

The University of Manchester

Computer Science

2020 Undergraduate brochure

Computer Science at Manchester

Our degree course offers you the opportunity to innovate, and that's what Computer Science is all about! It's about innovation and designing something new, and creating technology that could potentially change the world.

Dr Caroline Jay Senior Lecturer in Computer Science



Facilities & resources

Our facilities are second to none and provide students with the very best opportunities:

- Specialist electronic system design and computer engineering tools
- Onsite hardware library providing a range of devices and components including drones, robots, 3D printers, VR headsets to be used for student projects and activities
- Industrial mentoring programme for Software Engineering course units
- Guest lectures by industry and academics from other institutions
- Newly refurbished computing labs with modern desktop computers
- Collaborative working labs complete with specialist computing and audio visual equipment to support group working.





Learning support

Peer support scheme

Our peer support scheme is one of the largest in Europe. Peer mentors are higher-year students on the same degree programme as you, who will help you find your feet when you arrive here and adjust to student life. As they'll have already been a student at Manchester for at least a year, they should be able to help you with anything you might be worried or unsure about.

PASS (Peer Assisted Study Sessions)

Led by volunteer students, PASS sessions will often be based around a specific area of study. You'll have the opportunity to consolidate and build on your existing knowledge through discussion with other students in an informal and supportive environment, where you can compare notes, analyse, ask questions and talk through ideas.

Academic advisers

Study with us and you'll be assigned an academic adviser who is there to give advice about any academic issues throughout the duration of your course. Your adviser will be able to help you with the transition from school or college to university – and can help you get to grips with studying and learning more independently. They'll also be able to help you develop your skills in academic writing or research, or any other skills that are specific to your degree programme.

Disability support

If you have additional needs arising from a medical condition, physical or sensory disability, a specific learning disability such as dyslexia, or a mental health difficulty that affects your study, we can provide support. Contact or visit our Disability Advisory and Support Office before you apply, to discuss your needs and the support available.

www.manchester.ac.uk/dass

Find out more about the personal and academic support available to you throughout your studies: www.manchester.ac.uk/study/experience/student-life/university/student-support



Apply

How to apply

www.manchester.ac.uk/study/ undergraduate/applications

Please note that the course units listed in this brochure only represent a sample of the full breadth of available units for each course. Units are reviewed on an annual basis and as such may vary slightly to those advertised.

For up-to-date course information, including unit detail and entry requirements in full, visit our course finder: www.manchester.ac.uk/undergraduate

Typical offer

A-level: A*A*A-A*AA

We require A* in A-level Mathematics or equivalent, with the exception of Human Computer Interaction which requires two science and/or maths subjects studied at A-level or equivalent

IB: 38

For full details of our entry requirements: www.manchester.ac.uk/ugcourses

Our courses

| Artificial Intelligence | BSc | 3 years |
|--|------|---------|
| | MEng | 4 years |
| Artificial Intelligence with IE | BSc | 4 years |
| | MEng | 5 years |
| Computer Science | BSc | 3 years |
| | MEng | 4 years |
| Computer Science with IE | BSc | 4 years |
| | MEng | 5 years |
| Computer Systems Engineering | BSc | 3 years |
| | MEng | 4 years |
| Computer Systems Engineering with IE | BSc | 4 years |
| | MEng | 5 years |
| Software Engineering | BSc | 3 years |
| | MEng | 4 years |
| Software Engineering with IE | BSc | 4 years |
| | MEng | 5 years |
| Computer Science | BSc | 3 years |
| | MEng | 4 years |
| Computer Science | BSc | 4 years |
| numan Computer Interaction with IE | MEng | 5 years |
| Computer Science and Mathematics | BSc | 3 years |
| Computer Science and Mathematics with IE | BSc | 4 years |

Which course?

Choosing your course

Our Computer Science courses provide broad coverage of computational principles, techniques and applications and, after the first year, offer considerable choice, enabling you to specialise in areas of particular interest.

Our interdisciplinary and joint courses combine core material from different disciplines, equipping graduates for jobs that require rich skill sets and cross traditional topic boundaries.

Find out more information about our courses at: www.cs.manchester.ac.uk/study/undergraduate/courses

Flexible options for changing courses

Undergraduate teaching is modular, with core course units shared by the different courses. This means that it is often possible to change between courses up to the end of your first year, and (grades permitting) transfer to the MEng or Industrial Experience variant of your course.

Industrial experience

Competition in the graduate job market has risen dramatically over the last ten years, and students are increasingly looking for ways to differentiate themselves. An excellent way to do this is by choosing an industrial placement as part of your degree course. This involves spending a year working in industry during your third year of study. As well as the salary that you earn during your placement, you also gain practical experience that can be invaluable both in your final-year project and when competing for graduate jobs.

Read more about industrial placements and what employers and students say: www.cs.manchester.ac.uk/study/undergraduate/industrial-placements

Artificial Intelligence

One of the challenges in computing is to make computers think, or be intelligent, so that they can solve new problems, or cope with the unknown. By combining the study of Al and traditional computing techniques with an understanding from psychology of how humans learn, this course prepares you for a career applying computing in challenging applications. Al-specific topics include the key techniques of machine learning, which are built upon knowledge representation and reasoning. This course gives you the opportunity to study these techniques in the context of general computing, and their application in areas such as computer vision, natural language processing and robotics.

Course overview

- Teamwork-focused projects give students the opportunity to tackle and resolve real-world problems
- Theme grouped course units allow students to specialise from year 2 onwards
- Industry input ensures that our themes introduce cutting-edge approaches and technologies.

Year Sample course units

- Programming
 Data Science
 First Year Team Project
- 2 > Machine Learning and Optimisation
 > Programming Languages and Paradigms
 - Computer Graphics and Image Processing
 - Agile Software Engineering
 Cognitive Robotics
 - > Third Year Project

3

 Modelling Data on the Web
 Parallel Programs and their Performance
 Cyber Security By developing new applications in science, engineering and business, computer science is changing people's lives. Our Computer Science course combines the study of software and hardware, and information and communication technologies. You will gain not only knowledge and practical experience of the latest technologies, but also grounding in the underlying principles of the subject. It is this combination of skills that enable our graduates to keep pace with this fast moving subject, and secure rewarding careers.

Computer Science

Course overview

- A broad and flexible course that provides the freedom to choose from an extremely wide range of Computer Science topics
- Equips students with skills that are in high demand from industry
- A large School with an excellent staff to student ration of 1:12.

Year Sample course units

- Fundamentals of Computation
 Operating Systems
 - > First Year Team Project
- 2 > Algorithms and Data Structures
 - > Logic and Modelling
 - Programming Languages and Paradigms
 - > User Experience
 > Advanced Algorithms
 > Natural Language Systems
 - Industrial Project
 Text Mining

3

4

> Principles of Digital Biology

Further information:

www.cs.manchester.ac.uk/study/undergraduate/ courses/artificial-intelligence

| UCAS code | BSc | 3y | G700 | |
|------------|------|----|------|----------------|
| | MEng | 4y | G702 | DCS Accredited |
| With | BSc | 4y | G701 | Degree |
| Experience | MEng | 5y | G703 | |

| UCAS code | BSc | Зy | G400 | |
|------------|------|----|------|----------------|
| | MEng | 4y | G401 | bcs Accredited |
| With | BSc | 4y | G405 | Degree |
| Experience | MEng | 5y | l100 | |

Computer Science – Human Computer Interaction (HCI)

HCl is radically changing the way in which we experience our world, optimising the interaction between computer systems and their human users. HCl is truly interdisciplinary, at the intersection of computer science, behavioural sciences and social science. Here at Manchester we equip you with the skills needed to contribute to this exciting and rapidly-evolving field. We provide you with the highest level of education in understanding and improving future generations of user interfaces and interactions. Course units are delivered by specialists in their field, from neurophysiology to advanced social network analysis, and from complex software engineering and application development to qualitative research design and methods.

Course overview

- Plan, design, develop, and evaluate all aspects of interactive systems, device interfaces, and interaction scenarios
- Students attend course units from Neuroscience, Social Science and Statistics offering an exciting cross-disciplinary experience
- Students can specialise very quickly allowing a detailed understanding of HCI from early on in the course
- The course equips students with skills that are in high demand from industry

| UCAS code | BSc | Зy | l140 | |
|------------|------|----|------|----------------|
| | MEng | 4y | 1142 | DCS Accredited |
| With | BSc | 4y | l141 | Degree |
| Experience | MEng | 5y | 1143 | |

Year Sample course units

> Data Science
 > Brain and Behaviour
 > Excitable Cells

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> Software Engineering
 > Cognitive Neuroscience
 > How to Make a Brain

 Natural Language Systems
 Advanced Social Network Analysis

 Anthropology of Vision, Memory and the Senses

Industrial Project

 Modelling Data on the Web
 Ontology Engineering for the Semantic Web I always had the mindset in my degree that I was learning how to learn. I feel like the BSc in Computer Science gives you a very holistic view of the subject, all the way from logic gates to high-level modules like Computer Vision.

Todd Davies

BSc Computer Science with IE Now working at Google Offices, Munich



Here at Manchester, we encourage and support all our students to gain industrial experience during their study. This not only enables them to broaden and deepen their skills by combining academic knowledge with practical experience in the workplace, but also connects them with potential employers to help shape

their future career.



Dr Duncan Hull Lecturer and Employability Tutor, Computer Science

Computer Systems Engineering

Sophisticated electronic systems permeate all aspects of life - including MP3 players, games consoles, mobile phones, vehicle control systems and radar. All of these are embedded systems, which typically contain one or more microprocessors, memory, a communications capability, and application-specific hardware and software. We need a wide range of knowledge and skills to support their development, including digital electronics, software engineering, computer architecture and digital signal processing. This course involves the study of subjects crucial to the design and implementation of embedded systems, and the opportunity for involvement in leading-edge research and development projects, often sponsored by industry.

Course overview

- Students will graduate with skills in both software and hardware development
- Access to an extensive computer science hardware library with high-tech equipment to support students' project work.

Year Sample course units

- Mathematical Techniques for Computer Science
 Fundamentals of Computer Engineering
 - > Fundamentals of Computer Architecture
- > Processor Microarchitecture
 > System Architecture
 > Microcontrollers
- Chip Multiprocessors
 Advanced Computer Graphics
 The Internet of Things
 - Automated Reasoning and Verification
 Designing for Parallelism and Future Multi-Core Computing
 Business Feasibility Study

| UCAS code | BSc | 3y | HH66 | |
|------------|------|----|------|----------------|
| | MEng | 4y | GH4P | bcs Accredited |
| With | BSc | 4y | HHQ6 | Degree |
| Experience | MEng | 5y | H650 | |

Software Engineering

Software systems are at the heart of all successful modern businesses. These systems are complex and long-lived, and must be robust and adaptable. By studying software design and production techniques on our course, you will be equipped with the skills needed to follow a career specifying and developing such systems. Software engineering techniques consider the whole lifecycle of an application, from its specification and design, through to its implementation and testing, as well as its maintenance and adaptation. Central to these techniques is the use of specifications and models, which support analysis of solutions for correctness and the generation of skeleton implementation code. Current achievements include image and voice recognition and NASA's Mars Rovers.

Course overview

- You will gain not only knowledge and practical experience of the latest technologies, but also a grounding in the underlying principles of the subject
- Examines the fundamentals of the business environments within which complex software systems are deployed
- Our Industrial Mentoring Scheme gives you the opportunity to work in a team to solve real-world challenges.

Year Sample course units

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2

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- Fundamentals of Computer Architecture
 Fundamentals of Computer Engineering
 - > First Year Team Project
- Processor Microarchitecture
 Distributed Systems
 Logic and Modelling
- 3 > Third Year Project
 > Managing Finance in
 - Enterprises for Computer Scientists > Documents, Services and
 - Documents, Services and Data on the Web
 - Industrial Project
 Agile and Test-Driven Development
 Component-Based Software

Development

Computer Science and Mathematics

Mathematics and Computer Science have always been closely related, each providing support and suggesting new challenges to the other. This joint honours course enables you to acquire a useful combination of mathematical and computer science knowledge and skills. Topics studied develop your knowledge and understanding of important mathematical ideas, including the concepts of rigorous argument, formal proof and the power of abstract formulation of problems. These are combined with core computer science topics on programming and software engineering, together with a study of the mathematical principles underpinning the foundations of computing.

Course overview

- This interdisciplinary course combines the study of computer science (50%) with the study of mathematics (50%)
- Traditional careers to which both computer science and mathematics graduates progress are open to you
- Industry input and support for student projects and course units.

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|------|----------|-------|------|-------|
| rear | Samp | ne co | urse | units |

- First Year Team Project
 Foundations of Pure Mathematics
 Fundamentals of Computation
 - Real Analysis
 Logic and Modelling
 Algorithms and Data Structures

2

> Third Year Project
 > Al and Games
 > Mathematical Logic

| UCAS code | BSc | 3y | GG6K | |
|------------|------|----|------|----------------|
| | MEng | 4y | GG64 | DCS Accredited |
| With | BSc | 4y | G603 | Degree |
| Experience | MEng | 5y | 1300 | |

| UCAS code | BSc | Зу | GG14 | bcs Accredited |
|----------------------------------|-----|----|------|----------------|
| With Industrial Experience | BSc | 4у | GG41 | Degree |

Career opportunities

Computer Science graduates from The University of Manchester :

| 79% | 13% |
|------------|---------------|
| Employed | Further study |

Salaries

| UK average | f | 23,000 |
|--------------|---|--------|
| UK Comp Sci | £ | 25,203 |
| UoM Comp Sci | £ | 29,490 |

Further study options

MSc – 64% MA – 11%





Most popular qualifications



Most popular institution

What our graduates do:

Where our graduates work:

| Business Analyst | ARM |
|-----------------------|----------|
| Hardware Engineer | BBC |
| Management Consultant | EA Games |
| Programmer | Google |
| Researcher | IBM |
| Software Developer | NHS |
| | |





Women in science and engineering

The Department of Computer Science actively works towards generating an inclusive environment for all of our students and has been awarded an Athena SWAN Bronze award for its commitment to the advancement and promotion of the careers of women in STEM in higher education and research.

Although women are currently under-represented in computer science in the UK, here at Manchester we have an unusually high number of women among our academic staff (24%) and we have also seen a growth in our number of female students in the last few years, which is currently 22%.

Students benefit from a supportive study environment and an exceptional technical education, coupled with opportunities to develop strong communication and teamworking skills

Read about our Women of Wonder: www.se.manchester.ac.uk/people/women-of-wonder

Watch the stories of some of the women in our Faculty: www.mub.eps.manchester.ac.uk/scienceengineering/2017/03/06/women-of-wonder



Professor Carole Goble

Professor Carole Goble CBE FREng FBCS is a Professor of Computer Science. Her interests are in using knowledge engineering and computational systems to aide scientists to accelerate scientific discovery and share and reproduce their results. She leads a multi-disciplinary team of computational scientists, computer science researchers and software engineers who produce open source production systems that are part of the UK's and Europe's e-Infrastructure for Science. She is passionate about high-quality software engineering in science, and in revolutionising how scientific results are reported and valued through 'research objects' rather than articles.

Professor Goble co-founded the UK's Software Sustainability Institute and leads initiatives in major pan-national Research e-Infrastructures for Biology involving over 20 countries. She works with Biologists, Chemists, Ecologists, Social Scientists as well as e-Infrastructure developers and publishing houses on: reproducible research, computational workflows and scientific data curation, preservation and sharing, semantic interoperability, knowledge representation, and the semantic web. Undergraduates supervised by Professor Goble have significantly contributed to web-based platforms, tools and techniques which are used in international e-Infrastructures.



Dr Caroline Jay

Dr Caroline Jay is a Senior Lecturer in Empirically Sound Software Engineering. Her research focuses on modelling how digital information is perceived and used by people. She has also taken a growing interest in what we can learn about the human brain by considering the way we design and create technology.

Before becoming a Computer Scientist, Dr Jay qualified as a Psychologist. She is currently heading up the Data Science Meets Creative Media project, which is funded by The University of Manchester Research Institute and BBC Research and Development. She is a fellow of the Software Sustainability Institute and a keen advocate for open and reproducible science.

Dr Jay's research focuses on understanding the human relationship with technology with the aim of improving the way that technology is designed. Dr Jay's research seeks to think more about technology design from a human perspective, rather than relying on tech creators to dictate 'the next big thing'. Students will benefit from Dr Jay's cutting-edge research which feeds directly into shaping her undergraduate teaching.

Make your mark with Stellify

I wanted to try something completely new. Transforming unused and overgrown land into areas where fruit and vegetables can be grown gave my volunteering an environmental focus.

Volunteering is a different experience from study. For me, as a chemical engineering student, it's enabled me to think outside my discipline, which by its nature is very technical.

Here at Manchester, volunteering is embedded in the very heart of the University's culture – there are so many opportunities to try something new, which in turn can have such a positive impact on our communities.



Read Alessia's story at: www.manchester.ac.uk/make-your-mark At Manchester you'll find a whole host of transformational academic and extracurricular activities to help you stand out and make your mark on the world. You could even prove your abilities to potential employers by gaining a prestigious award.

We call this process **Stellify**: to change, or be changed, into a star.

Stellify offers you opportunities to develop and grow at a university leading the way in social responsibility. Here's how.



Learn without boundaries

 Enjoy interdisciplinary, international and entrepreneurial study options outside your course.

Understand the issues that matter

Become ethically, socially and politically informed on some of humanity's most pressing global issues.



(i)

Make a difference

Contribute to and learn from local and global communities through volunteering.



Step up and lead

Gain confidence and experience by assisting and inspiring your peers.

\checkmark

Create your future

Explore countless opportunities for professional career development.

STELLIFY

www.manchester.ac.uk/stellify

Manchester engineering campus development

A world-leading campus for teaching, learning and research, providing a brand new home for the next generation of engineers and material scientists.

It's a playground for engineers! It's got facilities and spaces - some social, some very technical - to let you work with other people to do some really amazing things.

Its workshops and lab spaces will become amplified centres of creativity, innovation and identity, allowing students to solve problems collaboratively to reflect the way industry works.

Learning will not be confined to the classroom – it will deliver a variety of adaptable and innovative learning spaces, recognising that there is no one right teaching and learning style.

Engineering is about creativity and the first thing you will see when you come into the building is students 'making' and 'doing'.

Our new campus reflects our pride in Manchester's rich academic and civic heritage, while showcasing our ongoing evolution of education and research.



Student project

Challenge yourself – you could help solve a global issue, or develop an invention to change the world!

Individual and team based projects form a key part of your studies here at Manchester. Project work facilitates opportunities to develop and enhance your skills in:

- Communication
- Time management
- Teamwork and collaboration
- Innovation and design
- Reflection and analysis

All of which are key skills in supporting your successful navigation of your degree as well as supporting you in your future career.

Projects are endlessly diverse and can also offer opportunities for inter-disciplinary collaboration. Projects range across a broad spectrum of themes from Digital Art – change detection in live video through to Virtual Education - Application Development for use in Secondary Schools, Modelling Social Networks, Visualising Allergy Hotspots, Real-time Hand Tracking, and Animation of Avatars using Human Motion Capture Data.





Everyone will just chat to each other, even between years - because you're all here doing the same thing or you've been there before, which creates such a friendly atmosphere within the Department.

Caitlin Fotheringham BSc Computer Science



Josh Langley MEng Computer Science with IE Now working at Bloomberg offices, London



The University of Manchester

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This brochure was printed in 2019 for the purposes of the 2020 intake. It has therefore been printed in advance of course starting dates and for this reason, course information may be amended prior to you applying for a place. There are a number of reasons why changes to course information and/or published term dates may need to be made prior to you applying for a place – more details can be found on our website. Prospective students are therefore reminded that they are responsible for ensuring, prior to applying to study, that they review up-to-date course information by searching for the relevant course at:

www.manchester.ac.uk/undergraduate/courses

Further information describing the teaching, examination, assessment and other educational services offered by The University of Manchester is available at:

www.manchester.ac.uk/undergraduate

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