UNIVERSITY OF LIVERPOOL

MSc

Theoretical Computer Science

Study mode	Duration	
Full-time	12 months	Apply by: **29 August 2025**
Part-time	24 months	Starts on: **22 September 2025**

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.

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.

Based in the Department of Computer Science, 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.

Who is this course for?

This programme 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

Please note that this course is pending accreditation by BCS, The Chartered Institute for IT.

Back to top

Course content

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

Semester one

You'll study three compulsory modules and one optional module in semester one.

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

You'll study one compulsory module and three optional modules in semester two.

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
CLOUD COMPUTING FOR E-COMMERCE (COMP315)	15

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

Final project

The dissertation project is completed over the summer.

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 on this programme comprises formal lectures, small group tutorials and practical sessions in computer laboratories. You will also take part in one or more group projects. At the end of the year, you'll complete a major individual research project under expert supervision.

How you're assessed

Modules are assessed through a combination of examinations and coursework. The examinations take place at the end of each semester and typically take the form of an in-person written assignment, usually to be completed in a couple of hours. You'll be assigned coursework across the length of each semester. This typically takes the form of class tests, programming assignments or small projects.

Your dissertation is assessed through a combination of written reports and a presentation of your achievements.

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.

The Liverpool Curriculum framework sets out our distinctive approach to education. Our teaching staff support our students to develop academic knowledge, skills, and understanding alongside our **graduate attributes**:

- Digital fluency
- Confidence

- Global citizenship

Our curriculum is characterised by the three **Liverpool Hallmarks**:

- Research-connected teaching
- Active learning
- Authentic assessment

All this is underpinned by our core value of **inclusivity** and commitment to providing a curriculum that is accessible to all students.

Back to top

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

Back to top

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 - £13,300
Part-time place, per year - £6,650

International fees

Full-time place, per year - £30,800
Part-time place, per year - £15,400

Fees stated are for the 2025-26 academic year.

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 £12,167 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, or stationery.

Find out more about the additional study costs that may apply to this course.

Back to top

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

88 overall, with minimum scores of listening 17, writing 17, reading 17 and speaking 19. TOEFL Home Edition not accepted.

Duolingo English Test

125 overall, with speaking, reading and writing not less than 105, and listening not below 100

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
5.5 overall, with no component below 5.5	10 weeks	On campus and online options available
5.5 overall, with no more than one component below 5.5, and no component below 5.0	12 weeks	On campus and online options available
5.5 overall, with no component below 4.5	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 below 4.5, and no component below 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.

Back to top

Generated: 28 Mar 2025, 21:43