UNIVERSITY OF LIVERPOOL

MSc

Theoretical Computer Science

Study mode	Duration	
Full-time	12 months	Apply by: **11 September 2026**
Part-time	24 months	Starts on: **28 September 2026**

About this course

Explore the world of computational game theory, where computer science and economics collide, and receive a grounding in algorithmic techniques and optimisation methods and models on this MSc. You'll develop a toolkit of analytical skills and have opportunities to specialise in areas such as microeconomics, e-commerce and data mining.

Introduction

This MSc immerses you in theoretical computer science, with a particular focus on computational game theory, where computer science and economics intersect. This is an area of rapid growth where skilled professionals are in high demand.

Based in the School of Computer Science & Informatics, you'll learn from leading academic experts and find a culture of research excellence with close links to industry. We'll augment and enrich your knowledge with specialist analytical tools and develop your ability to identify and execute creative solutions to practical problems.

You'll receive a comprehensive introduction to computational game theory and focus on algorithmic aspects of game theory in depth. Exploring the computational aspects of the

design of mechanisms and auctions, you'll also examine optimisation methods and their application to various optimisation models.

Optional modules include opportunities to work with large datasets, specialise in the design and analysis of algorithms, discover the essentials of microeconomic theory, or investigate e-commerce technologies.

We'll prepare you for an independent research project, where you'll plan and conduct research and analyse your findings, by equipping you with all the skills you'll need to conduct research in computer science.

Who is this course for?

This MSc is aimed principally at graduates who either plan to become high-profile professionals working in the IT industry or those who plan to continue to a research degree in this cutting-edge research area. This programme may also be appropriate for those professionals who are already in IT-related employment and wish to broaden and deepen their knowledge.

What you'll learn

- An understanding of the notion of a game, its solutions, concepts and applications
- Algorithmic aspects of game theory
- How computational game theory, computer science and economics intersect
- Contemporary application of algorithmic paradigms
- How to model continuous and discrete optimisation problems
- Key research methods in computer science
- How to design and analyse advanced discrete algorithms
- Essentials of microeconomic theory
- An understanding of all aspects of software safety and dependability
- Research issues in data mining
- Privacy, security, encryption and other technologies behind e-commerce

Accreditation

This programme is pending accreditation by BCS, The Chartered Institute for IT.

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Course content

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

Semester one

In Semester one, you'll study three compulsory taught modules and one optional taught module.

You'll choose an additional optional module in place of COMP323 Introduction to Computational Game Theory if you previously studied this module on your undergraduate degree.

Modules

Compulsory modules	Credits
INTRODUCTION TO COMPUTATIONAL GAME THEORY (COMP323)	15
OPTIMISATION (COMP557)	15
RESEARCH METHODS IN COMPUTER SCIENCE (COMP516)	15

Optional modules	Credits
EFFICIENT ALGORITHMS (COMP526)	15
KNOWLEDGE REPRESENTATION (COMP521)	15
MICROECONOMIC ANALYSIS (ECON915)	15

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

Semester two

In Semester two, you'll study one compulsory module and three optional modules.

It's only possible to select a maximum of one of modules COMP310 Multi-Agent Systems and COMP315 Technologies for E-Commerce unless you selected an alternative to COMP323 Introduction to Computational Game Theory in semester one. You will not be able to select these optional semester two modules if you previously studied them on your undergraduate degree.

Modules

Compulsory modules	Credits
ALGORITHMIC GAME THEORY (COMP559)	15

Optional modules	Credits
ADVANCED ALGORITHMIC TECHNIQUES (COMP523)	15
ADVANCES IN THEORETICAL COMPUTER SCIENCE (COMP555)	15
COMPUTATIONAL INTELLIGENCE (COMP575)	15
DATA MINING AND VISUALISATION (COMP527)	15
MULTI-AGENT SYSTEMS (COMP310)	15
SAFETY AND DEPENDABILITY (COMP524)	15
MSC GROUP PROJECT (COMP530)	15
CLOUD COMPUTING FOR E-COMMERCE (COMP315)	15

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

Final project

Your final project, undertaken over the summer, will give you the opportunity to work independently to explore a substantial problem in depth, making practical use of principles, techniques and methodologies you have acquired during the programme.

You'll create a proposal, deliver a presentation with a Q&A, and submit a final dissertation.

Modules

Compulsory modules	Credits
MSC PROJECT (COMP702)	60

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

Teaching and assessment

How you'll learn

Teaching comprises formal lectures, small group tutorials and practical sessions in computer laboratories. You may also take part in one or more group projects. In addition, you complete an individual project under academic supervision.

How you're assessed

Taught modules are assessed through a combination of examinations and coursework. You'll sit examinations at the end of each semester, which are typically in-person written assessments, usually completed over 2 or 2.5 hours. You will complete coursework throughout the semester, typically class tests, programming assignments or small projects.

For your final project, you will create a proposal, deliver a presentation with a Q&A, and submit a final dissertation, all of which will be assessed.

Liverpool Learning Framework

At Liverpool, we take a distinctive approach to education through the Liverpool Learning Framework. This means teaching that is engaging, inclusive and designed to help you succeed during your studies and beyond.

You'll develop specialist subject knowledge alongside the skills employers value most, including:

- Digital fluency
- Confidence
- Global citizenship

Our curriculum is characterised by the three Liverpool Hallmarks:

- Research-connected teaching - learning informed by the latest ideas and discoveries
- Active learning - taking part, applying knowledge and learning by doing
- Authentic assessment - assessments designed around real-world tasks and challenges

We also embed key priorities across our curriculum, including AI literacy, employability, and sustainability, helping you prepare for the future and make a positive impact in the world.

We're committed to creating a supportive and inclusive learning environment where every student can thrive.

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Careers and employability

This MSc equips you with an in-depth understanding of theoretical computer science. There is particular focus on computational game theory, a subject at the intersection of computer science and economics, which has seen a rapid growth in recent years. There is a significant skills shortage in this area and high demand for skilled professionals.

Whether you're a recent graduate seeking a career in the IT industry, plan to continue your studies and pursue a research degree, or you're already an IT professional in related employment, this programme will enhance your knowledge and immerse you in current developments.

We'll prepare you for senior technical and managerial positions in the profession, as well as providing a strong foundation for potential PhD research.

Previous graduates have progressed into a variety of roles which include:

- IT consultant
- Enterprise risk consultant
- Network optimisation engineer
- Data analyst
- Information analyst
- Business analyst
- IT implementation and support analyst
- Customer service adviser
- Software developer
- Software engineer
- Sales and marketing
- Search engine optimisation (SEO) specialist.

Many of our graduates also choose to continue their studies and embark on PhD research.

Career support from day one to graduation and beyond

Career planning

From education to employment

Networking events

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Fees and funding

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

Tuition fees

UK fees (applies to Channel Islands, Isle of Man and Republic of Ireland)

Full-time place, per year - £14,000
Part-time place, per year - £7,000

International fees

Full-time place, per year - £34,000
Part-time place, per year - £17,000

Tuition fees are for the academic year 2026/27.

Tuition fees cover the cost of your teaching and assessment, operating facilities such as libraries, IT equipment, and access to academic and personal support.

- You can pay your tuition fees in instalments.
- All or part of your tuition fees can be funded by external sponsorship.
- International applicants who accept an offer of a place will need to pay a tuition fee deposit.

If you're a UK national, or have settled status in the UK, you may be eligible to apply for a Postgraduate Loan worth up to £12,858 to help with course fees and living costs. **Learn more about paying for your studies**.

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, specialist equipment, or stationery.

You can find information on the general and subject-specific costs you could expect to incur on our study costs webpage.

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Entry requirements

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

Postgraduate entry requirements

We accept a 2:2 honours degree from a UK university, or an equivalent academic qualification from a similar non-UK institution. This degree should be in a subject area closely related to computer science.

International qualifications

Select your country or region to view specific entry requirements.

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 University of Liverpool International College, means you're guaranteed a place on your chosen course.

English language requirements

You'll need to demonstrate competence in the use of English language, unless you're from a majority English speaking country.

We accept a variety of international language tests and country-specific qualifications.

International applicants who do not meet the minimum required standard of English language can complete one of our Pre-Sessional English courses to achieve the required level.

IELTS

6.5 overall, with no component below 5.5

TOEFL iBT

If you took a TOEFL test on or before 20 January 2026, you'll need 88 overall, with minimum scores of listening 17, writing 17, reading 17 and speaking 19. If you took a TOEFL test from 21 January 2026 onwards, when a new scoring system was introduced, you'll need 4.5 overall, with 4 or above in all components. TOEFL Home Edition not accepted.

Duolingo English Test

125 overall, with speaking, reading and writing not less than 105, and listening not below 100. For academic year 2025/26 only, we will also accept the production, literacy, comprehension and conversation score set: 120 overall, with no component below 95.

Pearson PTE Academic

61 overall, with no component below 59

LanguageCert Academic

70 overall, with no skill below 60

PSI Skills for English

B2 Pass with Merit overall and no band below B2 Pass

INDIA Standard XII

National Curriculum (CBSE/ISC) - 75% and above in English. Accepted State Boards - 80% and above in English.

WAEC

C6 or above

Pre-sessional English

Do you need to complete a Pre-sessional English course to meet the English language requirements for this course?

The length of Pre-sessional English course you'll need to take depends on your current level of English language ability.

Pre-sessional English in detail

If you don’t meet our English language requirements, we can use your most recent IELTS score, or the equivalent score in selected other English language tests, to determine the length of Pre-sessional English course you require.

Use the table below to check the course length you're likely to require for your current English language ability and see whether the course is available on campus or online.

Your most recent IELTS score	Pre-sessional English course length	On campus or online
6.0 overall, with no component below 5.5	6 weeks	On campus or online
5.5 overall, with no more than one component at 5.0	10 weeks	On campus or online
5.5 overall, with no component below 5.0	12 weeks	Online
5.0 overall, with no component below 5.0	20 weeks	On campus
5.0 overall, with no component below 4.5	30 weeks	On campus
4.5 overall, with no more than one component at 4.0	40 weeks	On campus

If you’ve completed an alternative English language test to IELTS, we may be able to use this to assess your English language ability and determine the Pre-sessional English course length you require.

Please see our guide to Pre-sessional English entry requirements for IELTS 6.5 overall, with no component below 5.5, for further details.

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