose one module from MATH221, MATH226, MATH242, MATH260, MATH269.

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## **COMPULSORY MODULES**

### **STATISTICS AND PROBABILITY I (MATH253)**

**Credits: 15 / Semester: semester 1**

Analysis of data has become an essential part of current research in many fields including medicine, pharmacology, and biology. It is also an important part of many jobs in e.g. finance, consultancy and the public sector. This module provides an introduction to statistical methods with a strong emphasis on applying and interpreting standard statistical techniques. Since modern statistical analysis of real data sets is performed using computer power, a statistical software package is introduced and employed throughout.

### **ECONOMETRICS 1 (ECON212)**

**Credits: 15 / Semester: semester 1**

Econometrics is a branch of economics aimed at providing rigorous statistical techniques to test, empirically, the validity of economic hypotheses and economic models using data from the real world. Therefore, this module provides students with opportunities to develop and further strengthen important, but crucially transferable, advanced academic skills in economics, mathematics, statistics and computing, which can be used in a variety of different contexts such as applied economics and finance research. These skills are very useful and in high demand by graduate employers. A key feature of this module is the combination of rigorous theoretical foundation of OLS with hands-on applications using a relevant analytical software package (for example, EViews or STATA) and economic data.

### **MICROECONOMICS 1 (ECON221)**

**Credits: 15 / Semester: semester 1**

Introduction to the functions of individual decision-makers, both consumers and producers. Students will learn the major principles of microeconomics including consumer theory, producer theory, and general equilibrium. Perhaps more importantly, students will also learn how to apply these principles to a wide variety of real world situations in both personal and professional lives.

### **MICROECONOMICS 2 (ECON222)**

**Credits: 15 / Semester: semester 1**

This module aims to introduce students to three topics in microeconomic theory: game theory, asymmetric information and welfare economics.

## **MACROECONOMICS 1 (ECON223)**

**Credits: 15 / Semester: semester 1**

The module provides training in the principal methodologies, theories and techniques of modern macroeconomic analysis. It is designed to introduce classic macroeconomic issues such as growth, inflation, unemployment, interest rates, exchange rates, technological progress, and budget deficits. The course will provide a unified framework to address these issues and to study the impact of different policies, such as monetary and fiscal policies, on the aggregate behaviour of individuals. These analytical tools will be used to understand the recent experience of the United States and other countries and to address how current policy initiatives affect their macroeconomic performance.

## **STATISTICS AND PROBABILITY II (MATH254)**

**Credits: 15 / Semester: semester 1**

This module provides an introduction to probabilistic methods that are used not only in actuarial science, financial mathematics and statistics but also in all physical sciences. It focuses on discrete and continuous random variables with values in one and several dimensions, properties of the most useful distributions (e.g. geometric, exponential, and normal), their transformations, moment and probability generating functions and limit theorems. This module will help students doing MATH260 and MATH262 (Financial mathematics). This module complements MATH365 (Measure theory and probability) in the sense that MATH365 provides the contradiction-free measure theoretic foundation on which this module rests.

## **OPTIONAL MODULES**

### **DIFFERENTIAL EQUATIONS (MATH221)**

**Credits: 15 / Semester: semester 2**

Differential equations play a central role in mathematical sciences because they allow us to describe a wide variety of real-world systems and the mathematical techniques encountered in this module are useful to a number of later modules; this is why MATH201 is compulsory for a number of degree programmes. The module will aim to stress the importance of both theory and applications of ordinary differential equations (ODEs) and partial differential equations (PDEs), putting a strong emphasis on problem solving and examples. It has broadly 5 parts and each part contains two types of equations: those that can be solved by specific methods and others that cannot be solved but can only be studied to understand some properties of the underlying equations and their solutions. The main topics are first order ODEs, second order ODEs, systems of ODEs, first-order PDEs and some of the most well-known second-order PDEs, namely the wave, heat and Laplace equations.

## **METRIC SPACES AND CALCULUS (MATH242)**

**Credits: 15 / Semester: semester 2**

This is a foundational module aimed at providing the students with the basic concepts and techniques of modern real Analysis. The guiding idea will be to start using the powerful tools of analysis, familiar to the students from the first year module MATH101 (Calculus I) in the context of the real numbers, to vectors (multivariable analysis) and to functions (functional analysis). The notions of convergence and continuity will be reinterpreted in the more general setting of metric spaces. This will provide the language to prove several fundamental results that are in the basic toolkit of a mathematician, like the Picard Theorem on the existence and uniqueness of solutions to first order differential equations with an initial datum, and the implicit function theorem. The module is central for a curriculum in pure and applied mathematics, as familiarity with these notions will help students who want to take several other subsequent modules as well as many projects. This module is also a useful preparation (although not a formal prerequisite) for MATH365 Measure theory and probability, a very useful module for a deep understanding of financial mathematics.

## **FINANCIAL MATHEMATICS (MATH260)**

**Credits: 15 / Semester: semester 2**

Mathematical Finance uses mathematical methods to solve problems arising in finance. A common problem in Mathematical Finance is that of derivative pricing. In this module, after introducing the basic concepts in Financial Mathematics, we use some particular models for the dynamic of stock price to solve problems of pricing and hedging derivatives. This module is fundamental for students intending to work in financial institutions and/or doing an MSc in Financial Mathematics or related areas.

## **OPERATIONAL RESEARCH (MATH269)**

**Credits: 15 / Semester: semester 2**

The term "Operational Research" came in the 20th century from military operations. It describes mathematical methods to achieve the goal (or to find the best possible decision) having limited resources. This branch of applied mathematics makes use of and has stimulated the development of optimisation methods, typically for problems with constraints. This module can be interesting for any student doing mathematics because it concentrates on real-life problems.



## **SECURITIES MARKETS (ECON241)**

**Credits: 15 / Semester: semester 2**

This module seeks to provide students with an understanding of the role of securities markets in the global economy. This will be achieved through a presentation of their basic mechanisms and technical features, an explanation of the valuation of certain financial assets and an assessment of the operational and allocative efficiency of the markets. The module will be delivered via weekly small group face to face sessions and through weekly online lectures delivered asynchronously. Students will be directed to various media resources relevant to their day to day following and awareness of the activities of the global financial markets.

## **MATHEMATICAL ECONOMICS 2 (ECON211)**

**Credits: 15 / Semester: semester 1**

The aim of this module is to introduce students to the use of mathematical models in the study of Economics. This module builds on the material of the first year Mathematics and Economics modules and will deepen students' knowledge of mathematical techniques involved in Microeconomics and game theory. At the end of this course, students will have: A1. More advanced mathematical skills A2. Know how to use models to solve some economic problems using matrix and optimization.

## **MACROECONOMICS 2 (ECON224)**

**Credits: 15 / Semester: semester 1**

The aim of this module is to further extend the study of macroeconomics at intermediate level. The module follows a modern approach to macroeconomics by building macroeconomic models from microeconomic principles.

On completion of this module, students should be able to: 1) examine macroeconomic data and analyse macroeconomic events; 2) critically evaluate macroeconomic models, 3) build and solve micro-founded macroeconomic models; 4) explain the implications of shocks and evaluate the effects of fiscal and monetary policies using macroeconomic models.

## **NUMERICAL METHODS FOR APPLIED MATHEMATICS (MATH226)**

**Credits: 15 / Semester: semester 2**

Most problems in modern applied mathematics require the use of suitably designed numerical methods. Working exactly, we can often reduce a complicated problem to something more elementary, but this will often lead to integrals that cannot be evaluated using analytical methods or equations that are too complex to be solved by hand. Other problems involve the use of 'real world' data, which don't fit neatly into simple mathematical models. In both cases, we can make further progress using approximate methods. These usually require lengthy iterative processes that are tedious and error prone for humans (even with a calculator), but ideally suited to computers. The first few lectures of this module demonstrate how computer programs can be written to handle calculations of this type automatically. These ideas will be used throughout the module. We then investigate how errors propagate through numerical computations. The focus then shifts to numerical methods for finding roots, approximating integrals and interpolating data. In each case, we will examine the advantages and disadvantages of different approaches, in terms of accuracy and efficiency.

## **BECOMING ENTREPRENEURIAL (ULMS254)**

**Credits: 15 / Semester: semester 2**

This is a cross-disciplinary module focusing on the challenges of identifying, exploring, and implementing entrepreneurial opportunities that create and capture value. The module's broad spectrum provides students with a foundation in entrepreneurial thinking, allowing them to develop the skills and attributes needed whether to build their own start up from the ground up or add value within existing companies through entrepreneurial and innovation applications. Students will develop an entrepreneurial mindset through experiential learning and embeddedness in the entrepreneurship ecosystem through start-ups and industries engagement as well as the Brett Centre for Entrepreneurship Venture Creation Programme, in which every part of the business journey is covered from ideation to pitching to a panel of industry experts.

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## **YEAR THREE**

Year three optional modules: Choose 2 MATH modules and 2 ECON modules from each semester.

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## **OPTIONAL MODULES**

### **QUANTITATIVE FINANCIAL ECONOMICS (ECON308)**

**Credits: 15 / Semester: semester 1**

This module provides a broad introduction to essential topics in modern financial economics, which crucially includes decision-making under uncertainty, portfolio selection, pricing financial assets and state contingent claims, and forecasting asset returns and volatility from historical data. In addition to offering students necessary exposure to essential knowledge in the aforementioned topics, this module also aims to develop two essential analytical abilities, namely the ability to formulate real world decision problems into mathematically solvable optimization questions and the ability to solve formulated questions either analytically or numerically. Students will gain exposure to such knowledge and develop such analytical abilities from properly selected examples and problem sets to be discussed in lectures and tutorials.

### **GAME THEORY (ECON322)**

**Credits: 15 / Semester: semester 1**

The objective of this module is to provide an introduction to Game Theory. This is the study of strategic interactions i.e. situations where outcomes depend not only on our own actions but also on how others react to our actions. This module complements those in core macro and microeconomics and offers more insight into strategic business decisions and competitive behaviour in general. In particular, we will use game theory to study market competition, auctions, bargaining, signalling, etc.

### **INTERNATIONAL TRADE (ECON335)**

**Credits: 15 / Semester: semester 1**

This module aims to develop a good understanding of the main trade theories, their assumptions, implications, applications and limitations, and provide essential skills to students to engage in an analytical discussion of the impact of trade patterns, trade policies of government, foreign direct investment and World Trade Organisation on the economies of both developing and developed countries.

### **ADVANCED MICROECONOMICS (ECON342)**

**Credits: 15 / Semester: semester 1**

This is a third year advanced module in microeconomic theory focussed on the study of asymmetric information environments. In the seminar/tutorial students will be expected to present and discuss additional material as well as solve exercises.

## **APPLIED PROBABILITY (MATH362)**

**Credits: 15 / Semester: semester 1**

This module studies discrete-time Markov chains, as well as introducing the most basic continuous-time processes. The basic theory for these stochastic processes is considered in detail. This includes the Chapman Kolmogorov equation, communication of states, periodicity, recurrence and transience properties, asymptotic behaviour, limiting and stationary distributions, and an introduction to Poisson processes. Applications in different areas, in particular in insurance, are considered.

## **LINEAR STATISTICAL MODELS (MATH363)**

**Credits: 15 / Semester: semester 1**

This module extends earlier work on linear regression and analysis of variance, and then goes beyond these to generalised linear models. The module emphasises applications of statistical methods. Statistical software is used throughout as familiarity with its use is a valuable skill for those interested in a career in a statistical field.

## **PROFESSIONAL PROJECTS AND EMPLOYABILITY IN MATHEMATICS (MATH390)**

**Credits: 15 / Semester: semester 1**

This module gives the opportunity to further develop skills of mathematical problem solving and the application of mathematical results to real-world scenarios through group activities. The module aims to develop skills that are needed when undertaking employment or research, such as working in-depth on a problem over an extended period, writing reports, communicating mathematical results to different audiences and working in collaboration with others. This module will provide employability skills experiences and develop students' ability to articulate their skills, which will be useful to draw on when applying for jobs.

## **INDUSTRIAL ORGANISATION (ECON333)**

**Credits: 15 / Semester: semester 1**

Industrial organisation is concerned with the economic analysis of firms and industries, with a particular focus on how well consumers (society) are being served by particular industry structures and firm actions. The module incorporates debate between alternative schools of thought. The coursework is based on an industry case study selected by each student, which they research and which develops skills of independent research, writing, analysis and critical appraisal. In particular students are asked to evaluate which school of thought provides the most plausible interpretation of firm strategies and market outcomes.

## **THE ECONOMICS OF DEVELOPING COUNTRIES (ECON306)**

**Credits: 15 / Semester: semester 1**

This is an introductory module to the economics of international development. It introduces students to conceptual and methodological issues within international development and provides a solid grounding in various models of economic growth and development. It builds an understanding of various contemporary issues in this area and develops critical and analytical skills in analysing the problems of developing countries. From this perspective, it is designed to prepare students for a master's course in international development or to simply bring a critical understanding of issues of developing countries to their chosen field of work.

## **METHODS OF ECONOMIC INVESTIGATION 1: TIME SERIES ECONOMETRICS (ECON311)**

**Credits: 15 / Semester: semester 1**

This module aims to offer students the opportunity to learn basic econometric theories for time series analysis. The module will build upon the materials of ECON212 Basic Econometrics but make important extensions in order to model serial dependence in time series data. This module will introduce the classic ARIMA type of linear time series modelling framework and the classic ARCH/GARCH type conditional heteroskedasticity modelling framework as well as ARDL type multivariate time series model and cointegrated systems. Upon successful completion of this module, students should be able to apply these classic models to univariate and/or multivariate time series data for the purposes of, for example, producing economic/financial forecasts and/or investigating causal relationships between multiple economic/financial variables.

## **ADVANCED MACROECONOMICS (ECON343)**

**Credits: 15 / Semester: semester 1**

This module is designed for Economics students who wish to advance further their understanding of modern macroeconomic analysis. The module considers a number of macroeconomics topics at a more advanced level and in greater depth. Why do countries grow? What are the sources of recessions and booms? Why is there unemployment and what determines its extent? What are the sources of inflation? How do government policies affect output, unemployment, inflation and growth?

## **NUMERICAL METHODS FOR ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS (MATH336)**

**Credits: 15 / Semester: semester 2**

Many real-world systems in mathematics, physics and engineering can be described by differential equations. In rare cases these can be solved exactly by purely analytical methods, but much more often we can only solve the equations numerically, by reducing the problem to an iterative scheme that requires hundreds of steps. We will learn efficient methods for solving ODEs and PDEs on a computer.

## **COMBINATORICS (MATH344)**

**Credits: 15 / Semester: semester 2**

Combinatorics is a part of mathematics in which mathematicians deal with discrete and countable structures by means of various combinations, such as permutations, ordered and unordered selections, etc. The seemingly simple methods of combinatorics can raise highly non-trivial mathematical questions and lead to deep mathematical results, which are, in turn, closely related to some fundamental phenomena in number theory

## **APPLIED STOCHASTIC MODELS (MATH360)**

**Credits: 15 / Semester: semester 1**

Stochastic processes are ways of quantifying the dynamic relationships of sequences of random events. Stochastic models play an important role in elucidating many areas of the natural and engineering sciences. They can be used to analyse the variability inherent in biological and medical processes, to deal with uncertainties affecting managerial decisions and with the complexities of psychological and social interactions, and to provide new perspectives, methodology, models and intuition to aid in other mathematical and statistical studies. This module is intended as a beginning course in introducing continuous-time stochastic processes for students familiar with elementary probability. The objectives are: (1) to introduce students to the standard concepts and methods of stochastic modelling; (2) to illustrate the rich diversity of applications of stochastic processes in the science; and (3) to provide exercises in the applications of simple stochastic analysis to appropriate problems.

## **THEORY OF STATISTICAL INFERENCE (MATH361)**

**Credits: 15 / Semester: semester 1**

This module introduces fundamental topics in mathematical statistics, including the theory of point estimation and hypothesis testing. Several key concepts of statistics are discussed, such as sufficiency, completeness, etc., introduced from the 1920s by major contributors to modern statistics such as Fisher, Neyman, Lehmann and so on. This module is absolutely necessary preparation for postgraduate studies in statistics and closely related subjects.

## **MEDICAL STATISTICS (MATH364)**

**Credits: 15 / Semester: semester 2**

In recent years a culture of evidence-based practice has become the norm in the medical profession. Central to this is the medical statistician, who is required to not only analyse data, but to design research studies and interpret the results. The aim of MATH364 is to provide the student with the knowledge to become part of a "team" to enhance and improve medical practice. This is done by demonstrating the design of studies, methods of analysis and interpretation of results through a number of real-world examples, covering epidemiology, survival analysis, clinical trials and meta-analysis.

## **MEASURE THEORY AND PROBABILITY (MATH365)**

**Credits: 15 / Semester: semester 1**

This module is important for students who are interested in the abstract theory of integrating and in the deep theoretical background of the probability theory. It will be extremely useful for those who plan to do MSc and perhaps PhD in Probability, including financial applications. If you plan to take level 4 module(s) on Financial Mathematics next year, MATH365 can be very helpful.

## **MATHEMATICAL RISK THEORY (MATH366)**

**Credits: 15 / Semester: semester 2**

To provide an understanding of the mathematical risk theory used in practise in non-life actuarial depts of insurance firms, to provide an introduction to mathematical methods for managing the risk in insurance and finance (calculation of risk measures/quantities), to develop skills of calculating the ruin probability and the total claim amount distribution in some non - life actuarial risk models with applications to insurance industry, to prepare the students adequately and to develop their skills in order to be exempted for the exams of CT6 subject of the Institute of Actuaries (MATH366 covers 50% of CT6 in much more depth).

## **NETWORKS IN THEORY AND PRACTICE (MATH367)**

**Credits: 15 / Semester: semester 1**

MATH367 aims to develop an appreciation of optimisation methods for real-world problems using fundamental tools from network theory; to study a range of 'standard problems' and techniques for solving them. Thus, network flow, shortest path problem, transport problem, assignment problem, and routing problem are some of the problems that are considered in the syllabus. MATH367 is a decision making module, which fits well to those who are interested in receiving knowledge in graph theory, in operational research, in economics, in logistics and in finance.

## **FINANCIAL REPORTING AND FINANCE (NON-SPECIALIST) (ACFI290)**

**Credits: 15 / Semester: semester 1**

This module is a non-specialist introduction into the field of accounting and finance. The module aims to give students basic knowledge and skills in a range of financial accounting areas covering 4 main topics – financial reporting and analysis looking at the creation and understanding of financial statements and how to interpret the numbers included in such statements; taxation looking at basic tax calculations covering personal income tax, corporation tax and capital gains tax, along with understanding the tax system in place in the UK; managerial accounting looking at decision making based on financial data; and financial instruments and looking at financial institutions and how businesses can raise finance. Successful students will obtain a good knowledge of basic accounting techniques, the ability to perform accounting calculations and the ability to interpret and understand key financial statements and how to use them in a business scenario. Such skills are essential in the business world and offer students a good foundation on which to build if they are interested in further accounting or business modules. The module is delivered through interactive lectures and seminars involving a high level of question practice with discussion on key topics. It is assessed through a 100% exam. There will be a practice test in Week7 of the Semester.

## **ENVIRONMENTAL ECONOMICS AND SUSTAINABILITY POLICIES (ECON315)**

**Credits: 15 / Semester: semester 1**

This module introduces the main insights of environmental and ecological economics and discusses the development of sustainability policies. The interrelated nature of environmental, social, and economic systems is analysed together with the main theories and tools used to address some of the main sustainability constraints of the 21st century. The analysis of the mutual dependencies existing between the human and the ecological systems, together with the limits imposed by the natural resources constraints allows students to gain a critical understanding of the socio-environmental implications of economic activities.

Given the increasing demand for professionals able to use interdisciplinary perspectives for the resolution of real-world problems, the module will complement and integrate the critical abilities developed during the previous years of studies towards this aim.

## **STATISTICAL METHODS IN INSURANCE AND FINANCE (MATH374)**

**Credits: 15 / Semester: semester 1**

This module covers the application of statistical methodologies and technique into actuarial sets of data. This module can contribute to getting CS1 and CS2 exemptions by The Institute and Faculty of Actuaries.



## **ACTUARIAL MODELS (MATH376)**

**Credits: 15 / Semester: semester 2**

1. Be able to understand the differences between stochastic and deterministic modelling.
2. Explain the need of stochastic processes to model the actuarial data
3. Be able to perform model selection depending on the outcome from a model.
4. Prepare the students adequately and to develop their skills in order to be ready to sit for the exams of CT4 subject of the Institute of Actuaries.

## **FINANCIAL AND ACTUARIAL MODELLING IN R (MATH377)**

**Credits: 15 / Semester: semester 2**

This module focuses on the applications of actuarial and financial mathematics using the programming language R. It provides the students with an introduction to the basic principles of programming in R. Students will practice various computational aspects of actuarial science and finance. The module focuses on the implementation of the theoretical models, learned in other modules, using R code. Students will develop a background in the practical applications of Statistics, Reserving, Portfolio management, Option pricing, and others. This module will enhance the employability skills for students in Financial and Actuarial Mathematics.

## **MATHEMATICS OF NETWORKS AND EPIDEMICS (MATH338)**

**Credits: 15 / Semester: semester 2**

Networks are familiar to us from many real-world systems such as the internet, power grids, transportation and biological networks. The underpinning mathematical concept is called a graph and it is no surprise that the same issues arise in each area, whether this is to identify the most important or influential individuals in the network, or to prevent dynamics on the network (e.g. epidemics) or to make the network robust to the dynamics it supports (e.g. power grids and transportation). In this module, we learn about different classes of networks and how to quantify and describe them including their structures and their nodes. Much of our detailed understanding of networks and their features will come from analysis of idealised random networks which nevertheless are often good representations of those seen in the real world. We will consider real-world biological applications of network theory, in particular focusing on epidemics.

## **MATHS SUMMER INDUSTRIAL RESEARCH PROJECT (MATH391)**

**Credits: 15 / Semester: semester 1, summer**

The research internship module is designed to give students the experience of working in a research environment or setting that is quite different from any project work that they undertake in the Department of Mathematics. It should provide an insight into how students may apply skills and experiences later in their career; whether working abroad, in industry or in a scientific setting.

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## **HOW YOU'LL LEARN**

Your learning activities will consist of lectures, tutorials, practical classes, problem classes, private study and supervised project work.

In year one, lectures are supplemented by a thorough system of group tutorials and computing work is carried out in supervised practical classes. Key study skills, presentation skills and group work start in first-year tutorials and are developed later in the programme.

The emphasis in most modules is on the development of problem solving skills, which are regarded very highly by employers. Project supervision is on a one-to-one basis, apart from group projects in year two.

## **HOW YOU'RE ASSESSED**

Most modules are assessed by a two and a half hour examination in January or May, but many have an element of coursework assessment. This might be through homework, class tests, mini-project work or key skills exercises.

## **LIVERPOOL HALLMARKS**

We have a distinctive approach to education, the Liverpool Curriculum Framework, which focuses on research-connected teaching, active learning, and authentic assessment to ensure our students graduate as digitally fluent and confident global citizens.

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# Careers and employability

A mathematically-based degree opens up a wide range of career opportunities, including some of the most lucrative professions.

Recent employers of our graduates are:

- Barclays Bank plc
- Deloitte
- Forrest Recruitment
- Marks and Spencer
- Mercer Human Resource Consulting Ltd.
- Venture Marketing Group.
- BAE Systems
- BT
- Guardian Media Group
- Royal Bank of Scotland
- Siemens
- Unilever.

**87.5%** OF MATHEMATICAL SCIENCES GRADUATES GO ON TO WORK OR FURTHER STUDY WITHIN 15 MONTHS OF GRADUATION.

*Discover Uni, 2018-19.*

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# Fees and funding

Your tuition fees, funding your studies, and other costs to consider.

## TUITION FEES

<b>UK fees (applies to Channel Islands, Isle of Man and Republic of Ireland)</b>	
Full-time place, per year	£9,250
Year in industry fee	£1,850
Year abroad fee	£1,385

<b>International fees</b>	
Full-time place, per year	£24,800
Year abroad fee	£12,400

*Fees shown are for the academic year 2024/25. Please note that the Year Abroad fee also applies to the Year in China.*

Tuition fees cover the cost of your teaching and assessment, operating facilities such as libraries, IT equipment, and access to academic and personal support. [Learn more about paying for your studies.](#)

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## ADDITIONAL COSTS

We understand that budgeting for your time at university is important, and we want to make sure you understand any course-related costs that are not covered by your tuition fee. This could include buying a laptop, books, or stationery.

Find out more about the [additional study costs](#) that may apply to this course.

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## SCHOLARSHIPS AND BURSARIES

We offer a range of scholarships and bursaries that could help pay your tuition and living expenses.

We've set the country or region your qualifications are from as United Kingdom. [Change it here](#)

- 
- RIGBY ENTERPRISE AWARD**

- [Home students](#)

- [Are you a UK student with a household income of £25,000 or less? If you've participated in an eligible outreach programme, you could be eligible to apply for a Rigby Enterprise Award worth £5,000 per year for three years of your undergraduate degree.](#)

- 
- THE LIVERPOOL BURSARY**

- [Home students](#)

- [If you're a UK student joining an undergraduate degree and have a household income below £35,000, you could be eligible for a Liverpool Bursary worth up to £2,000 for each year of undergraduate study.](#)

- 
- ASYLUM SEEKERS SCHOLARSHIP**

- [Home students](#)

- [Apply for an Asylum Seekers Scholarship and you could have your tuition fees paid in full and receive help with study costs. You'll need to have applied for asylum in the UK, or be the dependant of an asylum seeker, and be joining an eligible undergraduate degree.](#)

- 
- CARE LEAVERS' OPPORTUNITY BURSARY**

- [Home students](#)

- [If you've spent 13 or more weeks in Local Authority care since age 14, you could be eligible for a bursary of £3,000 per year of study. You'll need to be a UK student joining an eligible undergraduate degree and be aged 28 or above on 1 September in the year you start.](#)

- 
- COWRIE FOUNDATION SCHOLARSHIP**

- [Home students](#)

- [Are you a UK student with a Black African or Caribbean heritage and a household income of £25,000 or less? You could be eligible to apply for a Cowrie Foundation Scholarship worth up to £8,000 for each year of undergraduate study.](#)

- 
- ESTRANGED STUDENTS BURSARY**

- [Home students](#)

- [If you're a UK student identified as estranged by Student Finance England \(or the equivalent UK funding body\), you could be eligible for a bursary of £1,000 for each year of undergraduate study.](#)

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## **GENESYS LIFE SCIENCES SCHOLARSHIP**

- Home students

Joining a School of Biosciences degree and have a household income of less than £25,000? If you're a UK student, you could apply to receive £4,500 per year for three years of your undergraduate course.

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## **GRADUATE ASSOCIATION HONG KONG & TUNG UNDERGRADUATE SCHOLARSHIPS**

- International students

- Hong Kong

If you're an undergraduate student from Hong Kong who can demonstrate academic excellence, you may be eligible to apply for a scholarship worth £10,000 in partnership with the Tung Foundation.

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## **NOLAN SCHOLARSHIPS**

- Home students

Do you live in the Liverpool City Region with a household income of £25,000 or less? Did neither of your parents attend University? You could be eligible to apply for a Nolan Scholarship worth £5,000 per year for three years of undergraduate study.

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## **ROLABOTIC SCHOLARSHIP**

- Home students

Are you a UK student with a household income of £25,000 or less? Did neither of your parents attend University? You could be eligible to apply for a ROLABOTIC Scholarship worth £4,500 for each year of your undergraduate degree.

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## **SPORT LIVERPOOL PERFORMANCE PROGRAMME**

- Home and international students

Apply to receive tailored training support to enhance your sporting performance. Our athlete support package includes a range of benefits, from bespoke strength and conditioning training to physiotherapy sessions and one-to-one nutritional advice.

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## **TECHNETIX BROADHURST ENGINEERING SCHOLARSHIP**

- Home students

Joining a degree in the School of Electrical Engineering, Electronics and Computer Science? If you're a UK student with household income below £25,000, you could be eligible to apply for £5,000 a year for three years of study. Two awards will be available per academic year.

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## **UNDERGRADUATE GLOBAL ADVANCEMENT SCHOLARSHIP**

- [International students](#)

[If you're a high-achieving international student starting an undergraduate degree with us from September 2024, you could be eligible to receive a fee discount of up to £5,000. You'll need to achieve grades equivalent to AAA in A levels and be joining a non-clinical degree.](#)



## **[UNIVERSITY OF LIVERPOOL INTERNATIONAL COLLEGE EXCELLENCE](#)**

### **[SCHOLARSHIP](#)**

- [International students](#)

[Completed a Foundation Certificate at University of Liverpool International College \(UoLIC\)? We're offering a £5,000 fee discount off the first year of undergraduate study to some of the highest achieving students joining one of our non-clinical degrees from UoLIC.](#)



## **[UNIVERSITY OF LIVERPOOL INTERNATIONAL COLLEGE FIRST CLASS](#)**

### **[SCHOLARSHIP](#)**

- [International students](#)

[We're offering a £1,000 fee discount for years 2 and 3 of undergraduate study to eligible students progressing from University of Liverpool International College. You'll need to be studying a non-clinical subject and get an average of 70% or above in year 1 of your degree.](#)



## **[UNIVERSITY OF LIVERPOOL INTERNATIONAL COLLEGE IMPACT](#)**

### **[PROGRESSION SCHOLARSHIPS](#)**

- [International students](#)

[If you're a University of Liverpool International College student awarded a Kaplan Impact Scholarship, we'll also consider you for an Impact Progression Scholarship. If selected, you'll receive a £3,000 fee discount off the first year of your undergraduate degree.](#)



## **[YOUNG ADULT CARER'S \(YAC\) BURSARY](#)**

- [Home students](#)

[If you're a young adult and a registered carer in the UK, you might be eligible for a £1,000 bursary for each year of study. You'll need to be aged 18-25 on 1 September in the year you start your undergraduate degree.](#)



# Entry requirements

The qualifications and exam results you'll need to apply for this course.

Your qualification	Requirements <a href="#">About our typical entry requirements</a>
A levels	<p>ABB</p> <p>Applicants with the Extended Project Qualification (EPQ) are eligible for a reduction in grade requirements. For this course, the offer is <b>ABC</b> with <b>A</b> in the EPQ.</p> <p>You may automatically qualify for reduced entry requirements through our <a href="#">contextual offers scheme</a>.</p> <p>If you don't meet the entry requirements, you may be able to complete a foundation year which would allow you to progress to this course.</p> <p>Available foundation years:</p> <ul style="list-style-type: none"><li>• <a href="#">Mathematical Sciences BSc (Hons) (Foundation, 4 year route with Carmel College)</a>_BSc (Hons)</li></ul>
GCSE	4/C in English and 4/C in Mathematics
Subject requirements	<p>Applicants must have studied Mathematics at Level 3 within 2 years of the start date of their course.</p> <p>For applicants from England: For science A levels that include the separately graded practical endorsement, a "Pass" is required.</p>
BTEC Level 3 National Extended Diploma	D*DD in relevant diploma when combined with A level Mathematics grade A
International Baccalaureate	33 including 6 in Higher Mathematics.
Irish Leaving	H1, H2, H2, H2, H3, H3 including Mathematics at H1.



<b>Your qualification</b>	<b>Requirements</b> <a href="#">About our typical entry requirements</a>
Certificate	
Scottish Higher/Advanced Higher	Advanced Highers accepted at grades ABB including grade A in Mathematics.
Welsh Baccalaureate Advanced	Acceptable at grade B or above alongside AB at A level including grade A in Mathematics.
Access	Access - 45 Level 3 credits in graded units in a relevant Diploma, including 39 at Distinction and a further 6 with at least Merit. 15 Distinctions are required in Mathematics.
International qualifications	Many countries have a different education system to that of the UK, meaning your qualifications may not meet our entry requirements. Completing your Foundation Certificate, such as that offered by the <a href="#">University of Liverpool International College</a> , means you're guaranteed a place on your chosen course.

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## ALTERNATIVE ENTRY REQUIREMENTS

- If your qualification isn't listed here, or you're taking a combination of qualifications, [contact us](#) for advice
  - [Applications from mature students](#) are welcome.
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**THE ORIGINAL**

**REDBRICK**

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