Royal Holloway is one of the UK’s leading research-intensive universities. One of the larger colleges of the University of London, we are strong across the sciences, social sciences, arts and humanities. We were ranked 27th in the UK (173rd in the world) by the Times Higher Education World University Rankings 2016-17, which described us as ‘truly world class’.

As an international community, with students from 130 countries, we focus on the support and development of the individual. Our friendly and safe campus, in Surrey, 40 minutes by train from central London, provides a unique environment for university study where students quickly feel at home.

“One of the 16 most beautiful universities in the world” (Daily Telegraph).

Visit us
Our College and departmental Open Days offer you a unique opportunity to come and find out more about us and get a taste of what university life is really like. Parents and friends are very welcome to come with you. To find out dates and register to attend please visit our website: royalholloway.ac.uk/opendays
Welcome to Computer Science

We provide research-focused, intellectually-challenging degree programmes that are informed by current industrial needs and prepare you for a career in which you can make a huge impact on society and the economy.

Computer scientists need to be prepared to face constant challenges and changes throughout their careers. These are careers in which you can find an enormous variety of work and interact with people from many other disciplines.

The more rewarding jobs require a lot more than having programming skills: problem-solving, engineering and analytical skills, as well as the ability to work in teams, are required to operate in the global economy of today.

A degree from Royal Holloway will prepare you for these challenges. Our internationally renowned academics bring both their research and experience of industry into the lecture theatre and the lab, helping you gain current and relevant skills and knowledge, stimulating your creativity, and challenging you to go out and transform the world in which we live.

Professor José Fiadeiro
Head of Department

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CONTACT DETAILS
Department of Computer Science

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+44 (0)1784 443421

CONNECT WITH US
royalholloway.ac.uk/computerscience

MORE INFORMATION
This brochure is designed to complement Royal Holloway’s Undergraduate Prospectus and information on the department’s website at royalholloway.ac.uk/computerscience
It is also available as a PDF at royalholloway.ac.uk/studyhere
Why study Computer Science?

Computer Science is not just the study of computers; it is the systematic study of processes that handle information. We now take it for granted that music, video, and any other form of information should be represented digitally; the great innovations in the last few decades have come about through this transformation of the way we process information.

In every field of life, from music to medicine, from finance to media, this shift to digital is accelerating. Computer scientists are at the heart of this enterprise, creating the key technologies that will underpin these new developments.

Computer Science is not just for techies, nor is it all about sitting at a computer coding for hours on end! You will be working closely with other people to innovate and explore the ramifications and benefits of exploiting new technologies.

Computer Science at Royal Holloway

- We are a medium-sized department, with an intake of around 100 students per year, which means that you will receive a great deal of individual support during your studies; we offer small group tutorials in the first year, and one-to-one teaching on final-year projects.
- All our single-honours degrees are accredited by the BCS (British Computer Society), the chartered institute for the global IT profession, and EQANIE, its equivalent at the European level.
- The MSci in Computer Science (Information Security) has been awarded provisional certification by GCHQ.
- A wide range of options gives you the opportunity to design a pathway that matches your ambitions.
- You will have access to excellent amenities, including 24/7 access to the departmental computer laboratories.
- Our research excellence informs our teaching: you will be taught by the people who are advancing their disciplines.
- Our teaching quality is consistently highly rated by our students in annual National Student Surveys (NSS).
- We offer you a hands-on approach to learning: there is lab or project work in every year of your studies, a substantial part of which is done in teams.
- You will start working in teams from day one: more than 50% of the first year will see you working together with other students in solving problems and developing small projects. This culminates in the Year 2 team project, where a substantial project is developed.
- You will have the opportunity to go on a full year out in industry, which will enable you to gain experience and acquire skills that can only be picked up in a real work environment.
- Bursaries are available through which you can engage in ongoing research projects during the summer. You can also be paid to participate in software development projects or assist our lab teaching.

INSPIRING TEACHING

The topics that you will be able to explore include the following:

- **ARTIFICIAL INTELLIGENCE AND BIG DATA**: the use of machine learning techniques and cloud computing for capturing, storing, visualising and analysing big pools of data.
- **INFORMATION SECURITY**: the threats to which software systems are vulnerable and the techniques through which can be designed to prevent or minimize those threats.
- **SOFTWARE ENGINEERING**: the construction of complex systems that behave and interact as intended, reliably and securely.
- **THE INTERNET OF THINGS**: the new generation of systems of networked devices that are capable of sensing, transmitting and acting on data.
Degree programmes

**Single Honours in Computer Science**
- G400: BSc Computer Science
- G402: BSc Computer Science with a Year in Industry
- G403: MSci Computer Science
- G404: MSci Computer Science with a Year in Industry

**Specialist Single Honours in Artificial Intelligence**
- G4G7: BSc Computer Science (Artificial Intelligence)
- G4G8: BSc Computer Science (Artificial Intelligence) with a Year in Industry
- GG47: MSci Computer Science (Artificial Intelligence)
- GG74: MSci Computer Science (Artificial Intelligence) with a Year in Industry

**Specialist Single Honours in Distributed and Networked Systems**
- G4T6: BSc Computer Science (Distributed and Networked Systems)
- G4T7: BSc Computer Science (Distributed and Networked Systems) with a Year in Industry
- G4G5: MSci Computer Science (Distributed and Networked Systems)
- G4G9: MSci Computer Science (Distributed and Networked Systems) with a Year in Industry

**Specialist Single Honours in Information Security**
- G407: BSc Computer Science (Information Security)
- G406: BSc Computer Science (Information Security) with a Year in Industry
- G500: MSci Computer Science (Information Security)
- G502: MSci Computer Science (Information Security) with a Year in Industry

**Specialist Single Honours in Software Engineering**
- G464: BSc Computer Science (Software Engineering)
- G462: BSc Computer Science (Software Engineering) with a Year in Industry
- G461: MSci Computer Science (Software Engineering)
- G463: MSci Computer Science (Software Engineering) with a Year in Industry

**Combined Honours with Computer Science as a major component**
- G4N2: BSc Computer Science with Management

**Joint Honours with Computer Science as an equal component**
- GG41: BSc Computer Science and Mathematics
- P304: BSc Digital Media Culture and Technology

**Combined Honours with Computer Science as a minor component**
- P300: BA Digital Media Culture and Technology

Admissions and entry requirements

We welcome applications from candidates looking for a challenging and exciting undergraduate degree taught in a well-equipped and friendly environment. The department admits about 100 students per year.

We are looking for students with an aptitude for Computer Science. This could be demonstrated by, for example: an A-level with an analytical component, such as Maths, Physics or Computing, an interest in a particular field of Computer Science, significant experience in programming; or through an interview with us.

We admit a number of students with non-standard qualifications, such as ACCESS courses, University Foundation programmes and BTECs (subject to certain requirements), as well as many with qualifications from other countries, or awarded by international organisations such as the International Baccalaureate. Normally we require that non-native English speaking students can demonstrate their proficiency in English with an IELTS of 6.5 or an equivalent grade in similar examination systems.

We are always on the lookout for good, well-motivated students, even if they do not have exactly the right qualifications. Evidence of a serious interest in an area of Computer Science, especially algorithms and programming, is very welcome.

We are committed to recruiting more female undergraduate students and ensuring gender balance in all activities.

We especially encourage mature students to apply, and we have a broad commitment to widening participation so that everyone, regardless of their income or background, can access the benefits of higher education.

We may interview candidates with unusual backgrounds so that we can assess their potential.

For the specific qualifications required for our degree programmes please refer to our web pages: royalholloway.ac.uk/computerscience
Degree structure

**CORE MODULES**
For each specialist degree, the additional core modules are selected from the corresponding strand as listed in the opposite page.

**ELECTIVE MODULES**
For each degree, these modules can be selected from any strand. The only exception is Year 3 of the Information Security MSci where, among the six elective modules, students can select at most two from the Information Security strand.

**YEAR IN INDUSTRY**
BSc students on the Year-in-Industry pathway go on a placement between Year 2 and Year 3, and MSci students between Year 3 and Year 4.

<table>
<thead>
<tr>
<th>Year 1 (BSc and MSci)</th>
<th>CS</th>
<th>AI</th>
<th>DNS</th>
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<tbody>
<tr>
<td>Computing laboratory (games)</td>
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<td>✔</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td>Computing laboratory (robotics)</td>
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<td>✔</td>
<td>✔</td>
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<td>Internet services</td>
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<td>✔</td>
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<tr>
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<td>✔</td>
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<td>✔</td>
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<td>✔</td>
<td>✔</td>
</tr>
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<td>✔</td>
<td>✔</td>
</tr>
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<td>Introduction to information security</td>
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<td>✔</td>
<td>✔</td>
<td>✔</td>
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<td>✔</td>
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<td>Applications of cryptography</td>
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<tr>
<td>Human-computer interaction</td>
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<tr>
<td>Malicious software</td>
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<tr>
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<table>
<thead>
<tr>
<th>Year 3 (MSci)</th>
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<th>AI</th>
<th>DNS</th>
<th>IS</th>
<th>SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual project</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Applications of cryptography</td>
<td>✔</td>
<td></td>
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<tr>
<td>Human-computer interaction</td>
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<td></td>
</tr>
<tr>
<td>Malicious software</td>
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<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Team project</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Secure business architectures</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Security management</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Security testing theory and practice</td>
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<td>3</td>
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</table>
The following tables represent a sample of our modules, organised by strand. The offer is subject to availability.

### Artificial Intelligence
- Computational finance: 3 or 4
- Data analysis: 4
- Deep learning: 4
- Intelligent agents and multi-agent systems: 3 or 4
- Introduction to artificial intelligence: 2
- Machine learning: 3 or 4
- Mathematical methods for computer science: 2
- On-line machine learning: 4
- Semantic Web: 3 or 4
- Visualisation and exploratory analysis: 3 or 4

### Information Security
- Applications of cryptography: 3
- Computer and network security: 2
- Cyber security: 3 or 4
- Digital forensics: 3 or 4
- Malicious software: 3
- Secure business architectures: 4
- Security management: 4
- Security testing theory and practice: 4
- Smart cards, RFID and embedded systems security: 3 or 4

### Software Engineering
- Human-computer interaction: 2 or 3
- IT project management: 3
- Running a small business: 4
- Software language engineering: 3
- Standards, IP and technology seminar series: 4
- Technology entrepreneurship: 4

### Distributed and Networked Systems
- Advanced data communications: 3 or 4
- Advanced distributed systems: 4
- Concurrent and parallel programming: 3
- Interconnected devices: 3
- Large-scale data storage and processing: 4
- Wireless sensor and actuator networks: 4

### Other
- Advanced algorithms: 3
- Bioinformatics: 3
- Compilers and code generation: 3
- Computational optimisation: 3 or 4
- Digital audio and applications: 3 or 4
- Functional programming and applications: 3

Consult our website for more details and updated information on the offer. Joint Honours programmes can also be found online.
Teaching and assessment

Our department has a strong culture of support for students. Every student has a personal tutor who works with them in providing academic advice and pastoral support throughout the entire degree programme.

Computer Science combines: the study of the foundations that underpin our subject, the principles, methods and techniques through which applications are developed; practical work that involves programming, the study of particular application areas such as robotics, games, human–computer interaction, intelligent agents or networked systems, and the various ethical and professional issues that are intrinsic to the role that computer scientists play in society and the economy.

Each of these areas demands its own teaching and assessment techniques. Teaching of Computer Science at Royal Holloway assumes that the motivation to study exists within you. We consider that our task as teachers is to introduce, explain, challenge and stimulate your creativity. At the end of your studies, you will be able to work independently, as well as able to work with others, in taking the challenges of developing software systems as ambitious as they may be.

How you learn is as important as what you learn. We believe that the best way of teaching you computer science is to make you practice what you learn by developing projects, some small and some slightly bigger, some on your own and some in groups.

HANDS-ON APPROACH TO LEARNING
We do not assume that, when you join us, you know how to program, so we offer two lab-based modules – one on games and the other on robotics – during which you can develop, at your own level, real applications using all your imagination and creativity. You learn a lot and you also have lots of fun.

The way we teach software engineering is also very much hands-on. You will practice Scrum-based Agile Software Development using state-of-the-art tools in a team project. You will learn to use the Eclipse and PyCharm IDEs, Subversion and Git version control systems, JUnit testing, Google Windowbuilder Pro GUI developer, and other modern industrial-strength tools. These skills are essential if you choose future employment in the software industry.

Some modules have a practical component that is best taught in a laboratory session. These include classes that have a heavy programming component, as well as those in robotics and computer games. Final-year students are given the opportunity to work in those sessions as teaching assistants.

PERSONAL TUTORIALS
Throughout the first year, part of the teaching takes place in small groups.

Project and team work

FIRST-YEAR PROJECTS
In order to build up your basic programming skills, we have equipped labs so that you can work in teams to develop robotics and games projects; you will have fun and acquire key skills while developing something that will actually work. You will also be introduced to the software engineering life cycle – from requirements to design, implementation and testing – through a project where, after the first stage, teams have to work on what another team has produced; state-of-the-art industrial-strength tools are used throughout the cycle.

SECOND-YEAR TEAM PROJECT
In the second year team project, small groups share software development tasks between their members to design and implement a large program using the Scrum-based Agile Development methodology. Both the technical and the managerial problems are often quite challenging, which will prepare you to face the challenges of working in a company.

THIRD-YEAR PROJECTS
The third-year project takes up a quarter of the final year for most students; you are assigned a supervisor and either pick a standard project or can specify something more original together with your supervisor. This is an opportunity to engage in a professional project or with a particular research topic that you find interesting.

FOURTH-YEAR PROJECTS
In the final year of an MSci, you develop a project at postgraduate level, which takes up half of the year. This is an opportunity to develop a more ambitious or consequent piece of software using cutting-edge technologies, or to develop in more depth a piece of research in a topic that excites you or that you would like to pursue at PhD level.

Software Engineering students develop applications for real clients as part of a company that they have to manage.

SOFTWARE DEVELOPMENT
You will be given the opportunity to work, under the direction of a project manager from our department, in ongoing software development activities for external clients in a real company.

RESEARCH PROJECTS
The Undergraduate Research Opportunity (UROP) projects are individual research projects conducted under the supervision of academics. They allow undergraduate students to experience research first hand, and provide training in relevant research skills.
The Department

The Department is at the forefront of research into the fundamentals of computer science as well as how this feeds into exciting new techniques and applications for business and industry, and we pass this on to you through our teaching.

Many of the Department’s graduates work for well-known companies and organisations such as Amazon, American Express, Apple, Bupa, Capita, CGI-Logica, Microsoft, Symantec, among many others.

Royal Holloway itself is located at the epicentre of the IT industry in the UK – the ‘M4 corridor’, also known as ‘England’s Silicon Valley’. Indeed, 45% of IT workplaces are in London and the South East.

According to StuRents.com, we are also located in the safest university town in England (Egham).

The Computing Society (CompSoc)

All students are able to join the Computing Society, which is run by our students who stand for election every year. It does great work in welcoming new students to the Department, and setting into university life. CompSoc organises events through the year, including regular social events, programming workshops, hackathons, industry and careers lectures, quizzes, and trips to external events; they also participate in external competitions. CompSoc is also very involved in promoting the Department and the discipline at Open Days and through school visits. Staff members regularly join students at several CompSoc events.

URL: http://computingsociety.co.uk
Twitter: RHULCompSoc
Email: rhul.computingsociety@gmail.com

Women in Computer Science

The Department has received an Athena SWAN Bronze award in recognition of our commitment to increasing the participation of women in Computer Science at all levels, from undergraduate students to the highest academic roles. We are one of only seven Computer Science departments to have received this award.

The Computing Society has a subgroup dedicated to female students: Girls Who Code. They engage with national activities and with companies where, like in Centrica, female employees organise initiatives that promote the role of women in IT.

The percentage of female students in our cohorts has been rising, achieving a record 20% in 2015/16, and our ambition is to increase this further.

The British Computer Society (BCS) has also distinguished our teaching of Software Engineering as ‘Best Practice’.

Professor Dave Cohen was awarded a College Excellence Teaching Prize for the redesign of the Second-Year Software Engineering strand. He was shortlisted for the Times Higher Education Award for Most Innovative Teacher of the Year Award.

“I decided to make this a flagship offering, to improve employability, to make internships, work placements and eventual employment more successful and to drive recruitment in a competitive market. We aim, on this course, to help students become professional Software Engineers who would make excellent colleagues.”

The British Computer Society (BCS) has also distinguished our teaching of Software Engineering as ‘Best Practice’.

Bernice Soutter, 3rd-year student
Your future career

By graduating in Computer Science, you will be embracing a career in which individuals can make a huge impact in boosting economic competitiveness in all sectors of activity and the well-being of societies. You will have the opportunity to interact with people from many sectors, spanning the arts, media, finance, aerospace, health, and others, who will stimulate your creativity.

INDUSTRY LINKS

The Department has an Industrial Advisory Board comprising of senior representatives from Accenture, Aridhia, Blackrock, British Gas/Centrica, dotMailer, HP, Investec, Jump Trading, Microsoft, Ovum, Pentatonix, Salesforce and Yahoo! The Board members provide valuable and detailed advice on our curriculum to ensure that the courses we offer are constantly revised and updated. This means that our graduates entering employment are already up to date with the latest developments and ready to build the next generation of computing systems for business and industry.

THE YEAR-IN-INDUSTRY PATHWAY

You will be given the opportunity to apply for an industrial internship after your second year of study. This will be an integrated part of your studies, leading to a Year-in-Industry degree, which is highly valued by employers. Our Careers Tutor visits you twice during your placement and keeps in touch with your host to monitor your progression.

Many students take advantage of this opportunity, finding placements both in software developing companies – such as Apple, Microsoft or Symantec – and in companies specialising in other areas, such as finance or consulting. These internships enable you to gain valuable work experience, which helps prepare you to move into the career of your choice upon graduation.

Often, at the end of their placements, students are offered permanent jobs in the same company, which they may take up following graduation.

CAREERS SUPPORT

Employers are interested in the skills developed through student life as well as the academic knowledge students gain through studies; as an IT professional you will not only solve problems for different areas of business, but you will be closely integrated with the people working within them. Therefore, in addition to the academic programme, we give you the opportunity to develop transferable skills and market yourself effectively for graduate jobs:

- The second-year group project will prepare you for team work using Agile Scrum-based Programming.
- In preparation for your third-year individual project, we will train you to give presentations and to write reports.
- Our Careers Service will give you training on CV writing, completing application forms and preparing for an interview.
- You will be able to benefit from one-to-one advice from a careers consultant, with appointments available in each term.

Advice and training on careers is provided by our departmental Careers Tutor and the College Careers Service – part of the Careers Group, University of London, the largest university careers service in Europe. We also organise a number of events through which you can get directly involved with employers:

- Through the part-time jobs fair, which runs in the first weeks of term, you will have access to local employers.
- A specific fair on IT brings many companies to the campus.
- ‘Careers in Finance’ week explores career opportunities in Investment Banking, Public Sector Finance, Accountancy, Professional Services, Risk and Insurance.
- The ‘Numbers, Words and Environment’ careers week offers you the opportunity to explore further the diverse range of occupations related to Computer Science.
- The Department also maintains a strong link with its alumni, who are often able to provide you with advice, contacts and networking opportunities.

Your future career
Alumnus: Robert Couldrey  
Subject: BSc Computer Science  
Graduated: 2012  
Place of Work: Innovise ESM  
Position: Business Development Manager

“I am a consultative salesperson for a leading global reach Enterprise Service Management company, Innovise ESM. Customers include retail and investment banks, telecommunications businesses and managed service providers; all with the challenge of managing millions of devices, systems and services worldwide.”

My technical capability gained through my degree gives me a competitive edge over others in commercially focused roles. My time at Royal Holloway also gave me the skills to design, challenge and articulate complex technical problems; critical to successfully engaging with enterprise customers. Courses taught me to think at a low and at a high level, providing me with both a practical and theoretical understanding of computational systems.

Whether you end up in a customer facing role or not, an ability to express yourself technically as well as professionally will get you far - so make sure you take full advantage of opportunities to write reports, present and work in a team.”

Alumnus: Piotr Nowak  
Subject: BSc Computer Science  
Graduated: 2014  
Place of Work: Citi, Financial Services  
Position: Java Application Developer

“There are a lot of competition among graduates from the best universities to get jobs at the top companies. It is essential to give the potential employer enough reasons to be chosen from the bulk of other amazing applicants. Professional experience is a very important factor during the selection process and taking the Year-in-Industry pathway puts you one step ahead of many others. I did my placement at CGI (formerly Logica), very close to Royal Holloway, which not only improved my personal and technical skills, but also increased my level of confidence in my abilities; at the end of the placement, I was offered a full-time Software Engineer position after graduation.

Doing the Year-in-Industry also gave more focus to the final year of my degree. I’m using all the knowledge and experience that I gained at CGI to design and implement my Final-Year Project, which is a substantial piece of software that I’m developing using a state-of-the-art industrial-strength framework.”

This brochure was published in June 2016 and the information given was correct at that time. It is intended primarily for those considering admission to Royal Holloway, University of London as undergraduate students in 2017-18. Occasionally it may be necessary for the University to vary the content and delivery of programmes so we advise all applicants to refer to the website prior to making any application. Full terms and conditions of admission can be found at royalholloway.ac.uk/studyhere