Mathematical Sciences

2+2
Why choose the 2+2 at the University of Liverpool?

Our story began in 1881... The University of Liverpool became one of the first civic universities. The original redbrick.

Nearly 140 years later, we are still as original as ever - offering different viewpoints and daring ideas. Unique perspectives and a city bursting with character. We are uncovering world firsts through our pioneering research and helping you to forge your own original path to success. Studying in Liverpool will provide you with an amazing, life-changing university experience that will help you to achieve your ambitions.

Internationally recognised
- Ranked 181st in the QS World University Rankings (2021)
- Ranked 101-150 in the Academic Ranking World Universities (2021)
- 20th in the UK for research power with 7 subjects ranked in the top 10 in the UK's Research Excellence Framework (both Chemistry and Computer Science ranked #1 in the UK for 4* & 3* research THE 2014).

Benefits of studying in the UK
- Develop communication skills, flexibility, adaptability, empathy and a global outlook – attributes which are highly sought by employers
- You may not need to take an IELTS when applying for postgraduate study at some universities in the UK
- Opportunity to explore the UK and Europe.

Graduate outcomes for 2+2 students
- 87% of all 2+2 graduates in Liverpool achieved a 1st or 2:1 upon graduation
- 80% of 2+2 graduates in Liverpool who were in further study after graduating from the University of Liverpool were enrolled in QS Top 100 Universities (DHLE 2020, University of Liverpool analysis of unpublished data)
- One of the top 25 UK universities targeted by leading graduate employers (High Fliers 2020).

Support services
- Happy students are successful students. In order to help you achieve your ambitions, the University of Liverpool has a wide range of services to support you throughout your studies, including:
  - Academic advisors
  - International advice and guidance
  - English Language Centre
  - Careers Studio
  - Student services (Health, Counselling, etc)
  - Guild of Students
  - Sports and Fitness Centre
  - Libraries
  - On-campus accommodation.

The university offers great facilities, the 24-hour library, informational Career Centre and the gym. The campus is a very friendly, passionate place with a good balance of studying and socialising.

Siqi Li
2+2 alumna in Communication and Media
Mathematical Sciences at Liverpool

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.

Take the first steps towards a brilliant career
Employers tell us that, alongside key problem solving skills, they want strong communication skills and the ability to work in a team, so we have ensured that these are integral to our mathematics programmes. As a result, we have an excellent graduate employment record. About a third of graduates become business and finance professionals; but there is a whole host of other careers which our graduates have found success in such as management training, information technology, further education or training (including teacher training), scientific research and development, and many more.

Shape your own degree from our wide range of study options
Our modules range from financial mathematics to fluid mechanics, from chaos to combinatorics. Students have the opportunity to study a broad range of topics or specialise in areas of interest.

Fulfil your potential in a supported environment
Our students benefit from the peer-assisted study scheme, where students assist first years with maths problems, as well as small first-year tutorial groups, a Department common room and a lively maths society help to foster a friendly and supportive environment. We are also proud of our record on teaching quality, with six members of the Department having received the prestigious Sir Alastair Pilkington Award for Teaching, the University’s top accolade for teaching quality.

Languages at Liverpool
Studying a programme within Mathematical Sciences allows you to study a language as an extracurricular course, on top of your degree. See liverpool.ac.uk/languages for more information.

STAFF PROFILE
Dr Linglong Yuan
Dr Linglong Yuan is a lecturer in Mathematical Sciences. In addition to teaching modules such as Statistics and Probability, Dr Yuan is the Mathematics Link Tutor for XJTU. Dr Yuan is a member of the Stochastics research group and has published articles in Journal of Statistical Physics and Journal of Applied Probability, among others.

How you learn
Your learning activities will consist of lectures, tutorials, practical classes, problem classes, private study and supervised project work. Key study skills and group work are developed in the programme. The emphasis in most modules is on the development of problem solving skills, which are regarded very highly by employers.

Most modules are assessed by examinations 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.

The most enjoyable thing about my course and studying at UoL must be my kind teachers. The teachers of all my courses are enthusiastic about my studying and willing to respond to any of my questions no matter how busy they are in their research. Also, teachers reply to the questions on the Discussion Board very quickly.

Baicheng Liu, 2+2 student in Mathematics with Finance BSc

96% are employed or in further study six months after graduation (DLHE 2016/17).

96% of our teaching evaluated as ‘excellent’ by the Quality Assurance Agency in its most recent survey.

92% of our research impact is either ‘world-leading’ or ‘internationally excellent’ (latest REF results, 2014).

We offer accredited programmes.

We offer the chance to study a language.

Mathematical Sciences
liverpool.ac.uk/mathematical-sciences

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We offer the chance to study a language.
Invest in your future

A mathematically-based degree opens up a wide range of career opportunities, including some of the most lucrative professions. Typical types of work our graduates have gone onto include as an actuarial trainee analyst in the audit practice, a graduate management trainee risk analyst and as a trainee chartered accountant on a graduate business programme. Employers value mathematicians’ high level of numeracy and problem solving skills. Financial rewards are impressive, as maths graduates have the third highest ‘graduate premium’ of all subject areas.

Recent employers of our graduates
- Aston University
- Baker Tilly
- Barclays Bank plc
- Deloitte
- EuroMoney Training
- Forrest Recruitment
- Hallidays Chartered Accountants
- Marks and Spencer
- Mercer Human Resource Consulting Ltd
- Mitchell Charlesworth
- Norwich Union
- Transmission Marketing Ltd
- Venture Marketing Group
- Wilson Henry Partnership
- Wolsley Group.

STAFF PROFILE
Professor Corina Constantinescu-Loeffen

Professor Constantinescu is a Professor of Mathematics and the Director of the Institute for Financial and Actuarial Mathematics, in the Mathematical Sciences department of the University of Liverpool.

She has recently coordinated a large European grant under the Marie Curie framework, on Risk Analysis, Ruin and Extremes (RARE), that connected 12 higher education institutions and over 60 researchers from all over the world working on extreme events and their applications to insurance modelling.

Prior to being an academic, she worked as an actuary and led the life insurance department of one of the first private Romanian insurance companies.

Mathematics BSc (Hons)

Studying Mathematics provides an excellent foundation for a wide range of careers.

Programme in detail
In the first year of the programme in Liverpool, you will study a range of topics covering important areas of both pure and applied mathematics. We have accreditation from the Institute of Mathematics and its Applications and from the Royal Statistical Society.

See pages 08-10 for module descriptions.

Actuarial Mathematics BSc (Hons)

This is one of our most popular degree programmes with great employment potential.

The programme is designed primarily for those who wish to work in finance, insurance or banking after graduation. We have accreditation from the Institute and Faculty of Actuaries, from the Institute of Mathematics and its Applications and from the Royal Statistical Society. Currently, our students can receive exemptions for CM2, CS1 and CS2 from IFoA of the professional actuarial exams.

Programme in detail
Actuarial mathematics prepares students to be professionals who use mathematical models to analyse and solve financial problems under uncertainty. Actuaries are experts in the design, financing and operation of insurance plans, annuities, and pension or other employee benefit plans.

In your final year, you will cover some specialised work in advanced actuarial and financial mathematics. Subsequently, you start to study more advanced ideas in probability theory and statistics as well as stochastic modelling, econometrics and finance.

This programme is designed to prepare you for a career in the banking sector, pension or investment funds, hedge funds, consultancy and auditing firms or government regulators. The course prepares students to be professionals who use mathematical models to analyse and solve financial problems

See pages 08-10 for module descriptions.

In our programmes, there is a wide range of modules. Each year you will take the equivalent of eight modules. Please note that we regularly review our teaching so the choice of modules may change.

Articulation routes

Mathematics with Finance BSc (Hons)

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Explores, from a game-theoretic point of view, models which have been used to understand the movement of cells within complex environments. Furthermore, she has significant expertise working directly with models bridging spatial and temporal scales to make biological predictions concerning the movement of cells within complex environments.

Professor Bearon received her Master of Arts and PhD in Mathematics from the University of Cambridge. She leads the mathematical biology research group and is responsible for User Engagement at the Liverpool Centre of Mathematics for Healthcare (LCMH). She has extensive experience of developing models bridging spatial and temporal scales to make biological predictions concerning the movement of cells within complex environments. Furthermore, she has significant expertise working directly with experimental biologists to develop novel frameworks for processing and integrating imaging data.

Please note: modules are illustrative only and subject to change.
## Selected modules overview Year Three (continued)

<table>
<thead>
<tr>
<th>Module title</th>
<th>Module description</th>
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<tbody>
<tr>
<td>Networks for mathematical biology MATH338</td>
<td>Provides a discussion of networks as they occur in the real world and develops mathematical techniques to analyse them.</td>
</tr>
<tr>
<td>Networks in theory and practice MATH367</td>
<td>Develops an appreciation of network models for real world problems.</td>
</tr>
<tr>
<td>Number theory MATH342</td>
<td>Gives an account of elementary number theory with use of certain algebraic methods and to apply the concepts to problem solving.</td>
</tr>
<tr>
<td>Numerical methods for PDEs MATH336</td>
<td>Introduces techniques for finding approximate solutions to differential equations that cannot be solved exactly, which can be used for modelling many phenomena in physics and engineering. Short computer programs will be developed to solve a range of practical problems.</td>
</tr>
<tr>
<td>Operational research MATH367</td>
<td>Introduces the theory of multi-objective and constrained optimisation as well as the elementary optimal control theory.</td>
</tr>
<tr>
<td>Professional projects and employability in mathematics MATH390</td>
<td>The aim of this module is to further develop students' problem solving abilities and their ability to select techniques and apply mathematical knowledge to authentic work-style situations. You will develop your ability to communicate mathematical results to audiences of differing technical ability, including other mathematicians, business clients and the general public.</td>
</tr>
<tr>
<td>Quantum mechanics MATH325</td>
<td>Develops an understanding of the way that relatively simple mathematics (in modern terms) led Bohr, Einstein, Heisenberg and others to a radical change and improvement in our understanding of the microscopic world.</td>
</tr>
<tr>
<td>Relativity MATH326</td>
<td>Explores the physical principles behind special and general relativity and their main consequence.</td>
</tr>
<tr>
<td>Statistical methods in actuarial science MATH374</td>
<td>Covers the application of statistical methodologies and techniques into actuarial sets of data.</td>
</tr>
<tr>
<td>Statistical physics MATH327</td>
<td>Introduces the foundations of statistical physics and develops an understanding of the stochastic roots of thermodynamics and the sometimes illusive properties of matter.</td>
</tr>
<tr>
<td>Stochastic modelling in insurance and finance MATH375</td>
<td>Explores stochastic modelling and its applications in different actuarial/financial problems.</td>
</tr>
<tr>
<td>Stochastic theory and methods in data science MATH368</td>
<td>Use of probability theory and stochastic methods in two ways: by studying models and by using data.</td>
</tr>
<tr>
<td>Summer industrial research project MATH391</td>
<td>Provides an opportunity to carry out a mathematical investigation of problems in communication with an industrial partner.</td>
</tr>
<tr>
<td>Topology MATH346</td>
<td>Introduces topological spaces through a wide range of examples and explores their basic properties, cumulating in a discussion of the fundamental group of a space.</td>
</tr>
</tbody>
</table>

Please note: modules are illustrative only and subject to change.

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## Support in the School of Physical Sciences and next steps

As a Mathematics student, you will be a part of the School of Physical Sciences. Within the School of Physical Sciences, you will find a dedicated student support team, offering guidance and advice all the way from enrolment through to your graduation.

As a mathematics student, your first point of contact within the department is your Academic Adviser, who is supported by the student experience team. Programme Directors provide support in your choice of modules, and oversee your programme of study, whilst the Chair of the Board of Studies, Senior Tutor and Disability Support Coordinator can provide additional advice and signpost further support in complex academic or challenging personal situations.

The Mathematics Student Support Office houses a dedicated student experience team who offer a point of contact, support and general advice to all Mathematical Sciences students.

Lecturers run a range of teaching activities for each module, supported by graduate student Teaching Assistants. Your peers will also provide valuable support throughout your study, and we run a Learning Assistant scheme across several second-year modules whereby third year students support the delivery of interactive learning and teaching sessions.

Extra-curricular activities are arranged by academic staff and students, including prestigious lectures (e.g. 2019 Barkla lecture featured Nobel Prize winner Didier Queloz), employability & careers events, and internship opportunities.

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### Steps for registration

You will be able to register for optional modules prior to your arrival in Liverpool. You will receive instructions by email in late August or early September on how register via Liverpool Life, the University’s information portal for current students.

I’ve really experienced critical thinking and creativity thinking. I found this education system is based on understanding, deriving and performing rather than just memorising. In order to get even closer to this sense of thinking, I decided to take part in the 2+2 programme. The University of Liverpool can help me in developing my logical mind and make me a sensational person instead of a ‘memorizing master’.

Jinyang Wang, 2+2 student in Mathematics with Finance BSc