ROYAL HOLLOWAY
University of London

PROGRAMME SPECIFICATION

This document describes **Single Honours BSc degree programmes in Computer Science (Software Engineering)**. For Joint and Combined Honours Degree programmes, please also refer to the equivalent document(s) for the other subject(s). This specification is valid for new entrants from September **2015.**

The aims of all honours degree programmes in Computer Science are:
- to produce graduates with the ability to engage in the lifelong learning and with the skills required for a professional career in a computer-based environment or for a research career in Computer Science and related areas;
- to develop computing-related cognitive abilities and skills as described in the QAA Computer Science benchmark statement;
- to develop, in a flexible and progressive structure, students knowledge and understanding of essential facts and theory, with the ability to use this knowledge to devise, cost, specify, design, implement, test, document and critically evaluate computer-based systems;
- to develop an understanding of professional and ethical issues involved in the deployment of computer technology;
- to produce graduates who can work effectively within teams;
- to produce graduates with a range of personal attributes relevant to the world beyond higher education, including information retrieval and use, numeracy, the ability to devise and present logical arguments to inform and support actions, and organisational skills;
- to produce graduates who understand how business value can be delivered to their customers through the software they develop.

The BSc degree programmes correspond to level 6 in the QAA framework. The length of these degrees vary from three years for standard BSc programme to four years for the BSc with a year in Industry programme. Apart from the year in industry, each stage comprises one year of full-time study during which the student must follow courses to the value of four units (one unit is roughly equivalent to 30 national credits).The programmes provide progressive structures in which students are able to gain ever-wider knowledge and understanding, and appropriate skills. The programmes contain a combination of compulsory, core and optional courses to introduce students to the theory and practice of Computer Science, including software development techniques and the technologies underlying specific application areas such as gaming and robotics. Team work will be emphasised in the curriculum of the first and second years. Students will also have extensive opportunities to engage companies, organisations and professionals, in particular in CS2815.

The structure encourages students to develop their own interests through informed choice among specialist options. In the final stage of the BSc programmes, students undertake a project, which accounts for 25% of their studies. There is a free choice of other final stage courses reflecting (i) core material, such as compiler theory, operating systems and concurrent programming, (ii) modern applications such as computer games technology, web design and digital sound and music, and (iii) currently important research areas such as machine learning, information security, software language engineering and metamodels, type theory, intelligent agents, computational finance and bioinformatics.

Further information
[Learning outcomes](#)
[Teaching, learning and assessment](#)
[Details of the programme structure(s)](#)
[Progression and award requirements](#)
[Student support and guidance](#)
[Admission requirements](#)
[Further learning and career opportunities](#)
[Indicators of quality and standards](#)
[List of programmes, with details of awards, degree titles, accreditation and teaching arrangements](#)

This document provides a summary of the main features of the programme(s), and of the outcomes which a student might reasonably be expected to achieve if full advantage is taken of the learning opportunities provided. Further information is contained in the College prospectus, the College Regulations and in various handbooks issued to students upon arrival. Whilst Royal Holloway keeps all its information for prospective applicants and students under review, programmes and the availability of individual courses are necessarily subject to change at any time, and prospective applicants are therefore advised to seek confirmation of any factors which might affect their decision to follow a specific programme. In turn, Royal Holloway will inform applicants and students as soon as is practicable of any substantial changes which might affect their studies.

Learning outcomes
Teaching and learning in the programmes are closely informed by the active research of staff, particularly in the areas of computer learning, information security, compiler algorithm design and analysis, languages and computer architectures, combinatorial algorithms and complexity, and bioinformatics. In general terms, the programmes provide an opportunity for students to develop and demonstrate knowledge of both core subject material and specialised research areas, and provide opportunities for students to develop and demonstrate the following learning outcomes:

Knowledge and understanding
- knowledge and understanding of the essential facts, concepts, principles and theories relating to computing and computer applications;
- an understanding of the implications of recent research in Computer Science, artificial intelligence and related fields, and how such research results can be incorporated into computer-based systems;
- an understanding of the professional, moral and ethical aspects of the use of computer-based systems, and ability to recognise any risks or safety aspects in a given context;
- knowledge of how computers are programmed and used; advanced programming; the fundamental technologies used for artificial intelligence; the functioning of the Internet and the World Wide Web; the main concepts of database technology and design; background theory necessary for a deeper understanding of computing and computers;
- an understanding of the principles of Software Engineering and the importance of good design;
- an understanding of how to work within a team in developing a significant software system;
- an understanding of the principles of information security and its context in Computer Science;
- depending on their programme of studies, students may also gain a knowledge of the following key practical application technologies: operating systems; graphics; robotics, bioinformatics, applied artificial intelligence and human-computer interfaces; theoretical foundations of algorithms and programming;
- an understanding of how to work within a small software company and deliver software within required user specifications;
- an understanding of how to provide appropriately costed software which delivers value to a customer;

Additional for programme with a year in industry
- an appreciation of the importance of computing and information technology for commerce and industry and an understanding of expected industry changes and the effects they will have.

Skills and other attributes
- ability to deploy appropriate theory, practices and tools for the modelling, specification, design, implementation and evaluation of computer-based systems (including stand-alone computer systems, information systems, embedded systems, distributed systems and web-based systems) to meet given requirements under practical constraints;
- employ the research skills needed to investigate a defined topic under supervision, through an extended individual project;
- interpersonal skills, including the ability to work as a member of a development team, recognising/respecting the viewpoints of others, recognising the different roles within a team and the different ways of organising teams;*
- problem identification, analysis and solution using critical assessment and reasoned argument;*
- taking responsibility for own learning and developing habits of reflection on that learning;*
- skills in written communication, project documentation, verbal presentation; numeracy and computation*

- use of information technology (including spreadsheets, databases, word processing, email and WWW);*
- information handling and retrieval (including the use of libraries and computer technology);*
- ability to work autonomously, and to demonstrate time management and organisational skills;*
- manage small projects;

Additional for programme with a year in industry
- ability to apply knowledge and skills in computing to large-scale practical applications.

* transferable skills

Back to top

Teaching, learning and assessment
Teaching and learning is mostly by means of lectures, small-group tutorials, practical and problem classes, supervised computing laboratory work, group work, completion of coursework and private study, guided independent study and research in the stage three independent project.

Assessment of knowledge and understanding is typically by formal, unseen written examination, coursework assignments, project reports, oral presentations, and the final stage project report. Transferable skills are also inherently assessed through the assignments, reports and oral presentations. Feedback is provided on students' performance in coursework, both assessed and non-assessed, and during tutorial and practical sessions. Full details of the assessments for individual courses can be obtained from the Department.

Back to top

Details of the programme structure(s)
Please note that the list of available courses offered is subject to change and not all courses run each year. A full list of courses for the current academic year can be obtained from the Department.

STAGE 1		Units
CS1802	Software development	Full
CS1820	Computing laboratory (robotics)	Half
CS1830	Computing laboratory (games)	Half
CS1840	Internet services	Half
CS1890	Software design	Half
CS1860	Mathematical structures	Half
CS1870	Machine fundamentals	Half

STAGE 2		
CS2800	Software engineering	Half
CS2815	Small enterprise team project	Half
CS2821	Systems programming	Half
CS2830	Robotics	Half
CS2844	Computer graphics	Half
CS2850	Operating systems	Half
CS2855	Databases	Half
CS2860	Algorithms and complexity	Half
IY2760	Introduction to information security	Half
IY2840	Computer and network Security	Half

STAGE 3		
CS3001	Year out in industry	Full
CS3003	IT project management	Half
CS3821	Full unit project *(cannot be taken with CS3810)*	Full
CS3110	Bioinformatics	Half

CS3220	Fundamentals of digital sound and music	Half
CS3230	Computer games technology	Half
CS3250	Visualisation and exploratory analysis	Half
CS3330	Embedded and real time systems	Half
CS3450	Software verification	Half
CS3460	Compiling for embedded systems	Half
CS3480	Software language engineering	Half
CS3470	Compilers and code generation	Half
CS3490	Computational optimisation	Half
CS3510	Functional programming and applications	Half
CS3580	Advanced data communications	Half
CS3750	Concurrent and parallel programming	Half
CS3870	Advanced algorithms	Half
CS3920	Computer learning	Half
CS3930	Computational finance	Half
CS3940	Intelligent agents and multi-agent systems	Half
IY3840	Malicious software	Half
IY3660	Applications of cryptography	Half

- At stage two or stage three, students may choose to substitute a half unit course for another outside the department provided the department approves the external unit. Students taking an industrial year take additional course CS3001 and thus have five teaching units in their final year.
- While students are normally allocated a specific lab for any given course they are registered for, they may if they wish attend additional labs of that course where space allows.
- Students for each year are expected to take part in the Advanced Topics Seminar course (CS3010). This course is not part of the degree programme but attendance will be placed in the student's transcripts.

The course units taken for each of these degree programmes are as follows:

BSc Single Honours Computer Science (Software Engineering) G464

First	CS1802 *mandatory non-condonable for progression* CS1820, CS1830, CS1840, CS1860, CS1870, CS1890 *mandatory condonable*
Second	CS2800 *mandatory non-condonable* CS2815 *mandatory non-condonable* CS2850, CS2855, CS2860, IY2760 *mandatory condonable* *two further non-project CS2XXX or IY2XXX courses*
Final	CS3821, CS3003, CS3480, IY3840 *mandatory condonable* *three further non-project CS3XXX or IY3XXX courses*

A year out in industry (CS3001) may be taken between second and final year.

BSc Computer Science (Software Engineering) with Year in Industry G462

First	CS1802 *mandatory non-condonable for progression* CS1820, CS1830, CS1840, CS1860, CS1870, CS1890 *mandatory condonable*
Second	CS2800 *mandatory non-condonable* CS2815 *mandatory non-condonable* CS2850, CS2855, CS2860, IY2760 *mandatory condonable* *two further non-project CS2XXX or IY2XXX courses*
Third	CS3001 *mandatory non-condonable*
Final	CS3821, CS3003, CS3480, IY3840 *mandatory condonable* *three further non-project CS3XXX or IY3XXX courses*

Back to top

Progression and award requirements

The progression and award requirements are essentially the same across all Honours Degree programmes at Royal Holloway as outlined in the College's Undergraduate Regulations. Students must pass units to the value of at least three units on each stage of the programme. Failing marks of 30 – 39% can normally be condoned in up to 30 credits across stages 1 and 2. In the final stage failing marks in up to 30 credits can normally be condoned. However, on some programmes there may be a requirement to pass specific courses in order to progress to the next stage or to qualify for a particular degree title and this will put restrictions on courses in which failing marks can be condoned (see programme structure above for details). Additionally there are requirements on the number of courses that must be passed in order to qualify for particular joint or combined Honours degrees.

Students are considered for the award and classified on the basis of a weighted average. This is calculated from marks gained in courses taken in stages two and three, and gives twice the weighting to marks gained in stage three. The College's Undergraduate Regulations include full details on progression and award requirements for all undergraduate programmes offered by the College.

Students who wish to transfer to the equivalent MSci may do so at the end of stage two or the final stage of their BSc. To transfer from stage two to the following stage in the MSci the student must achieve at their first attempt an average calculated to two decimal places of 50.00% or above. To progress from the final stage of their BSc to the final stage of the MSci the student must achieve a weighted average of 55.00% or above computed to two decimal places, where the second stage average is weighted as 1 and the ultimate BSc stage average is weighted as 2.

Students who are registered for BSc Computer Science (Software Engineering) but who fail the second stage of their programme will be eligible for the award of Certificate of Higher Education in Computer Science, if they have fulfilled the requirements to progress from first to second stage of their degree programme, including a pass in CS1802, and passed at least four Computer Science units from either the first or the second year.

Students who are registered for BSc Computer Science (Software Engineering) but who fail to graduate will be eligible for the award of Diploma of Higher Education in Computer Science, if they have fulfilled the requirements to progress from second to third stage of their degree programme and passed at least four CS units from either the second or third year, *including* passes in CS2800 and CS2815.

Back to top

Student support and guidance

- Advisors: All students are allocated a personal academic advisor who meets with them regularly through the programme. The advisor's role is to advise on academic, pastoral and welfare issues. Students have tutorials with their advisor during the first year.
- The programme co-ordinator, the director of pastoral care, the director of undergraduate studies and the head of department provide a back-up system of academic, pastoral and welfare advice.
- All staff are available and accessible. Initial contact can be arranged via email or through the departmental office.
- A detailed programme handbook is supplied to every student, and course notes and other learning resources are available either in hard copy or on the department's web site.
- Induction sessions are run at the start of each academic year by technical support staff on the use of the departmental computing systems.
- Technical back up is provided by the systems support staff for problems with using the departmental computing system.
- Extensive supporting materials and learning resources are available in the College libraries and the Computer Centre.
- Careers advice is provided by the College Careers Service and the departmental careers service liaison officer.
- Students have access to all College and University support services, including Student Counselling Service, Health Centre and the Educational Support Office for students with special needs.

Back to top

Admission requirements
The Department's standard conditional offer is available on the [Course Finder](#) web page. However, the Department also has flexibility in its admissions and offers policy and strongly encourages applications from non-standard applicants. Students whose first language is not English may also be asked for a qualification in English Language at an appropriate level. For further guidance it may also be helpful to contact the [Admissions Office](#).

[Back to top](#)

Further learning and career opportunities
Computer Science opens up a wide range of career opportunities for graduates and the department has a number of important links with industry. Computer Science graduates from the Department have found employment in a wide range of jobs. Many have gone into software houses such as Logica, while others have entered larger organisations such as British Telecom, Texas Instruments and BAE Systems. A large number enter careers with a management or financial slant, for example Accenture or large multi-national companies. The College Careers Office organises recruitment visits by companies and there are a number of careers fairs during the year when final year students can make useful contacts with prospective employers. In addition, the industrial year programme allows students to work within a company for one year between the second and final years. Students taking this option often find that the employer will encourage them to apply for posts at the completion of their degree. For further details please refer to the [Careers Service](#).

[Back to top](#)

Indicators of quality and standards
Royal Holloway's position as one of the UK's leading research-intensive institutions was confirmed by the results of the most recent Research Excellence Framework (REF 2014) conducted by the Higher Education Funding Council (HEFCE). The scoring system for the REF 2014 measures research quality in four categories, with the top score of 4* indicating quality that is world-leading and of the highest standards in terms of originality, significance and rigour and 3* indicating research that is internationally excellent.   81% of the College's research profile was deemed to be within the 4* or 3* categories, an increase of over 20% since 2008. The results for the quality of our research outputs placed Royal Holloway 15th in the UK based on an overall Grade Point Average (GPA) score and 20th in the UK for 4* and 3* research.

All our single-honours degree programmes are accredited by the British Computer Society; the 2014 accreditation visit panel also identified our teaching of Software Engineering as an area of best practice.

[Back to top](#)

List of programmes
All the programmes are taught entirely by staff at Royal Holloway, University of London, and either lead to degree awards of the University of London or alternatively Diploma of Higher Education awards of Royal Holloway and Bedford New College. The QAA subject benchmark statement in Computer Science describes the general features which one might expect from Honours Degree programmes in the subject, and can therefore be used as a point of reference when reading this document (see www.qaa.ac.uk). UCAS codes are given in parentheses (see www.ucas.ac.uk).

Specialist Honours Degree programmes within Computer Science – Software Engineering strand
     BSc (Hons) Computer Science (Software Engineering) (G464)
     BSc (Hons) Computer Science (Software Engineering) with Year in Industry (G462)

Diploma of Higher Education
(Only available to students registered for BSc in these subjects but who fail to graduate, subject to passing required courses as detailed in the Progression and award requirements section. Not available for admission through UCAS)

     DipHE in Computer Science

DipHE in Computing Studies

Certificate of Higher Education
(Only available to students registered for BSc in these subjects but who fail the second stage, subject to passing required courses as detailed in the Progression and award requirements section. Not available for admission through UCAS)

CertHE in Computer Science

[Back to top](#)