UNIVERSITY OF OXFORD

DEPARTMENT OF
COMPUTER SCIENCE

Computer Science is about understanding the mathematical, scientific and engineering principles underlying every kind of computing system, from cloud servers and supercomputers to smart phones and games consoles. At its heart, Computer Science is about problem solving: finding correct, efficient and elegant solutions to problems.

Team 1

BA/Master's in Computer Science, Mathematics and Computer Science or Computer Science and Philosophy

www.cs.ox.ac.uk/undergradcourses

Oxford has one of the longest-established Computer Science departments in the country. Today it is home to world-class research and teaching. Research activities encompass core Computer Science, including computational biology, quantum computing, machine learning, security, computational linguistics, information systems, software verification and software engineering. Practical applications of Computer Science include artificial intelligence, big data, fighting cancer and protecting endangered species.

Why Computer Science at Oxford?

- **Knowledge that endures.** Our courses teach the principles behind whatever technology you are using, rather than just the rules of a particular programming language. By the time you leave Oxford, you will be able to pick up a new programming language in half a day and begin to use it productively straight away.

- **Personalised tuition** from internationally recognised subject experts, through the world-famous Oxford tutorial system. Our tutorials are mainly given by members of academic staff, not graduate students. We have an excellent staff to student ratio: the department is a home to around 170 academic and research staff, and has over 260 undergraduates, making for a friendly and supportive atmosphere.

- **Strong industry links** and our reputation for excellence means our students are highly sought after. We host regular guest seminars and lectures by visiting international academics or industry representatives. Oxford has also produced a number of highly successful startups, including Dark Blue Labs, DiffBlue and Natural Motion.

- **Practical experiences**: many of our students undertake paid internships during the summer vacations. The Careers Service and the department can help you find positions. Oxford is well placed for internships. A recent 'Tech Nation' report recognised Oxfordshire as a major digital cluster. With around 25,000 people in digital tech economy jobs, the city is especially known for its expertise in cyber security, app and software development, gaming and cloud computing. Many placements lead to well-paid employment amongst top organisations.

- **The outstanding mix of people**. Join a community where you live and study alongside people who are as passionate about your subject as you are. Learning and debate doesn't stop when you leave the lecture theatre but continues in social areas and over meals.

- **Active student societies**: the Oxford University Computer Society (CompSoc) and Oxford Women in Computer Science Society (OxWoCS) both organise academic, social and career events, talks by invited industry speakers and provide networking and mentoring opportunities.

- **Cutting-edge science in a historic setting**: join one of the top-ranked Computer Science institutions in the world[1], and become part of the oldest university in the English-speaking world, which has been educating world-changing leaders for over 800 years. The department is in the heart of our small city, so everything you need is just a short walk or cycle away.

- **World-class resources**, not only for academic work, but also for sporting, artistic, creative and social activities. The University of Oxford has over 100 libraries, so our students rarely have to buy a book. There's an undergraduate social area in the department, where you can help yourself to a free coffee, relax, catch up on your email or discuss Computer Science with fellow students.

- **Generous financial support**. Oxford offers some of the country's most generous financial assistance to UK and EU students from lower income households to help with the cost of undergraduate study. Around a quarter of first-year students are given an Oxford bursary, which they never have to pay back. A variety of scholarships and prizes are available during the course of the degree.

[1] First in the world in the 2018 Times Higher Education 2017–18 rankings for Computer Science.

"I love how much freedom I have studying Computer Science and Philosophy; I'm taking courses from Knowledge and Reality to Lambda Calculus, allowing me to learn how to produce rigorous arguments both quantitively and qualitatively. This diverse skill set is great prep for almost any career."

Maninderbir Sachdeva
4th Year, Computer Science and Philosophy

Which course is right for me?

We are looking for students who have a real flair for mathematics: these are the skills needed for reasoning rigorously about the specific behaviour of programs and computer systems, and also for applications such as computer graphics, machine learning and scientific computing.

Computer Science

To be a successful Computer Science student, you will need a curiosity about how things work, and the ability to use mathematics to solve problems creatively. Computer Science at Oxford starts with the fundamentals of computers and programming, so it is not necessary to have studied Computing or ICT as a formal subject. We do however expect to see evidence of genuine interest and engagement with the subject.

Mathematics and Computer Science

The Mathematics and Computer Science joint degree gives you the chance to combine Computer Science with advanced study of pure mathematics, and will suit you if you are interested in using computers to solve mathematical or scientific problems, or in the deeper mathematical basis of Computer Science itself. By its nature Computer Science is very mathematical, applying deep and beautiful mathematics to real-world problems.

Computer Science and Philosophy

Our Computer Science and Philosophy degree allows you to study fascinating topics that are both intellectually exciting and creative right from the start: in Computer Science through the design of computer programs, and in Philosophy through the working out of arguments and systems of thought. The two disciplines meet in many fruitful ways, including artificial intelligence, artificial life and modelling, information ethics, logic, robotics and virtual reality.

All undergraduate level programmes are offered as three-year (BA) and four-year (Master's) degrees. You do not need to decide between the three- or four-year option when you apply: everyone applies for the four-year option, and chooses at the beginning of the third year whether to stay for one more year or two.[2]

For further details on course content, and options visit: **www.cs.ox.ac.uk/undergradcourses**

More than just a degree...

The 'city of dreaming spires', Oxford is famous the world over for its university, history and beautiful buildings. A bustling cosmopolitan place, its industries include motor manufacturing, publishing, and a large number of information technology and science-based businesses. Oxford has plenty of student-oriented pubs, restaurants and clubs, and for those who can be lured away by the bright lights, London and Birmingham are both little more than an hour away by public transport.

Oxford provides excellent facilities for sport at every level, from the Boat Race to college darts. If you can play a sport at international level, then there will be opportunities to do that. Equally, if you just like to kick a football around occasionally, there will be a place for you in one of your college's teams.

The University of Oxford offers unsurpassed opportunities to get involved in activities outside the confines of your subject. From music and arts to politics and cultural groups, most students have one or more passions that they pursue with others, either within their college or with students from other colleges. At eight weeks, Oxford terms are very short, but somehow you will find the time to fit it all in.

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[2] Students need to achieve a 2:1 at the end of their third year in order to progress to the fourth year.

BA/Master's in Computer Science

First Year: lays the foundations for the work you will do later in the degree. The emphasis is on using the power of mathematics to help design programs and to explain why they are correct. You will study the basics of Computer Science, beginning with how to write a good computer program, taking compulsory core Computer Science courses.

Second Year: you will take more core Computer Science courses, plus you will choose Computer Science options in the areas that interest you most. You will also take part in a group design practical, working with a group of fellow students to design a solution to a practical problem. Many group projects have the support of well-known international companies.

Third Year: brings more flexibility to your timetable. You will choose from a range of Computer Science options. Single honours students undertake an extended project, usually with the aim of developing a substantial computer program, or analysis of a computer system.

Optional Fourth Year: you will spend about two-thirds of your time taking research-oriented Computer Science advanced options. You will also do a research-oriented advanced project.

How the joint honours degrees differ from single honours

BA/Master's in Mathematics and Computer Science
During the first two years of the course you will split your time roughly equally between the two subjects. You will take (compulsory) core Mathematics courses and core Computer Science courses. During the second and third year you will choose from a range of Mathematics options and Computer Science options. In the third and fourth year, you have freedom to specialise more in one subject or the other if you wish. (But, unlike the single honours students, you won't undertake an extended project.) In the optional fourth year, you will spend about two-thirds of your time taking Mathematics advanced options and Computer Science advanced options, plus completing a Computer Science project or Mathematics dissertation.

BA/Master's in Computer Science and Philosophy
In the first year you will take (compulsory) core Philosophy courses and core Computer Science courses. During the second year, you will take further core Computer Science courses, plus Philosophy options and Computer Science options. During the first two years, your time is split roughly equally between the two subjects, but in the third and fourth years, you can specialise in one subject if you wish. In the third and fourth years, you will take Computer Science options and Computer Science advanced options respectively, plus Philosophy options. Unlike the single honours students you will not take a third year project, but you may undertake either a Computer Science project or Philosophy thesis in the fourth year.

How are the courses structured?

KEY Computer Science (CS) Mathematics (M) Philosophy (P)
Compulsory subject: ● Optional: ○

1st/2nd year Core Computer Science Courses	CS	M&CS	CS&P
Continuous Mathematics	●	●	
Design & Analysis of Algorithms	●	●	●
Digital Systems	●		
Discrete Mathematics	●		●
Functional Programming	●	●	●
Imperative Programming	●	●	●
Intro to Formal Proof	●		
Linear Algebra	●		
Probability	●	●	●
Algorithms & Data Structures	●	●	●
Models of Computation	●	●	●
Concurrent Programming	●	○	○
Compilers	●	○	○
Group Design Practical	●	●	●

1st/2nd year Core Mathematics Courses	
Algebra	Intro to Complex Numbers
Analysis	Intro to Pure Mathematics
Complex Analysis	Linear Algebra
Groups & Group Actions	Metric Spaces

1st/2nd year Core Philosophy Courses
Elements of Deductive Logic
General Philosophy
Intro to Logic
Turing on Computability & Intelligence

Example 2nd/3rd year Computer Science Options

Computer-Aided Formal Verification
Computer Architecture
Computer Graphics
Computer Security
Concurrency
Databases
Intelligent Systems
Logic & Proof
Machine Learning
Principles of Programming Languages

Example 2nd/3rd/4th year Philosophy Options

| |
|---|
| Ethics |
| Knowledge & Reality |
| Philosophical Logic |
| Philosophy of Cognitive Science |
| Philosophy of Mathematics |
| Philosophy of Mind |
| Philosophy of Science |
| Philosophy of Logic & Language |
| The Rise of Modern Logic |

Example 2nd/3rd year Mathematics Options

Banach Spaces	Integer Programming
Communication Theory	Logic
Graph Theory	Set Theory
Hilbert Spaces	Topology & Groups

Example 4th year Computer Science Advanced Options

Advanced Security
Automata, Logic & Games
Computational Game Theory
Computational Learning Theory
Computer Animation
Concurrent Algorithms & Data Structures
Database Systems Implementation
Physical Based Rendering
Probablistic Model Checking
Probability & Computing
Quantum Computer Science

Example 4th year Mathematics Advanced Options

Algebraic Topology
Axiomatic Set Theory
Combinatorics
Elliptic Curves
Godel's Incompleteness Theorems
Hyperbolic Equations
Probabilistic Combinatorics

The courses listed above are illustrative and may change. This information is intended as a simplified, rough guide. A full list of current options is available on the course website.
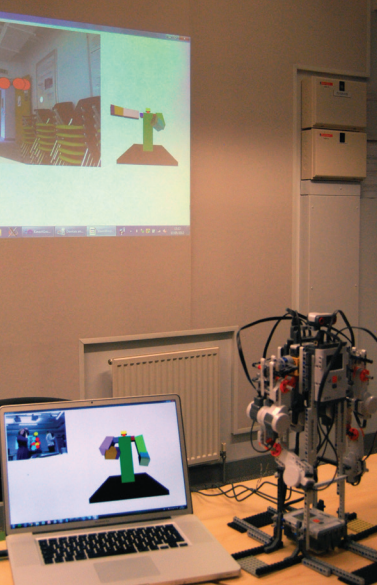
How will I be taught?

Our courses concentrate on creating links between theory and practice. You will also gain practical problem-solving and program design skills. The majority of subjects within the Computer Science elements of our degrees are linked with practical work in our well-equipped laboratories.

Tutorials normally consist of a one-hour meeting between two students and a tutor. They are based in colleges, and are an opportunity for you to spend an hour discussing some aspect of Computer Science. In your own time, you will write solutions to a set of problems, and your tutor will mark your work and then discuss it with you for an hour. Students typically have two or three tutorials or classes each week.

Lectures bring together students from all colleges to hear about some aspect of Computer Science, often from a world expert on that part of the subject. Our students typically attend eight to twelve lectures a week.

Practicals give you an opportunity to work on real programs that reflect the principles you have learned, and are a way to become familiar with up-to-date computing and programming technology. One week you might be creating interactive computer graphics, and another week you might be building a compiler for your own programming language, guided by a member of staff. Practical work might occupy two afternoons a week.

Problem classes: in later years of the course, you will also take part in small classes for the specialised topics that you have chosen to study in your degree. These small classes are taught by people with specialised knowledge in the topic.

Project work: you will have the opportunity to make a more extensive exploration of some of the ideas from your course by doing a project. You will have a project supervisor to guide your work, and might meet once a week.

Assessment: at the end of your first, second and third years you will sit exams. Most fourth year options are assessed by a take-home exam that you will complete during the Christmas or Easter vacation.

What qualifications do I need?

A-Levels: We will normally make an offer of A*AA on three A-Levels including at least an A in Mathematics:
- Computer Science, and Computer Science and Philosophy: the A* must be in Mathematics, Further Mathematics or Computing. Those taking Further Mathematics A-Level or AS Level are required to achieve at least a Grade A.
- Mathematics and Computer Science: if Further Mathematics is taken, then including A*A between Mathematics and Further Mathematics; otherwise including A* in Mathematics. Those taking Further Mathematics AS Level are required to achieve at least a Grade A.

Further Mathematics is strongly recommended as the best preparation for our courses. Computer Science or another science is recommended. Most successful candidates will have taken Further Mathematics to A2, but it isn't a requirement.

International Baccalaureate: 39 points, including core points. Higher Level grades of 7 6 6 with the 7 in Mathematics. For those taking the revised IB Mathematics syllabus (examinations from 2021) we will accept both Mathematics courses at HL.

For further information, including details of the wide range of alternative qualifications we are happy to accept, see: **www.cs.ox.ac.uk/howtoapply**
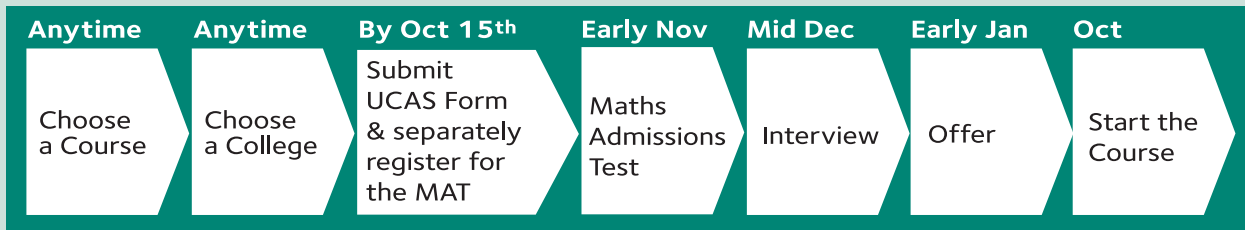
What is the role of the college?

Each Oxford college has its own particular history, ethos and architecture but the degree is identical. The Computer Science courses are organised and largely taught by the department: lectures, classes, practicals, projects and exams are all provided centrally. Your college will provide you with tutorials, where you and another student will meet with a tutor to discuss problems you have attempted to solve, or other aspects of Computer Science. This individual tuition is one of the University's great strengths. In addition, your personal tutor will advise you on your studies and monitor your progress: the relatively small number of students at each college allows for close support to be given to your academic development and your welfare.

Your college will be your home for much of your time at Oxford, and act as a social hub. You won't have to find somewhere to live before you come to Oxford: colleges provide affordable accommodation for at least two (and often more) years. You will normally only pay for your room during term-time, rather than for a full year, so it's cheaper for you. Colleges also offer affordable food and drink.

You can choose to apply to a specific college, or make an Open Application and we'll pick one for you.

See **www.cs.ox.ac.uk/collegelist** for a list of colleges that offer Computer Science and joint degrees.

How do I apply?

Anytime	Anytime	By Oct 15th	Early Nov	Mid Dec	Early Jan	Oct
Choose a Course	Choose a College	Submit UCAS Form & separately register for the MAT	Maths Admissions Test	Interview	Offer	Start the Course

All of our applicants must sit the Mathematics Admissions Test (MAT). We are unable to consider your application without it. Most students sit the test in their own schools or at a local test centre. Using the MAT score, and everything else we know about you, we decide whom to interview; this is normally about a third to a half of all applicants. As part of the process, you will stay in college for several days, giving you the opportunity to sample college life. All meals and accommodation are provided free of charge. (Skype interviews can be arranged for candidates outside of Europe.) All shortlisted candidates who come to interview in Oxford will be interviewed in at least two colleges. More information: **www.cs.ox.ac.uk/ug/apply**

After you graduate

Our graduate and postgraduate employment rates are exceptional. A *Sunday Times* league table of graduate salaries, released in 2017, placed Oxford Computer Scientists top. Six months after graduation our students enjoyed a mean salary of £45,000: higher than graduates of any other UK undergraduate degree course.

All of our degrees allow graduates to enter into technical, managerial, academic, financial or commercial posts, both in the UK and abroad. In recent years, our graduates have progressed to careers in many fields that need an understanding of computer systems, what such systems can (and cannot) do, and how to design them.

Recent employers of our graduates include IBM, Google, Amazon, Palantir Technologies, Cisco, Morgan Stanley, and Goldman Sachs, with jobs such as senior software engineers and developers, analysts, chief technology officers, games programmers, and technical leads.

We have also seen students going into teaching, government and policy organisations, management consultancy and law. Others have continued onto PhDs and academic or research careers, or started up their own companies.

Get in touch...

Visit the Computer Science admissions website for detailed information on course content, advice on applying, sample MAT papers and interview questions, and frequently asked questions: **www.cs.ox.ac.uk/undergradcourses**
Plus, learn more about the Oxford admissions process *(not Computer Science specific)*:
www.admissions.ox.ac.uk
Attend an open day or schools' event: **www.cs.ox.ac.uk/opendays**
Funding and fees: **www.ox.ac.uk/feesandfunding**
Help for international students: **www.ox.ac.uk/international**

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