Postgraduate study in Computer Science

Computer Science allows us to abstract, reason, represent, visualise, model and understand the world. It also allows us to build tools to change it.

Professor Russell Beale
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##Learn more

**Postgraduate Admissions Team**

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[www.cs.bham.ac.uk](http://www.cs.bham.ac.uk)

**Come along to an Open Day:**

[www.birmingham.ac.uk/opendays](http://www.birmingham.ac.uk/opendays)

**Contact us**

Our current students and alumni are happy to answer any questions you might have about life and study in Computer Science at Birmingham. Please contact: msc-admissions@cs.bham.ac.uk for details of our ‘Applicant Facebook Group’

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[www.facebook.com/uobcompsci](http://www.facebook.com/uobcompsci)

**Follow us on twitter**

[uobcompsci](http://uobcompsci)
Welcome

I am delighted that you are considering postgraduate study at Birmingham. Birmingham is a research-led university, and postgraduate students are central to our learning community. Our wide portfolio of research makes Birmingham one of the most popular universities for postgraduate study in the UK, and we hope that you will find this brochure of use when making your decision on where to study.

The School of Computer Science was established in the late 1950s and became one of the first academic departments in the UK to undertake research and teaching in this area. Some 50 years later, we now provide specialist teaching and conduct world-leading research in fundamental and applied computer science, artificial intelligence, optimisation, computer security, medical imaging, software engineering, human computer interaction and robotics. We are proud to deliver outstanding postgraduate education that offers a range of exciting career opportunities for students from around the world.

Our Department consistently ranks in the top ten in University League Tables and we have excellent student support facilities.

We are eager to receive applications from highly motivated and well qualified graduates and hope that you will find all of the information you need.

Professor Jonathan Rowe
Head of the School of Computer Science
It may be a bit of a cliché, but computing moves so fast it’s hard to pin it down exactly. Ever more challenging market demands mean that technology never stands still and that makes for a dynamic sector offering exciting careers with excellent rewards.

The term ‘computing’ covers every kind of digital technology that we use to create, store, communicate, exchange and use information. As such, it is the foundation for small and large businesses to build their strategies and grow. It is also the key to making our personal lives easier and more fun: mobile phones, online shopping, social media, communicating - we owe them all and a lot more besides, to computer science.

What can I do with a postgraduate degree in computer science?
Our postgraduates find themselves in a variety of environments within academia, research, industry, government and private organisations. The following is a short list of research and vocational areas:

- **Software Engineering**: developing methods for producing software systems on time, within budget and with few or no defects
- **Software Applications**: applying computing and technology to solving problems outside the computer field, eg, in education or medicine
- **Computer/Cyber Security**: covers all the processes and mechanisms by which computer-based equipment, information and services are protected from unintended and unauthorised access, change or destruction
- **Artificial Intelligence**: developing computers that simulate human learning and reasoning ability
- **Information Technology**: developing and managing information systems that support a business or organisation
- **Theoretical Computer Science**: investigating the fundamental theories of how computers solve problems and applying the results to other areas of computer science
- **Operating Systems and Networks**: developing the basic software computers use to organise themselves or to communicate with other computers

Where can I work?
You could join a technology consultancy firm like Accenture, PwC, CHP Consulting, LogicaCMG, BAE Systems, PA Consulting, Capgemini or one of the global IT giants, such as Microsoft, Google, Oracle, Hewlett Packard, IBM, Cisco Systems, and Apple, amongst many others.

There are a huge number of IT-focused UK companies, not to mention opportunities in investment, retail banking and financial computing and analytics (such as Goldman Sachs, Deloitte, J.P. Morgan, Morgan Stanley, Bank of England, Bank of America, HSBC, Barclays, RBS); telecommunications companies (such as BT, Vodafone, Orange, AT&T); IT for retail businesses (such as eBay, Amazon, Tesco, Argos, Expedia) and public sector organisations (such as NHS, GCHQ, Home Office).

Some students choose careers in teaching, research or technology development at universities both in the UK and overseas. There is a great deal of potential for postgraduates looking to put their computing skills to good use.

What skills will I develop?
We will broaden your knowledge of selected areas of computing by a combination of taught modules and individual project work, supervised by research active members of staff who will help you to develop appropriate investigation and study skills. Your course will give you a disciplined approach to analysing problems and the ability to design creative solutions, whilst critically evaluating the results. You will also develop management skills such as communication, teamwork, time management and report writing.

Through further study at an advanced level, postgraduates get into the habit of questioning and conceptualising, and these practices transfer well into the workplace.

Your prospective employers will be interested in both the technical skills (such as programming) you develop and your transferable skills such as writing reports and giving presentations.

What does the future hold?
Your career prospects are great and computing graduates with a good degree are in demand. Plus, with the number of computer science graduates from the UK diminishing at the same time as jobs are increasing, students with a postgraduate degree have an excellent chance of securing employment.
Summary of Postgraduate Degree Programmes

Computing crosses boundaries between mathematics, science, engineering and business. It also takes in important competencies that lie at the very foundation of professional practice.

Our portfolio of computer science programmes takes into consideration the broad nature of the discipline, so we offer a wide range of courses to meet the diverse requirements of our students:

**Taught programmes**

**MSc Advanced Computer Science**
This degree is an advanced programme which draws upon the school’s international research reputation. It is designed to prepare graduates for a career in academic or industrial research in computer science. It offers a broad range of advanced taught modules from which students can select the areas they are most interested in. Knowledge is also deepened through individually supervised research in one of the many research areas of the school. For more details see page 10.

**MSc Computer Science**
This one year programme offers graduates of a non-computing discipline an education in developing an expertise in computing. Often referred to as a ‘conversion course’, it is the longest running programme of its kind in the UK and contains significant programming component. It is designed to give you a grounding in both the fundamentals of computer science and practical software development skills with a choice of in-depth optional modules. For more details see page 12.

**MSc Cyber Security**
Graduates will gain an understanding of the computer security technologies that underpin products. The degree covers the theory and practice of designing and building secure systems. It provides a firm grounding in cryptography, network security, and secure programming. For more details see page 14.

**MSc Human Computer Interaction**
Human Computer Interaction is one of the most important aspects in any successful computer system and also provides great opportunities for innovation and creativity. In this course you will cover the underpinning theories, methodologies and practice of the discipline. You will also have the opportunity to broaden your studies through optional modules in areas such as Robotics, Security or Neural Computation. The course builds upon the world class research of the HCI Centre through project work and is designed to prepare you for a career in research or in industry or commerce. For more details see page 16.

**MSc Robotics**
This programme is intended for graduates of numerate disciplines allied to robotics, including electronic engineering, computer science, mechanical engineering, physics and mathematics. Students will learn theories of intelligent robotic control and software tools required to implement standard algorithms in mobile robots and robot manipulators. Graduates of the programme will either work in industry or pursue a research degree in robotics. For more details see page 18.

**MRes Natural Computation**
The MRes in Natural Computation is a one-year full-time degree for students who have found their undergraduate study stimulating and want to learn in-depth about this emerging interdisciplinary field. For more details see page 20.

**Research programmes**

**PhD Computer Science**
For students wishing to pursue careers in research and academia, we offer a PhD in Computer Science. For more details see page 22.

A PhD (three year) programme will demonstrate the ability of the student to conduct original research, and provides the opportunity to develop expertise in a specific area of interest and to gain the skills needed for independent research. Students become part of the existing research community and benefit from the experience and knowledge obtained from on-going research projects in the School. Research students are organised into various research themes.

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**Student profile**

Sara Hassan
Current PhD student

'I applied to study at Birmingham because of its high ranking, and completed an MEng here, before deciding to embark on PhD study.'

The continuous improvement of the modules which occurs every year as a result of student feedback is one of the best things about the Department, and having supportive, friendly lecturers and course mates make the University experience a very rich one.'

Read Sara’s full profile – www.birmingham.ac.uk/sara-hassan
Studying Computer Science at Birmingham

Birmingham has a history of research excellence, a stunning campus with exceptional facilities, and a culturally diverse academic community, all set within one of the most vibrant cities in Europe. Birmingham is one of the leading universities in the country for postgraduate study in computer science.

Choosing the right university is one of the most important and exciting decisions you will make. It will shape your future and directly affect your career path. To make the best decision for you there are a number of factors you need to consider:

Teaching quality
Computer teaching in Birmingham is considered to be excellent by both students, and independent reviewers.

The Guardian League Table 2016 has ranked our School fourth out of all UK Institutions offering Computer Science and IT. The Complete University Guide 2016 has also placed our School as one of the top ten Computer Science Departments in the UK, ranking us highly for research and graduate prospects.

We have the highest possible rating for our computer science teaching (from the QAA – Quality Assurance Agency for Higher Education)

Research excellence
We are currently ranked 8th by the 2014 Research Excellence Framework (REF) for the quality of our research intensity.

Our School has various Research Groups (AI/Robotics, Natural Computation, Medical Imaging, HCI, Security and Theory of Computation).

We are also home to the Centre of Excellence for Research in Computational Intelligence and Applications (CERCIA), The Human-Computer Interaction Centre (HCI), and the Centre for Computational Neuroscience and Cognitive Robotics (CNCR).

Our Security and Privacy Group is also recognised as an EPSRC/GCHQ Academic Centre of Excellence in Cybersecurity Research and we have a strong collaboration with the Centre for Computational Biology (CCB).

School facilities
As a student in the School you will be based within a purpose built multi-million pound building, which offers 24-hour swipe card access to an impressive range of state-of-the-art facilities. These include:
- Dedicated laboratories for Computer Science students
- A teaching laboratory for Robotics
- Research laboratories for Security, Medical Imaging and Intelligent Robotics
- A subject-specific library
- Various student/staff areas with collaborative teaching space (and drinks/snacks vending machines)
- Bookable meeting rooms

Student support
We are dedicated to ensuring our students have an enjoyable and beneficial time with us. All our students have their own academic advisor who meet with them on a regular basis to discuss progress, and the School also has a helpful welfare tutoring service and an international students’ tutor.

Additionally, the Student/Staff Consultative Committee provides a useful forum for raising issues, and the Computer Science Student Society, (CSS), offers student support and organises varied social events. The Department also sponsors a PG football team, and there are numerous societies and activities on campus to be part of.

The Postgraduate & Mature Student Association (PGMSA) is a voluntary student led group at the University and is a ‘Guild of Students recognised society’: www.students.guild.bham.ac.uk/pgmsa/

Postgraduate Mentor Scheme
The University operates a Postgraduate Mentor Scheme that allows prospective applicants to talk to current students and alumni to ask what life as a PG student at Birmingham is like. Find out more: www.pg.bham.ac.uk/mentors

Setting in
We want to make sure that you enjoy your time at Birmingham, so we make sure you have all the support you need to stay healthy and happy, and to succeed in your academic studies. Find out more: www.birmingham.ac.uk/postgraduate/support/health.aspx

Business and industry links
The School has taken the time to build strong local and national relationships with major industrial players from the public and private sector. Relationships include GCHQ, IBM, HP, MS, Capgemni, BT Exact, Honda, QinetiQ, Marconi, Rolls Royce, Severn Trent and Sony, Jaguar and Land Rover amongst many others.

Award-winning development
At the School of Computer Science we are not just renowned for teaching and research excellence. We also produce novel solutions for real-world applications. We work with Jaguar Land Rover to make their vehicles more secure, and have contributed to the development of the Trusted Platform Module which makes many of our computers capable of secure cryptographic operations. We have deployed autonomous, intelligent robots in security and health support facilities, and work closely with the nuclear industry to use similar systems to help speed up nuclear decommissioning. We are also proud to have developed a revolutionary, award-winning method for diagnosing skin cancer.

The campus
The Edgbaston campus is a safe, friendly environment with an impressive mixture of sculptures, striking Edwardian and modern buildings as well as a range of facilities for students. Set within 250 acres of parkland, it is a stunning place to be. Lawns, mature trees and pedestrian walkways contribute to the peaceful atmosphere on campus. Convenient facilities include bars, cafes, shops, a hair salon, a concert hall, banks, an art gallery, a medical practice and a nursery. We even have our own train station, and the city centre can be reached in under 10 minutes.
An international university
The School of Computer Science has around 150 international students from all over the world. Birmingham has over 7,500 students drawn from nearly 150 different countries; it is home to one of the largest communities of international students in the UK. The University is also a founder member of Universitas 21, an international network of 25 leading research-intensive universities in 17 countries.

Accommodation services
The University has a large amount of accommodation although most of our research students prefer to make their own arrangements. For more information visit www.birmingham.ac.uk/postgraduate/accommodation

Facilities
The University is investing £400 million over the next five years to transform our famous Edgbaston campus with new facilities that will be for the benefit of our students, staff and visitors. The University will deliver the city’s first 50 metre swimming pool in a brand new sports centre, create an outstanding academic library with a cultural student hub and open up a striking green park at the heart of the campus. Birmingham is also investing in brand new Halls of Residence at our Student Village and will continue its commitment to high-quality design and sustainable regeneration. Learn more: www.birmingham.ac.uk/university/building

Seminar series
The School runs several seminar series throughout the year, ranging from AI and Natural Computation, to HCI, Security, and Theory. They can take the form of a formal seminar or a lunchtime discussion, where staff and research students present their work. Seminars offered by other departments on the University campus are also open for you to attend. Find out more: www.cs.bham.ac.uk/events/seminars/

University Graduate School
Most of your work and your social contacts are likely to be based in your school, department or research group. However, as a postgraduate research student at Birmingham you will be a member of the University’s Graduate School. The aim of the Graduate School is to ensure that the environment in which graduate students work meets their social and academic needs. It provides a University-wide network for postgraduate students. For more information visit www.graduateschool.bham.ac.uk

Contact us
Our current students and alumni are happy to answer any questions you might have about life and study in Computer Science at Birmingham. Please contact: msc-admissions@cs.bham.ac.uk for details of our ‘Applicant Facebook Group’
Birmingham has been transformed into a city for young professionals and is one of Europe's most exciting destinations. It is more than somewhere to study; it is somewhere to build a successful career.

Birmingham is a modern, fascinating city. Famous for its historical industrial past it is now a centre of arts and culture, commerce and entertainment, with a vibrant and diverse community. Birmingham is home to the largest financial services and creative sectors outside London. The thriving business community offers you a wealth of opportunities when you join the job market, and around 40% of Birmingham graduates choose to make their home here after leaving university.

For more information on student life in Birmingham, visit: www.visitbirmingham.com/what-to-do/for-students where real Birmingham students will give you their opinions on everything from nightlife to culture and relaxation. View photos, read blogs watch films and sign up for their newsletter.

Modern city
Around £9 billion has already been ploughed into the city centre over the past 20 years and Birmingham continues to attract significant investment. The landscape of the area has changed significantly and more areas of the city are regularly being regenerated and transformed.

Birmingham is home to one of Europe’s largest shopping centres; the award-winning Bullring, with over 160 shops, restaurants and bars, including the iconic Selfridges building. It is also home to the Mailbox, a unique development that brings together designer fashion and lifestyle shops, luxury apartments, hotels and an array of restaurants and café bars. The Mailbox is also home to BBC Midlands’ television and radio. The city has also invested in a brand new Grand Central train station, serving over 140,000 passengers a day. Birmingham has excellent transport links to other parts of the UK, is a half an hour taxi ride to Birmingham International Airport and is only 90 minutes away from London via train.

Shopping, entertainment and culture in Birmingham
Although Birmingham is facing the future, it is still proud to showcase its past. The city
Factfile: The city of Birmingham

- A £96 billion regional economy makes the city a major engine of UK growth outside of London
- Birmingham is the ‘youngest’ city in Europe, with under 25s accounting for nearly 40% of its population
- Birmingham is home to some of the largest clinical trials clusters in the UK – helping to transform world-class cancer research into improved patient survival
- The Forensic Science Service pioneered the use of large scale DNA profiling and set up the world’s first DNA database from their laboratories in Birmingham
- Birmingham have over 8,000 acres of parks and open space, making it one of the greenest cities in the UK
- Sustainability: 80% of Birmingham’s new buildings are regarded as ‘Excellent’ by the environmental measurement rating BREEAM
- Air, road and rail connections provide access to 400 million people across Europe

Information courtesy of Marketing Birmingham.

was the hub of the industrial revolution and areas such as the historic Jewellery Quarter keep traditions alive. The canals are now fringed with bars and restaurants, and many visitors are excited by the city’s bustling nightlife.

There are more than 500 restaurants offering a vast range of international cuisine. After enjoying a meal, you could go for drinks or watch some of the best comedians on the circuit at the Glee Club. If you prefer live music, Birmingham has a number of leading venues for bands and local talent, including The Barclaycard Arena and The Genting Arena.

Birmingham is also home to one of the UK’s finest concert halls, Symphony Hall, where the City of Birmingham Symphony Orchestra is based, and Birmingham Hippodrome, where the Birmingham Royal Ballet is based. The city centre also has three other theatres and a number of cinemas, including the 30-screen ‘Vue’ at Star City, which shows the latest Asian and mainstream films under one roof.

In 2013 the new Library of Birmingham opened in Centenary Square. The library is 31,000 square metres, making it one of the largest public libraries in the world. Connected with Birmingham Repertory Theatre (The REP) there are always events and shows happening. Visit www.libraryofbirmingham.com for more information.

Sporting city
Birmingham is home to Premier League football clubs Aston Villa and Birmingham City and in recent years it has staged more sporting championships than any other UK city. The Warwickshire County Cricket ground, close to the University in Edgbaston, regularly hosts test matches and international tournaments including the Cricket World Cup. The city also boasts many golf courses, including The Belfry, which has hosted the Ryder Cup four times.

Welcoming city
There is something for everyone in Birmingham and you will get a warm welcome in one of the most culturally diverse cities in Britain. People from all over the world live, work and play here as part of a citywide community which has been harmonious and tolerant over many years. Our long record of industry and innovation contributes to the exciting and dynamic atmosphere of our historic city.
MSc Advanced Computer Science
www.birmingham.ac.uk/adv-computer-science

Subject at a glance
Mode(s) of Study           Full-time
Duration                   1 year
Entry Requirements         2:1 (Hons) degree in Computing or a closely related
discipline plus a solid foundation in programming
Start Date                  September
Admissions Tutor            Dr Hayo Thielecke
                            Tel: +44 (0)121 415 8742
                            Email: msc-admissions@cs.bham.ac.uk

The programme aims to:

- Allow graduates with a previous degree in computing to broaden their knowledge of leading areas of computing through the choice of options from a range of advanced taught modules
- Allow students to deepen their knowledge of selected areas of computing by individual project work supervised by research-active members of staff and to develop appropriate research skills. The final four months of the programme are spent on a summer project
- Provide a solid foundation for all graduates to pursue a career in the software industry with a particular focus on research and development, or the pursuit of further studies (such as a PhD)

Overview
This degree is an advanced programme which draws upon the school’s international research reputation. It is designed to prepare graduates for a career in academic or industrial research in computer science. It offers a broad range of advanced taught modules from which students can select the areas they are most interested in. Knowledge is also deepened through individually supervised research in one of the many research areas of the school.

This is a one-year, full-time degree. In the first eight months of the degree, students study taught modules, chosen from a wide range of topics. In the final four months, students work on their summer project and dissertation, individually supervised by a member of the research-active staff in the school.

Career prospects
The importance of project work, together with a very wide range of options available to you makes this MSc unusually suited as a preparation for a research career in computer science. Students graduating from this programme usually have developed a taste for working on difficult problems and look for a career where they will be able to apply their enhanced analytical and technical skills. Some students go on to a PhD, either at Birmingham, elsewhere in the UK or abroad. Other graduates move into industry, typically taking technically demanding jobs.

Programme structure

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<td>Taught modules chosen from options</td>
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Core module descriptions
The programme is taught in two semesters followed by a summer project.

Optional modules
This MSc has an unusually wide choice of modules from which students can choose freely. Options are offered in specialised modules, including: Human Computer Interaction, Robots, Machine Learning and Networks, in addition to Masters-level courses on core computer science.

For a list of all modules available, please visit: www.cs.bham.ac.uk/internal/programmes/

Summer project
The four summer months are spent working on the project and dissertation. These projects are often of an extremely high level and quality, as a result of the advanced focus of the programme and the high level of qualifications we ask of students joining this programme.

Examinations and assessments
Each project is assessed by the supervisor and a moderator. Taught modules are assessed in a variety of ways: summer written examination, practical assessment during the semester, or a mixture of both.

Entry requirements and admission
The entry requirements for this course are high, as we only admit students with a solid foundation in Computer Science. Our minimum requirement is an Upper Second class degree in a computing or mathematics related discipline or an international equivalent. As a guide, you should be in at least the top 15% of your academic year.

For further information on the admissions process and additional entry requirements, see page 26, or apply via the relevant course finder page: www.birmingham.ac.uk/adv-computer-science

Graduate profile

Alexander Darer
PhD Cyber Security Student, University of Oxford

‘I studied at the University of Birmingham for four years, and during that time I discovered the areas of computer science I wanted to further my understanding in. I am now studying a field which spans a wide variety of different disciplines; for example cyber security encompasses much more than just computer security, it also links to social science and political science. This means that there are so many different avenues for pursuing different areas of research and there is always something exciting occurring within the field itself!

The best part of the MSc Advanced Computer Science degree was the fact I had the opportunity to explore areas of research I hadn’t looked into before, and there are so many brilliant people (supervisors and students) at the University of Birmingham who will guide you as you progress.’

Read Alexander’s full profile – www.birmingham.ac.uk/alexander-darer

Student profile

Manal Alsitrawi
Programme of study: MSc Advanced Computer Science

‘I am currently an IT Specialist at the University of Bahrain. I studied an MSc in Advanced Computer Science at Birmingham, and had a great experience, acquiring knowledge in computer science and studying in an environment that made me feel as comfortable as if I was at home.’

Read Manal’s full profile – www.birmingham.ac.uk/manal-alsitrawi
MSc Computer Science
www.birmingham.ac.uk/msc-computer-science

Subject at a glance
Mode(s) of Study Full-time
Duration 1 year
Entry Requirements at least a good 2:2 (Hons) degree or equivalent in any subject other than Computer Science
Start Date September
Admissions Tutor Dr Jim Yandle
Tel: +44 (0)121 415 8742
Email: msc-admissions@cs.bham.ac.uk

The programme aims to provide:
- A solid foundation for a career or further study in computing/IT and covers the core areas of computer science
- A grounding in the theoretical underpinnings of contemporary developments in computer science
- A choice of options to reflect the student’s interests and first degree
- A grounding in practical software development skills

Overview
The MSc Computer Science is a one-year programme that allows graduates of non-computing disciplines to develop expertise in computing. Often referred to as a ‘conversion’ course, it is the longest running programme of this kind in the UK (since 1969).

The programme is different to IT programmes, in that it is a technical degree with a significant programming component. It is designed to give you a grounding in both the fundamentals of computer science and practical software development skills and choice of in-depth modules as optional modules. Students from all backgrounds are welcome to apply, but a certain amount of background in mathematics and scientific subjects, for example at ‘advanced’ high school level, would facilitate mastering the new Computer Science subjects.

The mixture of core computing modules and a range of flexible options reflecting your interests and first degree provide a solid foundation for a career in computing or for further study.

Career prospects
Most students graduating from this programme move into industry to work on software development. Others use their new computing skills to enhance their employment prospects in work related to their first degree. Each year, some students join sales and software support teams in industry and commerce or start their own companies and a few join our PhD programme.

Core module descriptions
Software workshop
A major part of the first semester is devoted to the Software Workshop to introduce and develop object-oriented design and programming skills. The core of Java programming is covered in lectures but most of your learning will come from tutorials and practical sessions built around a series of assignments. These assignments begin with fairly small individual exercises and move onto larger tasks involving design and testing of your programs. In the second semester the exercises are, of course, more advanced and typically finish with a group project involving a networked Java application linking to a remote data base system, for instance an online bookshop.

Fundamentals of Computer Science:
A series of modules explore some of the fundamentals of computer science, both hardware and software. Topics will include: introduction to hardware, operating systems, networking, programming languages, data types and algorithms, the software lifecycle, stages of the lifecycle, case studies, relational theory, relational algebra, query languages, data design. The necessary mathematical background will be developed alongside its application in databases. Students will be introduced to an existing database system.

Specialist modules
Human-Computer Interaction covers the principles meant for building computing systems that interact with human users in a synergistic way. It draws on foundations in human psychology and graphic design and develops interaction models.

Introduction to Artificial Intelligence introduces the subject of how we can build computing systems that incorporate some aspects of intelligent behaviour such as logical reasoning, problem solving and automatic learning.

Programme structure

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Operating Systems and Networks gives an overview of the design of computer operating systems and computer networks. It also provides an opportunity for hands-on lab sessions for learning about a selection of essential Operating Systems and Network skills.

Optional modules
All students select at least one optional module. In addition, students that may have taken any of the compulsory modules in their previous curriculum or have specific interest in some subjects may opt to take additional optional modules. The modules available vary from year-to-year. The range of modules include: Fundamentals: Software Engineering, Cryptography, Evaluation Methods and Statistics, Intelligent Data Analysis, Introduction to Neural Computation and Machine Learning.

An option checker, together with the module descriptions is available at: www.cs.bham.ac.uk/internal/programmes/

Summer project
The four summer months are spent working on your project. Projects vary from applied software engineering through to work that is linked to our research groups. The common factor is that almost all projects involve the development of a large software system. Usually, projects are selected from a list of topics proposed by the teaching staff (possibly on behalf of an external customer) or students can suggest their own project, providing it is appropriate.

Examinations and assessments
The Software Workshop is currently assessed by assignments in the practical sessions, team project as well as a final examination. Taught modules are assessed in a variety of ways: summer written examination, practical assessment or a mixture of both. The project is assessed by a report, supported by a practical demonstration.

Entry requirements and admission
This degree will permit graduates to gain an understanding of the fundamentals of computer science and practical software development skills that prepares them to become computer professionals. The minimum entry requirement for admission is a good Lower Second class degree (or an international equivalent). Applications are accepted from able graduates from all subject areas except computer science.

For further information on the admissions process and additional entry requirements, see page 26, or apply via the relevant course finder page: www.birmingham.ac.uk/msc-computer-science

Graduate profile

Jen Crowe
Programme of study: MSc Computer Science
Current job title: Chief Navigator, Polarcus

'I graduated with a degree in Literature from the University of Birmingham. Computer Science had never even been an option for me, but having spoken with my then-tutor I decided to read up on the available conversion courses in the UK.

During the year I grew to love Computer Science, and it would not have been possible for me to complete my MSc without the facilities at the School - they were amazing and always available. Working on top of my study meant the ability to come in at various times was invaluable. I could not have completed my Masters without the support and understanding of the staff.

It’s difficult to describe how much fun I had in Birmingham. There was plenty of work for students, loads of places to live, always something interesting going on and the campus itself just made me happy by being there. It was everything I expected of University, and more!

I am now a Chief Navigator with Polarcus. Computer Science opened the door to my industry and then helped me advance very quickly by giving me a great foundation and the relevant building blocks to keep learning and creatively solving problems.'

Read Jen's full profile – www.birmingham.ac.uk/jen-crowe

Krisztina Nogradi
Current MSc Computer Science student

‘Birmingham is the perfect place to do a conversion degree. I was particularly convinced by the campus, the Open Day and the modules included in the course description. The campus is great for studying, both individually and in groups. Facilities like the library, the common rooms in the Computer Science building and the computer labs provide everything that a Computer Science postgraduate could possibly need.’

Read Krisztina’s full profile – www.birmingham.ac.uk/krisztina-nogradi

Student profile

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Student profile
The programme aims to:

- Allow students to obtain knowledge and expertise to evaluate, design and build secure computer systems
- Provide exposure to and experience with technologies and standards for such systems
- Provide a solid foundation for graduates to pursue a career in the software industry or research

Overview
Information about all aspects of life is now routinely stored and transmitted electronically, and ensuring security of a vast and complex online infrastructure is an ongoing and ever-increasing challenge.

Our MSc in Cyber Security is about designing systems that resist attack. As computers and IT systems become ever more prevalent and ever more connected with each other, the opportunities for attackers become even greater, and the need to resist them becomes more urgent. Computing infrastructure is now vital for communication, government, commerce, and control of our physical environment, and is a potential target of terrorist and criminal attacks. Graduates who understand the technologies that underpin products and practices to secure it will be in great demand.

The MSc intends to equip students to engage with complex, challenging problems and real-world issues, teaching students the intellectual and technical skills they need to deal with current and future cyber security threats. The degree programme considers all the layers at which security must be considered, from low-level attacks on hardware and software implementations, through to more abstract design principles underlying secure systems, to strategies for management of processes and people.

This is a one-year full-time degree programme for graduates in a computing-related discipline, taught by leading academics. It will allow students to obtain the knowledge and expertise to evaluate, design and build secure processes for people that are involved in cyber security. It covers the theory and practice of designing and building secure systems and gives you a firm grounding in cryptography, network security and secure programming, as well as optional modules in topics such as hardware and embedded system security, operating systems and incident management and forensics. The programme also gives you practical experience with technologies and toolkits for building internet-based software.

The programme has received provisional GCHQ accreditation and the University has been officially established as an ‘Academic Centre of Excellence in Cyber Security Research’ (ACE-CSR) by the UK government. This is an exciting development for us and this accolade is a testament to the first rate research and work taking place in our School. Students who wish to study the GCHQ certified pathway select specific modules (see next page).

Course Structure
All students studying the MSc Cyber Security undertake compulsory modules, and can choose from a variety of optional subjects. Our students also undertake a large, personally supervised project in the final months of the course.


Optional Modules from a range including: Compilers and Languages (Extended), Hardware & Embedded Systems Security, Incident Management and Forensics, and Networks (Extended).

Some modules are specific to the GCHQ certified pathway option. For more information on all modules available please see: www.cs.bham.ac.uk/internal/programmes

Industry Involvement
Our curriculum has been developed with the involvement of key individuals in the cyber security industry. As well as advising us on the skills they seek when recruiting graduates, they also contribute directly to the MSc programme through guest lectures and project supervision. Companies including Microsoft, Vodafone, Siemens, IBM and Hewlett Packard come onto campus to talk directly to our students.

Our Graduates
The MSc in Cyber Security is a new programme, but graduates of the MSc in Computer Security have gone on to work for companies including Accenture, IBM, PriceWaterhouseCoopers, BT and Delcam.

Our students gain the knowledge to become leaders in the field of cyber security and to shape the technologies that will be developed in the future. They are equipped to work on secure software development within the software and IT industry, or to become cyber security consultants. They may also choose to move on to PhD research.

Entry requirements and admission
The minimum entry requirement for this MSc is an upper second-class in Computer Science or a closely related discipline, and a solid foundation in programming and knowledge of data structures and algorithms. In particular, knowledge of object-oriented programming will be a strong asset.

For more information on the admissions process and additional entry requirements, see page 26 or apply here: www.birmingham.ac.uk/msc-cyber-security

Graduate profile
Robert Savage
Position: Digital Forensic and E-Disclosure Manager
Employer: CCL Group

‘I studied both a BSc and an MSc at Birmingham, with my postgraduate degree being in Computer Security*. I have always had an interest in computers so a degree in Computer Science was the obvious choice for me. During my undergraduate degree I developed an interest in computer security which led me down the route of doing a masters.

On graduating from the University of Birmingham I began working at PriceWaterhouseCoopers where I was involved in providing digital forensic support to a number of multinational fraud and bribery investigations. I stayed at PwC for 4 years at which point I moved into a 18 month role helping banks and insurers prevent and detect consumer application fraud. I have now been at CCL for 2 years during which time I have been focussed on supporting the development of the Legal and Corporate markets.’

* now Cyber Security

Read Robert’s full profile – www.birmingham.ac.uk/robert-savage

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Read Robert’s full profile – www.birmingham.ac.uk/robert-savage
MSc Human Computer Interaction
www.birmingham.ac.uk/mschci

**Subject at a glance**
- **Mode(s) of Study**: Full-time
- **Duration**: 1 year
- **Entry Requirements**: 2:1 (Hons) degree in Computer Science or Computer Engineering, however other disciplines such as Psychology or Design will also be considered
- **Start Date**: September
- **Admissions Tutor**: Professor Russell Beale
  - Tel: +44 (0)121 415 8742
  - Email: msc-admissions@cs.bham.ac.uk

The programme aims to:
Our aim is to provide a flexible programme of study to suit your background, interests and ambitions. In particular, we want to:
- Provide students with the core knowledge and skills to design, build and evaluate HCI systems
- Allow students to develop a deep understanding and expertise in the specialist sub-area of HCI where they want to focus
- Equip students to undertake a successful career in commercial HCI design or development
- Prepare students to undertake a successful career in Research and Development in HCI

**Overview**
The discipline of Human Computer Interaction is about many things: it is about the interface that a system provides (and, therefore, is the most important and most complex component of most systems) but it is also about so much more. We need to understand the people that use the systems and their abilities and constraints. We need to understand how to build systems that really work and also how to evaluate them. We also need to be able to think creatively in order to build innovative solutions to new problems and emerging applications and domains – to be able to solve the problems of tomorrow’s world rather than just those of today.

This course covers the underpinning theories, methodologies and practices of HCI. It includes specialist modules in application domains. Through course and project work your degree is intimately integrated into the research of the University’s HCI Centre.

This is a one year, full-time course consisting of 180 credits. Students will spend a good proportion of time studying taught modules - the core principles, theories, methodologies and application areas of the discipline will be covered. There will also be an opportunity to take optional modules in other areas. You will also have the chance to undertake one or two mini-projects (as part of your optional module choices). Here you will work one-to-one with one of our research-active staff to explore an area in great depth – analysing the problem and existing solutions, developing new ideas and building or evaluating prototype systems. You will develop your skills in analysis, research, and technology, and also in presenting and explaining your work clearly and effectively.

The final four months will be spent extending the work of one of your mini projects, again with expert one to one supervision.

The course will be taught through a variety of methods. There will be some small lecture classes, problem-based workshops and also one-to-one supervision. There will be some group work as part of the taught modules. There may be opportunities for some industry-based project work. Perhaps most importantly, you will be part of a small, highly qualified group of students working closely with researchers within the HCI Centre.

**Career prospects**
HCI spans all stages of the technological lifecycle from the conceptual planning required to design an interactive system, to evaluating the ways in which technology supports people’s practices. The application of HCI is relevant to a number of industries including health care, games and entertainment and mobile communication.

Graduates of this degree will have the skills to take a wide range of roles in industry such as user experience, interactive design or information architecture. Through the course you will not only have become a specialist in HCI but also have built the skills of analysing and researching new problems, of constructing creative and innovative solutions and of presenting and explaining your work clearly and effectively.

**Programme structure**

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<th>Semester 1</th>
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<td>Research Skills</td>
<td>Core Modules and Options</td>
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<td>Core Modules</td>
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Graduates of this programme are well prepared to continue their studies through research for a PhD. Many students choose this stream, but the demand for experts in Human Computer Interaction is such that the opportunities for successful careers in industry and commerce are tempting.

Core modules
The core modules aim to provide all students with the key knowledge to build a successful career in HCI. These will cover:
- The theoretical underpinning of HCI such as cognitive models and the constraints that human performance places on HCI systems
- Techniques for HCI evaluations: designing and conducting experiments, analysis of results
- HCI design methodologies
- Application areas such as Mobile and Context Aware systems, Affective Interfaces

Optional modules
Students are able to take optional modules (including mini-projects) outside of the core HCI programme. These can allow you to focus your studies more deeply into an area in which you are especially interested, for instance, speech, natural language. They also allow you to explore other parts of Computer Science. Some students will be interested in areas such as Robotics, Security or Neural Computation – either as an application area for their HCI work or as an enabling technology. We also offer other optional modules, ranging from Commercial Computing, Cryptography, Machine Learning to Interactive Systems Design. The full list of taught and optional modules is available here: www.cs.bham.ac.uk/internal/programmes/

Research skills
This module provides you with the basis of transferable knowledge and skills necessary for a successful career in industry or academia, with a particular orientation to computing-based disciplines. You will learn how to find and critically evaluate previous work as well as how to present your proposals and results effectively.

Mini projects
Each student undertakes a piece of research work related to HCI that can be seen as preparation for a possible final summer project under the supervision of a research-active member of academic staff. Supervision and the written report should address the development of skills in defining aims, objectives and plans; project and time management skills; systematic literature searching and written and verbal communication skills.

More than anything else, these mini-projects allow you to explore and develop new ideas and approaches and help you to explore a particular area in great depth.

There is no requirement for a mini-project to include development of software.

Projects are either negotiated from a list of academic staff’s interests or are developed from a student’s original idea.

Final project and dissertation
Each student undertakes a piece of research work that is expected to be based on one of the previously completed mini-projects. It is undertaken in collaboration with one of the research-active members of academic staff. Students should demonstrate an ability to define aims, objectives and plans, manage their project and time, use the results of systematic literature searches and communicate in writing and verbally. You don’t need, necessarily, to develop a program as part of the project, although that is usual.

It is through the mini-projects and the final project that you can really develop the skills, knowledge and expertise that you need. Projects can be very varied. They may be design focussed where you concentrate on building your skills for designing and building real-world systems. They may focus on the experimental evaluation of systems. It might also be that the work is research oriented – trying to develop novel techniques or understanding fundamental principles. The emphasis will depend upon your interests and the project will be developed in collaboration with your supervisor.

Examinations and assessments
As you would expect, assessment is by both practical and written coursework and examination. The project is assessed on the basis of a practical demonstration and a written report.

Entry requirements and admission
The minimum requirement is an upper second class degree. Most students will have either a first class or a high upper second class degree. You should, typically, be in the top 15% of your year. Most students will have a background in Computer Science or Computer Engineering, but we will also consider students from other disciplines (eg. Psychology or Design) who will then follow a modified programme.

For further information on the admissions process and additional entry requirements, see page 26, or apply via the relevant course finder page: www.birmingham.ac.uk/mschci
# MSc Robotics

www.birmingham.ac.uk/mscrobotics

<table>
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<th>Subject at a glance</th>
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<tr>
<td>Mode(s) of Study</td>
<td>Full-time</td>
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<tr>
<td>Duration</td>
<td>1 year</td>
</tr>
<tr>
<td>Entry Requirements</td>
<td>2:1 (Hons) degree in a relevant subject (Computer Science, Electronic Engineering, Physics, Mathematics or Mechanical Engineering), plus programming experience</td>
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<tr>
<td>Start Date</td>
<td>September</td>
</tr>
<tr>
<td>Admissions Tutor</td>
<td>Dr Michael Mistry</td>
</tr>
<tr>
<td>Tel:</td>
<td>+44 (0)121 415 8742</td>
</tr>
<tr>
<td>Email:</td>
<td><a href="mailto:msc-admissions@cs.bham.ac.uk">msc-admissions@cs.bham.ac.uk</a></td>
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</table>

This programme aims to:

- Provide students with the theoretical and practical underpinnings of robotics science and technology, focusing on key concepts in perception, control, and autonomy.
- Allow students to deepen their knowledge and obtain practical skills in selected areas of robotics through individual project work supervised by research-active members of staff.
- Prepare students for a successful career in industrial/commercial robotics engineering or in robotics research and development.

## Overview

The MSc in Robotics is a one-year full-time degree for graduates of numerate disciplines allied to robotics, including electronic engineering, computer science, mechanical engineering, physics and mathematics. Students will learn theories of intelligent robotic control and software tools required to implement standard algorithms in mobile robots and robot manipulators. Entrants to the programme should have a good level of mathematical ability in probability theory, linear algebra, and mathematical analysis, and the ability to program in either C/C++ or Java.

You will take compulsory modules in which you will study robotics to an advanced level. You will also work on at least one mini-project. Here you will work one-to-one with one of our research-active staff to explore an area in great depth – analysing the problem and existing solutions, developing new ideas and building or evaluating prototype systems. You will develop your skills in analysis, research, technology and also in presenting and explaining your work clearly and effectively. In addition, you will be able to take several optional taught modules from various fields.

## Programme structure

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All students work on a research project in an area of robotics over the summer, again with expert one-to-one supervision.

The course will be taught through a variety of methods. There will be some small lecture classes, problem-based workshops and also one-to-one supervision. There will also be some group work as part of the taught modules. There may be opportunities for some industry-based project work. Perhaps most importantly, you will be part of a small, highly qualified group of students working closely with researchers within the robotics lab.

## Career prospects

Through the course you will become a specialist in robotics. Graduates from this programme will be well-equipped for software development roles in the robotics industry or research and development roles, or to go on to pursue a research degree in robotics.
Core module descriptions

**Advanced Robotics**
Concerned with robot motion in a physical world, this module introduces the concepts and tools for modeling, simulating, and controlling dynamic robots. In a series of lectures we will study the fundamentals of manipulation including kinematics, dynamics, and control. Lab exercises will reinforce learned concepts by means of evaluation on a (real/simulated) physical robot.

**Intelligent Robotics**
This module is designed to give an appreciation of the issues that arise when designing complete, physically embodied autonomous agents. Some of the most popular methods for controlling autonomous mobile robots are introduced and hands on experience of engineering design is given. Lab exercises, lectures and workshops encourage independent thought on possible cognitive architectures for autonomous agents.

**Robot Vision**
Vision is one of the major senses enabling humans to act (and interact) in (ever) changing environments. In a similar vein, computer vision should play an equally important role in relation to intelligent robotics. This module focuses on the fundamental computational principles that enable conversion of an array of picture elements into structural and semantic entities necessary to accomplish various perceptual tasks. In a series of lectures, we will study the problems of low level image processing, recognition, categorisation, stereo vision, motion analysis, tracking and active vision. The lectures will be accompanied by a series of laboratory exercises where many of these computational models will be designed, implemented and tested in real-world scenarios.

**Optional modules**
Students select up to three optional modules. The modules presented will vary from year-to-year. The range of modules include: Advanced Robotics, Computational Vision, Graphics, Intelligent Data Analysis, Intelligent Robotics, Introduction to Neural Computation, Machine Learning, First semester mini-project and Second semester mini-project.

An option checker, together with the optional module descriptions are available at: [www.cs.bham.ac.uk/internal/programmes/](http://www.cs.bham.ac.uk/internal/programmes/)

**Final project**
Over the summer students work on a project which allows them to demonstrate professional competence in a substantial robotics-related task and to apply material learned in other components of the degree programme. Projects are chosen from staff suggestions or are developed from the student’s original idea. The project may be completed in industry in the form of a work placement under the lead supervision of an academic member of staff from the School.

**Examinations and assessments**
Assessment is by both practical and written coursework and examination. Projects are assessed on the basis of a practical demonstration and a written report.

**Entry requirements and admission**
The minimum entry requirement is an Upper Second Class degree or an international equivalent in Computer Science. Degrees in Electronic Engineering, Physics, Mathematics, Mechanical Engineering, or other numerate disciplines will be acceptable only if the student can show programming experience equivalent to that in a BSc Computer Science in either Java or C/C++.

For further information on the admissions process and additional entry requirements, see page 26, or apply via the relevant course finder page: [www.birmingham.ac.uk/mscrobotics](http://www.birmingham.ac.uk/mscrobotics)

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*Emmanuel Johnson*
MSc Robotics Student

"I applied to the MSc Robotics programme because it allowed me to study specifically what I was interested in. Most Schools around the world do not offer degrees in Robotics. The best part of my programme is the professors. They are experts in Robotics and they make themselves accessible. This allows you to gain the knowledge not offered in textbooks or online. They provide the support and insight I think all students need when trying to build their knowledge-base in any domain of robotics.

If you are looking to work and learn from some of the best, then the University of Birmingham is the place for you. Understand that obtaining a MSc in Robotics will not be easy but will prepare you to tackle some interesting robotics problems."

Read Emmanuel’s full profile – [www.birmingham.ac.uk/emmanuel-johnson](http://www.birmingham.ac.uk/emmanuel-johnson)
The programme aims to:

The MRes is a Masters degree by research. This means that you are taught core principles and then develop these skills by doing interesting, innovative research, supported by academic staff and peers. This is structured so that you learn how to plan, organise and manage your time; you learn what it is to be a scientific researcher; you help contribute to the development of new knowledge; you learn intellectual skills such as argumentation, exposition, and reasoning; and you develop as an individual by improving your communication skills, writing, collaborative working and creativity.

The programme is designed for highly competent students who are keen on research-oriented Masters programmes. It consists of a mini-project and a major research project, which will be two-thirds of the entire Masters programme. You will also study essential Research Skills, and a further 20 credits of optional modules from the following list:
- Nature Inspired Search and Optimisation
- Introduction to Neural Computation
- Intelligent Robotics (Extended)
- Intelligent Data Analysis (Extended)

An option checker, together with the optional module descriptions are available at: www.cs.bham.ac.uk/internal/programmes/
Natural computation is the study of computational systems that use ideas and gain inspiration from natural systems, including biological, ecological and physical systems. It is an emerging interdisciplinary area in which appropriate techniques and methods are studied for dealing with large, complex, and dynamic problems.

The aims of this programme are to:

- Meet the increasing need from industry for graduates equipped with knowledge of natural computation techniques.
- Provide a solid foundation in natural computation for graduates to pursue a research and development career in industry or to pursue further studies (eg. PhD).
- Give up-to-date coverage of current topics in natural computation (such as evolutionary algorithms, co-evolution, evolutionary design, nature-inspired optimisation techniques, evolutionary games, novel learning algorithms, artificial neural networks, theory of natural computation).

Career prospects
We have strong links with industry, especially through CERCIA, including Honda, BT, Thales, Unilever, GSK, Rolls Royce, etc. We encourage MRes students to carry out their research projects in collaboration with our industrial partners. Opportunities exist for students to do their project work within a company.

First semester mini project
This module consists of a research project on the in-depth investigation of a chosen topic coming from industry (strongly encouraged) or academia.

Research skills
This module provides you with the basis of transferable knowledge and skills necessary for a successful research-oriented career in industry or academia, with a particular orientation to computing-based disciplines.

Research project
The research project consists of solving a substantial problem using natural computation techniques (including hybrid techniques). Industrial co-supervisors will be used whenever appropriate. The research project requires you to apply the knowledge and skills you acquired in the programme to solve a difficult problem.

Examinations and assessments
The taught modules will be assessed by a mixture of written examinations and continuous assessment. The first semester mini-project will be assessed by a written report. You will write up your research project in the form of a thesis, which will be examined by an internal and an external examiner.

Entry requirements and admission
At least an Upper Second Class (2.1) degree or an international equivalent in Computer Science or Engineering with significant computing content. Applicants must possess competent mathematical skills. This is a highly selective Masters programme and only a limited number of places are available.

For further information on the admissions process and additional entry requirements, see page 26, or apply via the relevant course finder page: www.birmingham.ac.uk/natural-computation-mres
PhD Computer Science

Science today is a collaborative process
At Birmingham, we work closely in small teams of researchers embedded within a broad and lively research culture. This combination means you get the necessary focus, while keeping an eye on the bigger picture in which your work is placed. In consequence, we believe that this school is an outstanding place to complete a research degree.

Nurturing and monitoring PhD students
We offer supervision for the PhD in Computer Science. Most of our students are full-time, but a small number are part-time, usually working for UK companies. The supervision process usually takes the form of weekly meetings, although the frequency will vary according to need, at which ideas are exchanged, help is offered and written work is discussed.

Research themes
The staff and research students are loosely organised into informal research themes. Researchers are free to contribute to one or more themes and each theme organises its own activities. Cross-disciplinary research is a major feature of the school. Links exist with, for example, psychology, medicine, language studies and electronic engineering.

Supervision is arranged on an individual basis in order to match closely the interests of the student with those of the supervisor. We can only offer supervision in the areas in which we have academic expertise. These include:

Artificial Intelligence
Reasoning and Cognition covers research on architectures for accounting for human mental states and processes as well as recreating them in computer programs.

Robotics research focuses on intelligent robotics and related areas, including cognitive robotics, learning robots, fault diagnosis, machine learning and sequential decision-making.

Natural Language Processing includes metaphor understanding; emotion detection; temporal information analysis; corpus analysis.

Nature-inspired Computation
Natural Computation covers both basic and applied research in areas including evolutionary computation, neural computation, artificial life, self-organising systems, emergent behaviours, machine perception, evolutionary robotics, complex adaptive systems, swarm intelligence and real-world applications.

Medical Imaging and Image Interpretation
Image Interpretation draws upon multidisciplinary research on computational techniques for image interpretation. The core activities relate to medical imaging and aim to develop diagnostic aids, which quantitatively characterise the properties of body tissues and organs.

Security and Privacy Group
The Security and Privacy group researching all aspects of computing security and privacy. The research ethos of the group is to tackle problems that are important to society, including government and industry. We are recognised as an EPSRC/GCHQ Academic Centre of Excellence in Cybersecurity Research.

Human Computer Interaction Group (HCI)
Human Computer Interaction promotes leading-edge research and development in theories, designs, methodologies, and systems to support people in whatever they want to achieve. Work includes visualisation, intelligent interaction, data mining, ubiquitous and mobile computing. The group acts as a focal point for research, development and expertise in anything that has the user at the core.

Software Engineering Group (SE)
Software Engineering focuses on methods and techniques for the development of large and complex software and systems, especially in the areas of: cloud, service orientated architectures, software tools and automated code generation. Our research spans over theoretical as well as practical aspects and has resulted in a number of popular software products.

Theory of Computation Group
Theoretical Computer Science explores fundamental concepts in computation and programming language semantics. This often involves profound and surprising connections between different areas of computer science and mathematics. From category theory to λ-calculus and computational effects, from topology to constructive mathematics, from game semantics to program compilation, our research is diverse and continues to provide new insight and underlying structure.

For more details on our research themes and a list of research group members visit www.cs.bham.ac.uk/research

Admission
For further information on the admissions process and additional entry requirements, see page 26, or apply via the relevant course finder page: www.birmingham.ac.uk/computer-science-phd
Scholarships and bursaries

Funding for Taught Degrees
Both the University and the School of Computer Science offers scholarships and bursaries annually for both Home/EU and International students wishing to study for a Masters degree in a Computer Science subject. Scholarships are awarded to students who have achieved, or expect to achieve, excellent academic results.

Paul and Yuanbi Ramsay MSc Bursary
For Home/EU students there are two MSc bursaries which cover the full current Home/EU tuition fee. Applicants must be from a low income background or in receipt of benefits. Applications should be made through the Student Funding Office using the form available from the scholarships web page.

International Student Masters Scholarships
A £3,000 scholarship will be awarded to a number of privately funded, full fee paying, international masters students. Applicants must have accepted an unconditional offer on one of the School’s MSc programmes. These scholarships are open to students from outside the European Union. Nomination is by the School of Computer Science only. Please indicate that you wish to be considered when completing your application to study an MSc.

Funding for Research Degrees
Our research students are funded from a variety of sources. We have a number of school scholarships available to our research students. All of our scholarships are by nomination only, and no separate application is required. Other studentships may be available from funding sources under the control of the supervisor, and applicants should discuss this with potential supervisors. To find out about the latest opportunities, please contact: compsci-phd@contacts.bham.ac.uk

School of Computer Science Teaching Assistantships
For UK and European students, financial support from the School is normally conditional on the student contributing to the School’s teaching as a teaching assistant. Our teaching assistants are registered for a part-time research degree, working 75% of their time on their research and 25% of their time on teaching duties – which can vary from demonstrating to tutoring and organising schedules. Maintenance payments are based on the EPSRC minimum annual rate. For more information visit www.epsrc.ac.uk
School of Computer Science

Careers support and employability

Overview
Our careers and employability programme includes recruitment fairs, presentations, workshops and orientation sessions. In addition to the University recruitment fairs which attract a large number of national and international employers to campus, the School of Computer Science organises its own specialist fairs. These are aimed at careers in software, systems, emerging technologies, consultancy, social, cloud and financial computing. We host some of the top national and international firms including Microsoft, IBM, Cisco, Oracle, BAE Systems, PwC, BT, Deloitte, IBM, Goldman Sachs, Morgan Stanley, Facebook, J.P. Morgan, Bank of America, Bank of England, NHS, UBS, Capgemini, Credit Suisse among many others.

The School has also initiated the ‘Employers in Residence’ scheme, where high profile employers set up a recruitment desk in the School providing assistance and guidance on the application process. Employers use this opportunity to promote a vacancy or scheme, recruit on the spot for certain openings, ‘headhunt’ the best students, collect details of interested students and even sometimes to interview candidates from our School.

International students from China and India returning home also benefit from events where they have the opportunity to meet representatives from high profile companies in India and China and learn about the latest labour market trends. Leadership training is integrated with the curriculum of our postgraduate courses. We take an active role in a number of community and grand challenge events; recent examples have included the Capgemini India and University of Birmingham Super Techies Show; and the College of Engineering and Physical Sciences Grand Challenge.

We also participate in the Global Challenge Bursary programme*. In previous runs, our students applied for up to £9,000 to spend the summer as an intern at a top global company. They also have access to the Gateway Bursary scheme, through which the University provides financial support to students undertaking internships or work experience linked to their future career. Recent students have claimed up to £2,000 towards a low or unpaid work experience position taking place in the summer.

University Careers Support
A wide range of careers and employability services are also offered by the University. The Careers Database features over 2,000 graduate job vacancies and internship opportunities targeted at University of Birmingham students. Our students enjoy the support of specialist college internship officers, careers and industrial liaison tutors and advisors for advice on finding jobs and placements, writing CVs and application forms and succeeding in interviews.

Employers of our graduates include

*Subject to review

Lakshmi Gopalakrishnan
Programme of study: MSc Computer Science
Current position: Software Developer, Factset Europe Ltd

‘I currently work as a Software Developer at Factset Europe Ltd. Graduating last year, I studied the MSc in Computer Science, which allowed me to go deeper into understanding certain topics in computer science whilst still developing a general understanding about various other areas. The subject that I had chosen for my project was something that I always wished to study, Though there is no course on that particular subject in the University, I received a tremendous amount of support from the School and IT Innovation Centre, who boosted my confidence and gave me a green signal to carry on my dissertation work.

The best thing about studying in the School of Computer Science was that it felt at home from day one. The University lets you settle into this new environment with ease, thanks to the super supportive staff and students. The international exposure and the modern outlook of the University and the faculty is amazing.’

Read Lakshmi’s full profile – www.birmingham.ac.uk/lakshmi-gopalakrishnan
Graduate profile

Anna Jackson
Programme of Study: MSc Computer Science
Current position: Software Engineer, IBM

‘Although I had done a non-technical first degree, I realised that I wanted to work in a technical area. The degree offered the chance to spend a year gaining expertise in highly sought after skills in a School with a really good reputation, which allowed me to gain my position as a Software Engineer at IBM.

The facilities in the School of Computer Science are great, and the structure of the course means that you get both a broad introduction to computing and the chance to go more in depth in an interesting topic. My advice would be: be prepared to work hard! It takes time and effort, but learning to program can be fun and very rewarding!’

Read Anna’s full profile – www.birmingham.ac.uk/anna-jackson

Graduate profile

Dave Gurnell
Position: Partner
Employer: Underscore

‘I am a partner at a specialist technology consultancy called Underscore. We provide consulting, training and software development services, predominantly to companies in finance and media. Following my PhD Computer Science I formed a small software development company with fellow graduate Noel Walsh. We found ourselves taking on work from larger and larger customers, so we formed a partnership with several similar companies to create Underscore. There are now ten partners in the UK and Australia and we have customers all over the world.’

Read Dave’s full profile – www.birmingham.ac.uk/dave-gurnell

Graduate profile

James Brown
Position: Postdoctoral Scientist
Employer: Medical Research Council

‘I studied a BSc in Computer Science, before progressing onto the ‘Physical Sciences of Imaging in the Biomedical Sciences (PSIBS)’ Doctoral Training Programme. During my undergraduate studies, I developed a keen interest in applying my skills in computing to problems faced in biology and medicine. Although based primarily in the School of Computer Science, my research was done in collaboration with the Rheumatology Research Group (RRG) at Birmingham, and I now work as a Postdoctoral Scientist at the Medical Research Council.

The School of Computer Science has a very strong research presence. This has spawned a diverse range of taught modules that gives students a chance to delve into many different areas of computing. The quality of the teaching is excellent, and I owe a great deal to the lecturers that have inspired myself and others to pursue careers in academia. There is also a strong sense of community within the School of Computer Science.’

Read James’ full profile – www.birmingham.ac.uk/james-brown
Application and admissions

Postgraduate entry requirements
The normal minimum admission requirement for all our postgraduate computer science courses is an upper second class degree (or international equivalent), but some courses may relax this requirement and accept a lower second class degree. Please refer to the course entry page for specific entry requirements.

Please note there is a £50 application fee.

How to apply
Applications for all computer science postgraduate programmes are made directly to the University of Birmingham. We receive a considerable amount of applications for our programmes, so would advise making an application as soon as possible.

We will require:
- An application form
  Applications should be submitted online via the individual course finder page – www.birmingham.ac.uk/postgraduate/courses/taught/listing.aspx. Please search for your programme of study.
- Two references
  We require two academic references in support of your application (or, if appropriate, to the programme applied for, one may be from your employer. Please contact the Admissions Tutors beforehand). The references can be uploaded to your online application.

Transcripts of grades or marks
We must receive a list of the subjects you have studied in your previous degrees. This list should include the marks or grades you were given for each subject. If you have not finished your degree, you should send a transcript of the grades you were awarded in the previous years. The transcript can be uploaded to your online application.

If you have obtained your degree from outside the UK, you can find out if it is comparable by contacting admissions@bham.ac.uk.

English language qualification
If your first language is not English, you will need to offer an acceptable English language qualification. Visit: www.birmingham.ac.uk/postgraduate/requirements-pgt/international/index.aspx for a list of acceptable English language qualifications for our degrees and the latest required grades.

Once you have submitted an online application you will be sent details of how to enter your applicant portal. Your portal experience will allow you to send and receive communications to and from the University. You will be able to track the progress of your application at every stage of the admissions process; update your personal information, upload further supporting documents, view decisions and accept any offers you may receive.

Once you have applied online, please remember the ID number given to your application.

Closing dates
Although there are no formal closing dates for applications to our postgraduate courses, you are advised to apply by April for entry in Late September/Early October of the same year. (especially if you are applying to us from outside the UK and will need to make a VISA application).

Postgraduate Research Only
- Finding a potential supervisor and identifying your research area
  Before submitting your application you should ensure that our school has an appropriate supervisor for your chosen area of research. www.cs.bham.ac.uk/research
- Search for an advertised postgraduate research opportunity via our Doctoral ReSEARCHER page. www.birmingham.ac.uk/students/courses/postgraduate/findaphd.aspx

Statement of research interests (PhD)
Successful research students must show that they are capable of original and creative thinking. We ask you to write a research plan which includes the following points:
1. A description of work that you have done or would like to do. This work should have inspired you to want to study for a research degree.
2. Briefly describe the way or ways in which this work could be extended to make good research topics.
3. Using one of these research topics, give a plan for carrying through this research. Your plan should show the detailed stages which have to be carried out and so this part should be at least a page long.
4. Describe any other work you know of that is related to your proposed work.
5. Explain how your work would be new and useful to other researchers in your field.

Visit us
There are many opportunities to visit us; either coming to see us or via our online virtual campus. Find out more: www.birmingham.ac.uk/postgraduate/visit/pg-campus-tours-and-conversation.aspx

Fees and finance
The University charges an annual fee which includes tuition, examination and graduation, as well as fees payable to the Guild of Students. Fees are usually paid annually in advance at the start of the programme but it is possible for you to pay by instalments providing certain conditions are met. A small charge is made for this service.

Tuition fees
The standard annual tuition fees for Postgraduate taught (MSc) and Postgraduate Research (PhD) are available at: www.birmingham.ac.uk/postgraduate/pgt-fees/pgfees.aspx

Funding
For further information on funding opportunities available, please visit: www.birmingham.ac.uk/postgraduate/funding/FundingFilter.aspx

The University Council reserves the right to revise fees at any time without previous notice. You can check the current University fees on the University website.

Other costs
The University fees do not take into account the cost of accommodation, living expenses, equipment or books. Please visit UKCISA’s website www.ukcisa.org.uk and click on ‘funding and cost of living’.
Useful contacts

General enquiries
Postgraduate Admissions Team
School of Computer Science
University of Birmingham
Edgbaston
Birmingham
B15 2TT
United Kingdom

Postgraduate Taught
+44 (0)121 415 8742
msc-admissions@cs.bham.ac.uk

Postgraduate Research
+44 (0)121 414 2653
compsci-phd@contacts.bham.ac.uk

www.cs.bham.ac.uk
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Follow us on twitter @uobcompsci

For information on:
Life as a PG UoB student
To find out more about life as a postgraduate student at Birmingham, please visit:
www.birmingham.ac.uk/postgraduate/pgt/index.aspx

Accommodation
LIVING
Accommodation Enquiries
Tel: +44 (0)121 414 8000
Email: living@contacts.bham.ac.uk

Student fees
Student Funding Office
Tel: +44 (0)121 414 6073
Email: studentfees@bham.ac.uk

www.birmingham.ac.uk
This brochure was written several months in advance of the start of the academic year. It is intended to provide prospective students with a general picture of the programmes and courses offered by the School. Please note that not all programmes or all courses are offered every year. Also, because our research is constantly exploring new areas and directions of study some courses may be dropped and new ones offered in their place.

We endeavour, where possible, to provide you with the most up to date information regarding study with us. Please note that occasionally modules or information may change. You may find the following website useful:
www.birmingham.ac.uk/applicantinfo