UNIVERSITY OF LIVERPOOL

Advanced Computer Science MSc

COURSE DETAILS

- Full-time: 12 months
- Part-time: 24 months

KEY DATES

- Apply by: 29 August 2025
- Starts: 22 September 2025

Course overview

This course aims to extend your knowledge gained during undergraduate study with more advanced specialised material reflecting current research at the “cutting-edge” of the discipline.

INTRODUCTION

This programme will underpin and enhance your current knowledge and understanding; along with skills that you develop during the programme, will provide you with a strong basis for your future career in the IT industry and towards specialisation in the field of Computer Science related research and development.

WHO IS THIS COURSE FOR?

Designed for graduates of the highest calibre, the MSc in Advanced Computer Science is directed at graduates with a previous Computer Science or IT degree.

WHAT YOU'LL LEARN

- A deep and systematic understanding of selected issues at the forefront of current research in the academic discipline of Computer Science
- A depth of knowledge of Computer Science to provide an effective basis for students to continue to a research degree either at The University of Liverpool or elsewhere
- A broad-based understanding of current research issues in Computer Science
- A comprehensive understanding of how established techniques of research and enquiry are used to extend, create and interpret knowledge in Computer Science and how that knowledge may be applied
- The opportunity to participate in current research
- An understanding of (research) project management and control.

ACCREDITATION

The programme is accredited by the British Computer Society and is continually updated to reflect new technologies and trends.

Course content

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

SEMESTER ONE

Your only compulsory module this semester will help you learn and practice all the necessary skills needed to conduct independent research in computer science which you will need for further learning and your final projects.

You will then select at least three optional modules for the remainder of the semester. You can choose to focus on practical algorithms and data structures for large datasets, how the modern geographic information sciences toolkit can be integrated with Data Science tools to solve practical real-world problems, the fundamentals of how images are generated, represented, compressed and processed, parallel programming for multi-core architectures, optimisation methods, or privacy and security topics such as identification and authentication, monitoring protocols, attacks and defences, legal and ethical issues and future directions.

Students normally take 60 credits in each semester. However, if you opt to select the two 7.5 credit modules, you will have an uneven distribution of credits across the two semesters.

In exceptional circumstances, and with the approval of the programme Director of Studies, alternative modules available within the Computer Science provision may be substituted for optional modules.

COMPULSORY MODULES

RESEARCH METHODS IN COMPUTER SCIENCE (COMP516)

Credits: 15 / Semester: semester 1

In this module the students will learn and practise all the necessary skills needed to conduct independent research in computer science, including literature search, project management, presentation techniques, peer reviewing, writing skills and critical review of texts. They will also learn about the professional, legal, social and ethical framework of the IT industry. The module covers, e.g., planning and scheduling projects and drawing Gantt charts. Students shall also conduct a research project (including research, paper, literature review, or MSc project proposal, ...) and use tools like EndNote and Zotero bibliography manager within MS Word and Latex.

OPTIONAL MODULES

KNOWLEDGE REPRESENTATION (COMP521)

Credits: 15 / Semester: semester 1

The module introduces formalisms to reason about knowledge and information. One such formalism is epistemic logic, where one can explicitly represent of what an agent (robot, human, system) knows about the world or about others, as in "I have sent a message, how do I know that it has been received, and that the receiver knows I know this?"

PRIVACY AND SECURITY (COMP522)

Credits: 15 / Semester: semester 1

The module "Privacy and Security" covers topics such as: identification and authentication, monitoring protocols, attacks and defences, legal and ethical issues and future directions.

EFFICIENT ALGORITHMS (COMP526)

Credits: 15 / Semester: semester 1

Masters module on practical algorithms and data structures for large datasets.

MULTI-CORE AND MULTI-PROCESSOR PROGRAMMING (COMP528)

Credits: 15 / Semester: semester 1

This is a module to cover theoretical and practical aspects of parallel programming for multi-core architectures with the main focus on hand-on programming experience with latest multi-core and multi-processor platforms.

GEOGRAPHIC DATA SCIENCE (ENVS563)

Credits: 15 / Semester: semester 1

This module will introduce students to the nascent field of Geographic Data Science (GDS), a discipline established at the intersection between Geographic Information Science (GIS) and Data Science. The course covers how the modern GIS toolkit can be integrated with Data Science tools to solve practical real-world problems. Core to the set of employable skills to be taught in this course is an introduction to programming tools for GDS in R and Python. The programme of lectures, guided practical classes and independent study illustrate how and why GDS is useful for social science applications.

IMAGE PROCESSING (ELEC319)

Credits: 7.5 / Semester: semester 1

This module covers the fundamentals of how images are generated, represented, compressed and processed to extract features of interest.

OPTIMISATION (COMP557)

Credits: 15 / Semester: semester 1

This module is an in-depth tour over optimisation methods applied for various optimisation models. These methods are extensively used in both academic and industrial practices.

MSC GROUP PROJECT (COMP530)

Credits: 15 / Semester: semester 2

This module is designed to allow students to consolidate work from the first semester by working as a programming team to realise a solution to a problem related to their programme of study.

Any optional modules listed above are illustrative only and may vary from year to year. Modules may be subject to minimum student numbers being achieved and staff availability. This means that the availability of specific optional modules cannot be guaranteed.

SEMESTER TWO

You have the chance to choose all of your modules during your second semester, giving you the opportunity to have a bespoke experience.

You could dig into basic algorithmic methods for the design and analysis of algorithms, the algorithmic aspects of game theory, biologically inspired optimisation and introduction to neural networks for artificial intelligence, machine learning, data mining, source coding and error correcting, multi-agent systems, utilising advanced web technologies, use of logic as a tool for specifying the desired behaviour of hardware, software and artificial intelligence systems, game-theoretic discussions of auctions, technical and organisational discussions about cryptography and security, or gain an understanding of how maps can be visualised online.

You'll also have the chance to participate in a group project where you can work with colleagues as a programming team to build on work from your first semester to find a solution to a relevant problem.

Choose four optional modules.

OPTIONAL MODULES

ADVANCED ALGORITHMIC TECHNIQUES (COMP523)

Credits: 15 / Semester: semester 2

This module aims to teach basic algorithmic methods for design and analysis of algorithms.

SAFETY AND DEPENDABILITY (COMP524)

Credits: 15 / Semester: semester 2

Safety and Dependability will cover techniques for the validation of systems against formal specifications. In a first part, safety specifications (something bad never happens) using the Hoare calculus and safe abstraction are covered. A second part refers to termination (something good eventually happens), exploiting well foundedness. In a third part, Markov chains and decision processes are studied, extending the qualitative safety and termination problems from the first part to qualitative/probabilistic properties, and extending them to a simple probabilistic specification language, PCTL. As part of the module, the ability of formulating (probabilistic) models as Markov chains and decision processes are taught, as well as the use of of-the-shelf tools like PRISM or IscasMC for their analysis.

DATA MINING AND VISUALISATION (COMP527)

Credits: 15 / Semester: semester 2

The module covers a range of topics and techniques for analyzing data. Students will learn about different types of data mining problems, including classification, clustering, association pattern mining, and social network analysis, as well as algorithms to solve them.

Students will program selected data mining algorithms from scratch using Python. This hands-on approach will allow them to gain a deeper understanding of how the algorithms work and how they can be applied to real-world datasets. They will experiment with different datasets to see how the algorithms perform and learn how to interpret the results.

MULTI-AGENT SYSTEMS (COMP310)

Credits: 15 / Semester: semester 2

Multi-agent systems have emerged as one of the most important areas of research and development in information technology in the 1990s. A multi-agent system is one composed of multiple interacting software components known as agents, which are typically capable of co-operating to solve problems that are beyond the abilities of any individual member. Multi-agent systems are important primarily because they have been found to have very wide applicability, in areas as diverse as industrial process control and electronic commerce. This module will begin by introducing the student to the notion of an agent, and will lead them to an understanding of what an agent is, how they can be constructed, and how agents can be made to co-operate effectively with one another to solve problems.

CLOUD COMPUTING FOR E-COMMERCE (COMP315)

Credits: 15 / Semester: semester 2

This module will provide an introduction to cloud computing. It will cover physical cloud infrastructure (data-centres, networks and servers), and the software stacks that run on it (containers, micro-services, orchestration and web frameworks).
During the course, students will assemble their own cloud-based application, which will be a webpage with a scalable micro-service-based backend.

ONTOLOGIES AND SEMANTIC WEB (COMP318)

Credits: 15 / Semester: semester 2

This modules provides a basic introduction to the main principles behind representing and retrieving knowledge effectively on the Web. The module covers the evolution from the standard Web to the Semantic Web, and gives student the opportunity to gain an awareness of the main methods and techniques, including practical awareness, of the main issues arising in annotating web pages with semantic information, in interlinking pages with similar semantic content and in effectively querying these pages.

ALGORITHMIC GAME THEORY (COMP559)

Credits: 15 / Semester: semester 2

This module focuses on algorithmic aspects of game theory. A main focus of this module is on the computational aspects in the design of mechanisms and auctions. as part of the module, the students learn about Googles sponsored serarch auctions, which is one of the most successful targeted advertising systems today.

INFORMATION THEORY AND CODING (ELEC415)

Credits: 7.5 / Semester: semester 2

This module is aimed to provide an extensive overview of the information theory and coding. Different source codes and channel codes are discussed. Cryptography is also covered.

MACHINE LEARNING AND BIOINSPIRED OPTIMISATION (COMP532)

Credits: 15 / Semester: semester 2

This module teaches you about bio-inspired algorithms for optimisation and machine learning. The algorithms are based on reinforcement learning, DNA computing, brain or neural network models, immune systems, the evolutionary version of game theory, and social insect swarm behaviour such as ant colonies and bee colonies. These techniques are extremely useful for searching very large solution spaces (optimisation) and they can be used to design agents or robots that have to interact and operate in dynamic unknown environments (e.g. a Mars rover, a swarm of robots or network of satellites). The idea of learning optimal behaviour, rather than designing, algorithms and controllers is especially appealing in AI.

REASONING ABOUT ACTION AND CHANGE (COMP525)

Credits: 15 / Semester: semester 2

The module introduces the student to the use of logic as a tool for specifying the desired behavior of hardware, software and artificial intelligence systems, and for checking whether a given system does indeed behave as desired. The module enables the student to gain familiarity with a set of techniques which are critical in contemporary industrial applications and in academic research. It consists of 30 lectures and 10 practical sessions.

WEB MAPPING AND GEOVISUALISATION (ENVS456)

Credits: 15 / Semester: semester 2

Through this module students will gain an understanding of how maps can be visualised online through a number of web platforms. Additionally, the internet will be presented both as a source of new data, and provide analytical functionality that can assist when solving geographic problems. Geographic data can be any dataset that can be visualised in a map. The module is taught through a mixture of lectures and practicals, and is assessed through two summative projects.

COMPUTATIONAL INTELLIGENCE (COMP575)

Credits: 15 / Semester: semester 2

Biologically inspired optimisation and introduction to neural networks for artificial intelligence.

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FINAL PROJECT

Your final project 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 will create a proposal, a presentation, and a final dissertation.

COMPULSORY MODULES

MSC PROJECT (COMP702)

Credits: 60 / Semester: summer

Masters Level final project (individual project with dissertation)

Any optional modules listed above are illustrative only and may vary from year to year. Modules may be subject to minimum student numbers being achieved and staff availability. This means that the availability of specific optional modules cannot be guaranteed.

HOW YOU'LL LEARN

You will learn using a combination of formal lectures, small group tutorials and practical sessions in our state-of-the-art PC and Mac laboratories. Throughout the year, you will also take part in one or more group projects. At the end of the year, you will complete a large individual project.

As well as subjects in computer science, you will also develop general skills required for employability in industry or research including teamwork, presentation skills and research

techniques.

HOW YOU'RE ASSESSED

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

Lastly, you will submit a final dissertation 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.

Careers and employability

Graduating in Advanced Computer Science will provide you with a basis for further career development towards senior technical and managerial positions in the IT industry, and towards specialisation in the field of Computer Science-related research and development.

Career support from day one to graduation and beyond

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Career planning

Our Careers Studio and career coaches can provide tailored support for your future plans.

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From education to employment

Employability in your curriculum for a successful transition

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Networking events

Make meaningful connections with like-minded professionals

YOUR FUTURE

Job titles and their definitions are not standardised within the IT industry and in a fast changing world employers demand maximum flexibility. However the following are some current options:

- Database administrator
- Information systems manager
- Applications developer
- IT consultant
- Network engineer
- Systems designer.

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 fees and funding**.

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.

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

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POSTGRADUATE GLOBAL ADVANCEMENT SCHOLARSHIP – ACHIEVEMENT

- International students

If you're an international student joining a master's course with us, you could be eligible to receive a tuition fee discount of £2,500, based on your prior academic achievement, choice of course, and you not having studied with us before.

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POSTGRADUATE GLOBAL ADVANCEMENT SCHOLARSHIP – COUNTRY

- International students
- Antigua and Barbuda
- Australia
- Bangladesh
- Barbados
- Belize
- Brunei
- Canada
- China
- Cyprus
- Dominica
- Egypt
- Ghana
- Grenada
- Guyana
- India
- Jamaica
- Japan
- Kenya
- Malaysia
- Mauritius
- Mexico
- New Zealand
- Nigeria
- Pakistan
- Saint Kitts and Nevis
- Saint Lucia
- Saint Vincent and The Grenadines

- Singapore
- South Africa
- South Korea
- Sri Lanka
- Tanzania
- Thailand
- Trinidad and Tobago
- Turkey
- Uganda
- Vietnam

If you're an international student joining a master's course with us, you could be eligible to receive a tuition fee discount of £2,500, based on your nationality, choice of course, and you not having studied with us before.

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GRADUATE LOYALTY ADVANCEMENT SCHOLARSHIP

- Home and international students

If you're a University of Liverpool graduate starting this master's degree with us, you could be eligible to receive a loyalty discount of up to £2,500 off your master's tuition fees.

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CHILEAN NATIONAL AGENCY FOR RESEARCH AND DEVELOPMENT (ANID) SCHOLARSHIP

- International students
- Chile

If you're a Chilean student joining a master's degree, you could be eligible to apply for a 20% discount on your tuition fees with a Chilean National Agency for Research and Development (ANID) Scholarship. Scholarship.

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CHEVENING SCHOLARSHIPS

- International students
- Albania
- Algeria
- Anguilla
- Antigua and Barbuda
- Argentina
- Australia
- Azerbaijan
- Bangladesh
- Barbados
- Belize
- Bolivia
- Brazil
- British Virgin Islands
- Brunei
- Canada

- Cayman Islands
- Chile
- China
- Columbia
- Costa Rica
- Cuba
- Dominica
- Ecuador
- Egypt
- El Salvador
- Ghana
- Guatemala
- Guyana
- Honduras
- Hong Kong
- Iceland
- India
- Indonesia
- Iraq
- Jamaica
- Japan
- Jordan
- Kazakhstan
- Kenya
- Libya
- Malaysia
- Mauritius
- Mexico
- Moldova
- Mongolia
- Montserrat
- Morocco
- Nepal
- New Zealand
- Nicaragua
- Nigeria
- Pakistan
- Panama
- Paraguay
- Peru
- Philippines
- Russia
- Saint Kitts and Nevis
- Saint Lucia
- Saint Vincent and The Grenadines
- Serbia
- Singapore
- South Africa

- South Korea
- South Sudan
- Sri Lanka
- Sudan
- Taiwan
- Tanzania
- Thailand
- Trinidad and Tobago
- Turkey
- Turks and Caicos Islands
- Uganda
- Ukraine
- Uruguay
- Venezuela
- Vietnam
- Zimbabwe

If you're an international student from an eligible country, joining a one-year master's course, you could be eligible to apply for a Chevening Scholarship. If your application is successful, you could expect to have your master's fees paid, up to a maximum of £18,000, and receive additional help with living costs.

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CONSEJO NACIONAL DE CIENCIA Y TECNOLOGIA (CONACYT) AWARD

- International students
- Mexico

If you're a Mexican student joining a master's degree, you could be eligible to apply for a 30% discount on your tuition fees with a CONACyT Award.

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FUND FOR THE DEVELOPMENT OF HUMAN RESOURCES (FIDERH) AWARD

- International students
- Mexico

If you're a Mexican student joining a master's degree and you're in receipt of a FIDERH graduate loan, you could be eligible to benefit from a 20% discount on your tuition fees with a FIDERH Award.

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FUNED AWARD

- International students
- Mexico

If you're a Mexican student joining a master's degree and you're in receipt of a FUNED loan, you can apply to be considered for a 20% tuition fee discount. A total of up to 50 awards will be available to master's and PhD students per academic year.

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FUNED SCHOLARSHIP FOR WOMEN IN STEM SUBJECTS

- International students
- Mexico

If you're a female Mexican student joining an eligible master's course in a science, technology, engineering or maths (STEM) subject and you're in receipt of a FUNED loan, you can apply to be considered for a 25% tuition fee discount. Up to five awards are available in each academic year.

- ## HRH PRINCESS SIRINDHORN UNIVERSITY OF LIVERPOOL SCHOLARSHIP (THAILAND)

  - International students
  - Thailand

If you're a student from Thailand joining a one-year master's degree, you might be eligible to apply to have your tuition fees paid in full and receive help with living costs. One award is available and only students who are new to the University will be considered.

- ## HUMANITARIAN SCHOLARSHIPS FOR MASTER'S PROGRAMMES

  - International students

Do you have recognised status as a refugee or person with humanitarian protection outside the UK? Or are you a Ukrainian who's sought temporary protection in the EU? You could be eligible to apply for the full payment of your master's fees and additional financial support.

- ## JOHN LENNON MEMORIAL SCHOLARSHIP

  - Home students

If you're a UK student, either born in or with strong family connections to Merseyside, you could be eligible to apply for a fee discount of up to £4,500. You'll need to demonstrate an active interest in global, community and environmental issues to be considered.

- ## JUVENTUDESGTO SCHOLARSHIP

  - International students
  - Mexico

If you're a resident of the state of Guanajuato in Mexico joining a master's degree, you could be eligible for a 10% discount on your tuition fees with a JuventudEsGto Scholarship.

- ## KAPLAN DIGITAL PATHWAYS EXCELLENCE SCHOLARSHIP

  - International students

Completed a Kaplan Digital Pathways Pre-Master's? We're offering a £5,000 fee discount off the first year of master's study for a maximum of two high achieving students joining one of our non-clinical master's courses from an online Kaplan Pre-Master's programme.

- ## MARSHALL SCHOLARSHIP

  - International students
  - United States

If you're a USA student joining an eligible master's with us, you could be eligible to apply for a Marshall Scholarship. If your application is successful, your master's tuition fees will be paid in full. One Marshall Scholarship for master's study is available in each academic year.

- ## POSTGRADUATE OPPORTUNITY BURSARY

  - Home students

If you're a UK University of Liverpool graduate joining a master's degree with us, you could be eligible to receive £3,000 off your tuition fees. You must have graduated in the last two years and received a widening access scholarship during your undergraduate studies.

- ## 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.

- ## THE AZIZ FOUNDATION SCHOLARSHIP

  - Home students

If you're a British Muslim, active within a Muslim community and dedicated to bringing positive change to society, you could apply to potentially have the full cost of your master's tuition fees covered by an Aziz Foundation Scholarship.

- ## TURKISH MINISTRY OF EDUCATION SCHOLARSHIP

  - International students
  - Turkey

If you're a Turkish student joining a master's degree, you could be eligible to apply for a 20% discount on your tuition fees with a Turkish Ministry of Education Scholarship.

- ## UNIVERSITY OF LIVERPOOL INTERNATIONAL COLLEGE EXCELLENCE SCHOLARSHIP

  - International students

Completed a Pre-Master's at University of Liverpool International College (UoLIC)? We're offering a £5,000 fee discount off the first year of master's study to some of the highest achieving students joining one of our non-clinical master's courses from UoLIC.

- ## 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 fee discount worth £3,000 off the first year of your master's course.

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VICE-CHANCELLOR'S INTERNATIONAL ATTAINMENT SCHOLARSHIP FOR MAINLAND CHINA

- International students
- China

Are you a high-achieving graduate from the People's Republic of China with a degree from a Chinese university? You could be eligible to apply for a £5,000 fee discount if you're joining an eligible master's course. Up to 15 eligible students will receive this scholarship.

Entry requirements

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

Your qualification	**Requirements** About our typical entry requirements
GCSE	4/C in English and 4/C in Mathematics
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 computer science or a closely related subject.
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 University of Liverpool International College, means you're guaranteed a place on your chosen course.

THE ORIGINAL REDBRICK