UNIVERSITY OF LIVERPOOL

BSc (Hons)

Computer Science – Algorithms and Optimisation pathway

UCAS code G400

Entry requirements	Study mode	Duration	
A level: AAB	Full-time	3 years	Apply by: **13 January 2027** Starts on: **27 September 2027**

About this course

From the underlying principles to the very edge of modern technology, this programme will cover all aspects of Computer Science and ensure that when you graduate you will know exactly what is and isn't possible with computers.

Introduction

Many problems are highly complex and hard to solve even by a computer. Algorithms are a precise set of instructions or rules for step-by-step procedures designed to solve a problem, and optimisation is the process used to refine the algorithms and find the best solution to minimise prediction errors, discover the best methods and improve efficiency (within given constraints).

The Algorithms and Optimisation pathway will develop your knowledge and understanding of the theoretical modelling of algorithms and their properties. It looks at how complex tasks can be achieved more efficiently.

On the first year of this course, we provide you with a strong foundation on the core elements of a Computer Science degree. This includes programming, computer systems,

data structures, algorithms, and an introduction to artificial intelligence.

In Years Two and Three, you will expand your understanding and knowledge of key concepts related to software development and database development. Choose modules from a range of specialism topics including Algorithms, Theory of Computation, Scripting Languages, Optimisation, Big Data Analysis, Biocomputation, Efficient Sequential Algorithms and Complex Information Networks.

On this pathway, you will graduate with the degree title **Bachelor of Science with Honours in Computer Science (Algorithms and Optimisation)**

Explore our other Computer Science programme and pathway options:

Computer Science BSc (Hons)

Computer Science BSc (Artificial Intelligence) (Hons)

Computer Science BSc (Cyber Security) (Hons)

Computer Science BSc (Data Science) (Hons)

We also offer a four year MEng (master's) programme Computer Science MEng.

This programme is also available as an option with a Year in Industry, Year in China or Year Abroad.

Our Computer Science BSc programmes are accredited by the British Computer Society which means that the course is continually updated and adapted to reflect new technologies and emerging trends.

What you'll learn

- Programming in Java
- Understanding different computer systems
- Building and structuring databases
- Fundamentals of software engineering
- Algorithmic foundations
- Complexity of algorithms and decision
- Computation and language
- Uses and possibilities of biocomputation
- Introduction of Computation Game Theory
- Complex social networks

Accreditation

Accredited by BCS, so opens up a wide variety of career opportunities with excellent employment prospects.

Accreditation in detail

BCS

The Chartered Institute for IT for the purposes of fully meeting the academic requirement for registration as a Chartered IT Professional.

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Course content

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

Year one

In year one, you will learn the fundamentals of computer science. Starting with an introduction to procedural programming using commonly found language platforms, you'll move on to learn about the importance of hardware and software components within the operation of computer systems, formal analytic techniques and the development of artificial intelligence.

In year one, students will typically undertake either COMP101: Introduction to Programming or COMP105: Programming Language Paradigms based on prior exposure to programming (e.g. Computer Science A Level). Students without a background will normally study COMP101. In some instances, you may be permitted to enrol on COMP105 instead.

All other year one modules are required.

Modules

Compulsory modules	Credits
INTRODUCTION TO PROGRAMMING (COMP101)	15
PROGRAMMING LANGUAGE PARADIGMS (COMP105)	15
DESIGNING SYSTEMS FOR THE DIGITAL SOCIETY (COMP107)	15
DATA STRUCTURES AND ALGORITHMS (COMP108)	15
OBJECT-ORIENTED PROGRAMMING (COMP122)	15

Programme details and modules listed are illustrative only and subject to change. This course has been updated for 2027 entry as part of a review of all our programmes. This

review has considered refining study pathways, strengthening links with employers, integrating generative AI, developing students' research skills, and enhancing alignment with our research strengths. Please note, as at all times, the University reserves the right to make reasonable changes, including to content, entry requirements, or fees, or to discontinue programmes. Applicants will be informed of any significant change.

Year two

In year two, you will expand your knowledge of key concepts and skills related to software development and database development. You will also begin to choose which wider elements of computer science you want to engage with, such as cyber security, computer-based trading in financial markets and principles of computer game design.

Choose at least 30 credits from the following optional modules to follow the Algorithms and Optimisation pathway:

- COMP218: Introduction to Theory of Computation
- COMP229: Core Data Science
- COMP226: Computer-based Trading in Financial Markets
- COMP288: Web Programming Languages.

Modules

Compulsory modules	Credits
SOFTWARE ENGINEERING I (COMP201)	15
DATABASE DEVELOPMENT (COMP207)	15
COMPLEXITY OF ALGORITHMS (COMP202)	15
GROUP SOFTWARE PROJECT (COMP208)	15

Optional modules	Credits
COMPUTER NETWORKS (COMP211)	15
INTRODUCTION TO THEORY OF COMPUTATION (COMP218)	15
ADVANCED ARTIFICIAL INTELLIGENCE (COMP219)	15
APP DEVELOPMENT (COMP228)	15
INTRODUCTION TO DATA SCIENCE (COMP229)	15
PRINCIPLES OF COMPUTER GAMES DESIGN AND IMPLEMENTATION (COMP222)	15
COMPUTER-BASED TRADING IN FINANCIAL MARKETS (COMP226)	15
CYBER SECURITY (COMP232)	15
BECOMING ENTREPRENEURIAL (ULMS254)	15

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Year three

Year three is where you will start to build on what you've learned so far with your own research and exploration by undertaking an individual project. While guided, you will work independently to explore a substantial computer science problem in depth,

making use of the principles, techniques and methodologies acquired elsewhere in the programme.

Choose at least 60 credits from the following optional modules to follow the Algorithms and Optimisation pathway:

- COMP305: Biocomputation
- COMP309: Efficient Sequential Algorithms
- COMP323: Introduction to Computational Game Theory
- COMP331: Optimisation
- COMP336: Big Data Analytics
- COMP324: Complex Information Networks
- COMP326: Computational Game Theory and Mechanism Design.

Modules

Compulsory modules	Credits
HONOURS YEAR COMPUTER SCIENCE PROJECT (COMP390)	30
OPTIMISATION (COMP331)	15

Optional modules	Credits
KNOWLEDGE REPRESENTATION AND REASONING (COMP304)	15
SOFTWARE ENGINEERING II (COMP319)	15
INTRODUCTION TO COMPUTATIONAL GAME THEORY (COMP323)	15
HIGH PERFORMANCE COMPUTING (COMP328)	15
AUTONOMOUS MOBILE ROBOTICS (COMP329)	15

Optional modules	Credits
COMMUNICATING COMPUTER SCIENCE (COMP335)	15
BIG DATA ANALYTICS (COMP336)	15
COMPUTER VISION (COMP338)	15
QUANTUM COMPUTING AND SECURITY (COMP345)	15
CYBERPSYCHOLOGY-HUMAN COMPUTER INTERACTION (PSYC327)	15
EFFICIENT SEQUENTIAL ALGORITHMS (COMP309)	15
FORMAL METHODS (COMP313)	15
CLOUD COMPUTING FOR E-COMMERCE (COMP315)	15
ONTOLOGIES AND SEMANTIC WEB (COMP318)	15
NETWORK MINING AND ANALYSIS (COMP324)	15
DATA MINING AND VISUALISATION (COMP337)	15
ROBOT PERCEPTION AND MANIPULATION (COMP341)	15
ADVANCED TOPICS IN COMPUTER GAME DEVELOPMENT (COMP342)	15
COMPUTER FORENSICS (COMP343)	15
MUSIC INTELLIGENCE (COMP346)	15

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Teaching and assessment

How you'll learn

Teaching is a mix of formal lectures, small group tutorials and supervised laboratory-based practical sessions. Students also undertake individual and group projects. Key problem-solving skills and employability skills, like presentation and teamwork skills, are developed throughout the programme.

How you're assessed

The main modes of assessment are through a combination of coursework and examination, but depending on the modules taken, you may encounter project work, presentations (individual or group), and specific tests/tasks focused on solidifying learning outcomes.

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

Liverpool's computer science graduates go onto well-paid graduate jobs and careers such as: computer programmer; software developer; systems analyst; software engineer; technical consultant; web designer.

Computer science graduates will enter a high-in-demand pool in the field with possible roles in:

- computer programmers, web developers, or software engineers
- data scientists
- artificial intelligence researchers
- systems analysts
- technical consultants.

Recent employers include:

- BAE Systems
- BT
- Guardian Media Group
- Royal Bank of Scotland
- Siemens
- Unilever

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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 - £10,050
Year in industry fee - £2,010
Year abroad fee - £1,508 (applies to year in China)

International fees

Full-time place, per year - £32,000
Year in industry fee - £1,955
Year abroad fee - £14,950 (applies to year in China)

The UK fees shown are for the academic year 2027/28. The international fees shown are for the academic year 2026/27 and will be subject for change for the academic year 2027/28. Please be advised that tuition fees may increase each year for both UK and international students. For UK students, this will be subject to the government's regulated fee limits.

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.

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. 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.

A levels

AAB
in A levels including Maths or Computer Science. Mathematics (Pure), Mathematics (Pure and Applied), and Mathematics (Pure) and Statistics are acceptable. CCEA A level Software Systems Development and CCEA A level in Digital Technology (Northern Ireland) aren't acceptable subjects. We don't accept A level IT.

Applicants with the Extended Project Qualification (EPQ) are eligible for a reduction in grade requirements. For this course, the offer is **ABB** from A levels, with **A** in the EPQ including A level Mathematics or Computer Science.

You may automatically qualify for reduced entry requirements through our contextual offers scheme. Based on your personal circumstances, you may automatically qualify for up to a two-grade reduction in the entry requirements needed for this course. When you apply, we consider a range of factors – such as where you live – to assess if you're eligible for a grade reduction. You don't have to make an application for a grade reduction – we'll do all the work.

Find out more about how we make reduced grade offers.

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.

Available foundation years:

- Computer Science (Foundation) (4 year route with Carmel College) BSc (Hons)

T levels

You'll need T level Science or ICT, alongside A level Mathematics or Computer Science. T Level Science or ICT is accepted with an overall grade of Distinction to include the grade of Distinction in the specialism component and grade B in the core.

Applicants should contact us by completing the enquiry form on our website to discuss specific requirements in the core components and the occupational specialism.

GCSE

Further Education requirements, in addition to Level 3 GCSE qualifications, must be met. GCSE grade minimum 4/C in English and 4/C in Mathematics.

Subject requirements

A level Mathematics or Computer Science is required. For applicants from England: for science A levels that include the separately graded practical endorsement, a "Pass" is required.

BTEC Level 3 National Extended Certificate

D in BTEC and AA in A levels (to include either Mathematics or Computer Science).

IT and ICT are not relevant BTEC subjects and cannot be accepted in lieu of the required A level subjects.

BTEC Level 3 Diploma

DD in BTEC and A in A level in Mathematics or Computer Science.

BTEC Level 3 National Extended Diploma

D*DD in a relevant diploma plus A level Maths or Computer Science grade B (GCSE Maths grade A/7 required if A level Mathematics not taken).

Relevant diplomas are:

- Computer Science
- Mathematics
- Engineering.

International Baccalaureate

34 points overall or 6,6,5 in 3 HL subjects including Mathematics/Computer Science.

IB Maths ‘Analysis and Approaches’ or ‘Applications and Interpretation’ pathways are acceptable at Higher Level as a Mathematical subject.

Irish Leaving Certificate

H1,H1,H2,H2,H2,H3, including H1 in Higher Mathematics or Computer Science. We also

require a minimum of H6 in Higher English.

Scottish Higher/Advanced Higher

Acceptable on same basis as A levels, or higher grades AAABB and Advanced Higher grade A in Maths or Computer Science.

Welsh Baccalaureate Advanced

Acceptable at grade B (with A levels AA including Mathematics or Computer Science).

Cambridge Pre-U Diploma

Principal subjects acceptable in lieu of A levels. D3 in Cambridge Pre U Principal Subject is accepted as equivalent to A-Level grade A M2 in Cambridge Pre U Principal Subject is accepted as equivalent to A-Level grade B Global Perspectives and Short Courses are not accepted.

Access

Pass Access with 36 Level 3 credits at Distinction (including 15 in Mathematical or Computer Science credits) and 9 Level 3 credits at Merit. Open Awards Access Diploma in Computing and Digital Technology isn't acceptable as there isn't enough relevant content.

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 direct entry requirements. Although there is no direct Foundation Certificate route to this course, completing a Foundation Certificate, such as that offered by the University of Liverpool International College, can guarantee you a place on a number of similar courses which may interest you.

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.

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

6.0 overall, with no component below 5.5

TOEFL iBT

If you took a TOEFL test on or before 20 January 2026, you'll need 78 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 overall, with 4 or above in all components. TOEFL Home Edition not accepted.

Duolingo English Test

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

Pearson PTE Academic

59 overall, with no component below 59

LanguageCert Academic

65 overall, with no skill below 60

Cambridge IGCSE First Language English 0500

Grade C overall, with a minimum of grade 2 in speaking and listening. Speaking and listening must be separately endorsed on the certificate.

Cambridge IGCSE First Language English 0990

Grade 4 overall, with Merit in speaking and listening

Cambridge IGCSE Second Language English 0510/0511

0510: Grade C overall, with a minimum of grade 2 in speaking. Speaking must be separately endorsed on the certificate. 0511: Grade C overall.

Cambridge IGCSE Second Language English 0993/0991

0993: Grade 5 overall, with a minimum of grade 2 in speaking. Speaking must be separately endorsed on the certificate. 0991: Grade 5 overall.

Cambridge ESOL Level 2/3 Advanced

169 overall, with no paper below 162

International Baccalaureate English A: Literature or Language & Literature

Grade 4 at Standard Level or grade 4 at Higher Level

International Baccalaureate English B

Grade 6 at Standard Level or grade 5 at Higher Level

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
5.5 overall, with no component below 5.5	6 weeks	On campus or online
5.5 overall, with no component below 5.0	10 weeks	On campus or online
5.0 overall, with no component below 5.0	12 weeks	Online
5.0 overall, with no component below 4.5	20 weeks	On campus
4.5 overall, with no component below 4.5	30 weeks	On campus
4.0 overall, with 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 6.0 overall, with no component below 5.5, for further details.

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