

PROGRAMME SPECIFICATION

This document describes **MSci Honours Degree programmes in Computer Science**. 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 2014**.

The aims of all MSci Honours Degree programmes in Computer Science are:

- to equip graduates with the ability to fully engage in lifelong learning, 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 a mastery of computing-related cognitive abilities and skills as described in the QAA Computer Science benchmark statement;
- in a flexible and progressive structure, to develop students' knowledge and understanding of essential facts and theory, with the ability to use this knowledge to devise, specify, design, implement, test, document and critically evaluate computer-based systems;
- to develop an advanced understanding of professional and ethical issues involved in the deployment of computer technology;
- to provide 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 develop an advanced understanding of knowledge and current awareness of current problems and/or new insights in the area of computing science research.

The programmes described here correspond to level 7 of the QAA Framework for Higher Education Qualifications. The length of these degrees vary from four years for the MSci programmes without a year in industry to five years for the MSci with a year in Industry programmes.

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 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.

The structure encourages students to develop their own interests through informed choice among specialist options. In the final two years of the taught elements of the MSci programmes, students undertake projects, which accounts for 50% of their studies in the penultimate year and 50% in the ultimate year. There is a free choice of other penultimate and ultimate 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. Students will also attend core and optional courses in their final two years which reflect their specialism.

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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. The programmes provide opportunities for students to develop and demonstrate knowledge of both core subject material and specialised research areas.

The students will have an opportunity to develop and demonstrate the following learning outcomes:

Knowledge and understanding

- an advanced knowledge and understanding of the facts, concepts, principles and theories relating to computing and computer applications;
- mastery 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;
- a thorough command of the professional, moral and ethical aspects of the use of computer-based systems, and the ability to recognise any risks or safety aspects in a given context;
- knowledge of how computers are programmed and used; advanced programming; software engineering and team work for developing a significant software system; 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; and
- depending on their programme of studies, students may also gain a complex knowledge of the following key practical application technologies: operating systems; graphics; robotics, bioinformatics, information security, applied artificial intelligence and human-computer interfaces; theoretical foundations of algorithms and programming.

Additional for Computer Science (Year in Industry)

- 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.

Additional for Computer Science (Information Security)

- a command of the fundamental aspects of cyber security;
- a mastery of the identification and appropriate application of security controls.

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 one's 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;*

Additional for Computer Science (Year in Industry)

- ability to apply knowledge and skills in computing to large-scale practical applications.

* transferable skills

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Teaching, learning and assessment

Teaching and learning is mostly by means of lectures, small-group tutorials, practical and problem solving 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](#).

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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		Course Unit Value
CS1801	Object oriented programming	Full
CS1820	Computing laboratory (robotics)	Half
CS1830	Computing laboratory (games)	Half
CS1840	Internet services	Half
CS1850	Databases	Half
CS1860	Mathematical structures	Half
CS1870	Machine fundamentals	Half

STAGE 2		Course Unit Value
CS2800	Software engineering	Half
CS2810	Team project	Half
CS2812	Team project in artificial intelligence (<i>G4G7 only</i>)	Half
CS2821	Systems Programming	Half
CS2830	Robotics	Half
CS2844	Computer graphics	Half
CS2850	Network operating systems	Half
CS2860	Algorithms and complexity I	Half
CS2870	Algorithms and complexity II	Half
IY2760	Introduction to information security	Half
IY2840	Computer and Network Security	Half

STAGE 3/4		Course Unit Value
CS3001	Year out in Industry	Full
CS3810	Half unit project (<i>cannot be taken with CS3821, CS3822</i>)	Half
CS3821	Full unit project (<i>cannot be taken with CS3810</i>)	Full
CS3822	Individual project in artificial intelligence (<i>cannot be taken with CS3810</i>)	Full
IY3821	Full unit project (Information Security)	Full
CS3110	Bioinformatics	Half
CS3210	Image processing	Half

CS3220	Fundamentals of digital sound and music	Half
CS3230	Computer games technology	Half
CS3330	Embedded and realtime systems	Half
CS3450	Software Verification	Half
CS3460	Compiling for embedded systems	Half
CS3480	Software engineering with metamodels	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
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

STAGE 4/5		Course Unit Value
CS4821	Computer Science MSci Project	Two Units
CS4822	Computer Science (Artificial Intelligence) MSci Project	Two Units
IY4500	Information Security MSci Project	Two Units
CS4100	Data Analysis	Half
CS4810	Programming for Data Analysis	Half
CS4200	On-line Machine Learning	Half
CS4920	Computer Learning (<i>cannot be taken with CS3920</i>)	Half
CS4930	Methods of Computational Finance (<i>cannot be taken with CS3930</i>)	Half
CS4450	Software Verification (<i>cannot be taken with CS3450</i>)	Half
CS4234	Large-scale Data Storage and Processing	Half
CS4490	Computational Optimization (<i>cannot be taken with CS3490</i>)	Half
CS4940	Intelligent Agents and Multi-Agent Systems (<i>cannot be taken with CS3940</i>)	Half
CS4580	Advanced Data Communications (<i>cannot be taken with CS3580</i>)	Half
CS4220	Fundamentals of Digital Sound and Music (<i>cannot be taken with CS3220</i>)	Half
IY4606	Smart Cards/Token Security and Applications	Half
IY4609	Digital Forensics	Half
IY4610	Security Testing Theory and Practice	Half
IY4612	Cyber Security	Half

- At stage two or stage three, students may choose to substitute a half unit course for another half unit outside the department provided the department approves the external unit. Students taking a year in industry take the additional course CS3001 and thus have five units in their final year.
- While students are normally allocated a specific laboratory class for any given course they are registered for, they may if they wish attend additional laboratories for 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 recorded in the student's transcripts.

The course units taken for each of the MSci Degree Programmes are as follows:

MSci Computer Science G403

First	CS1801 compulsory for progression CS1820, CS1830, CS1840, CS1850, CS1860, CS1870 Core
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Second	CS2800 core pass required CS2810 core pass required CS2860 core, CS2870 core four further non-project CS2XXX courses
Third	CS3821 core Six further non-project CS3XXX courses
Final	CS4821 core Four further non-project courses from the above Stage 4/5 list

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

MSci Computer Science with Year in Industry G404

First	CS1801 compulsory for progression CS1820, CS1830, CS1840, CS1850, CS1860, CS1870 Core
Second	CS2800 core pass required CS2810 core pass required CS2860 core, CS2870 core four further non-project CS2XXX courses
Third	CS3001 core pass required
Fourth	CS3821 core Six further non-project CS3XXX courses
Final	CS4821 core Four further non-project courses from the above Stage 4/5 list

MSci Computer Science (Information Security) G500

First	CS1801 compulsory for progression CS1820, CS1830, CS1840, CS1850, CS1860, CS1870 Core
Second	CS2800 core pass required CS2810 core pass required IY2760, IY2840, CS2860, CS2870 core Two further non-project CS2XXX courses
Third	IY3821, IY3840, IY3660 core Four further non-project CS3XXX courses-to a total of 2 units of Computer Science
Final	IY4500 core Four further non-project courses from the above Stage 4/5 list with two being IY4XXX courses - to a total of 2 units of Computer Science

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

MSci Computer Science (Information Security) with Year in Industry G502

First	CS1801 compulsory for progression CS1820, CS1830, CS1840, CS1850, CS1860, CS1870 Core
Second	CS2800 core pass required CS2810 core pass required IY2760, IY2840, CS2860, CS2870 core Two further non-project CS2XXX courses -
Third	CS3001 core pass required
Fourth	IY3821, IY3840, IY3660 core Four further non-project CS3XXX courses-to a total of 2 units of Computer Science
Final	IY4500 core Four further non-project courses from the above Stage 4/5 list with two being IY4XXX courses - to a total of 2 units of Computer Science

MSci Computer Science (Artificial Intelligence) G4G7

First	CS1801 compulsory for progression CS1820, CS1830, CS1840, CS1850, CS1860, CS1870 Core
Second	CS2800 core pass required CS2812 core pass required CS2830 core, CS2860 core Four further non-project CS2XXX courses
Third	CS3822 core, CS3920 core Five further non-project CS3XXX half units

Final	CS4822, CS4100, CS4810, CS4200 core One further non-project courses from the above Stage 4/5 list to a total of 0.5 units of Computer Science
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A year in industry (CS3001) may be taken between second and third year.

MSci Computer Science (Artificial Intelligence) with Year in Industry GG74

First	CS1801 compulsory for progression CS1820, CS1830, CS1840, CS1850, CS1860, CS1870 Core
Second	CS2800 core pass required CS2812 core pass required CS2830 core, CS2860 core Four further non-project CS2XXX courses
Third	CS3001 core pass required
Fourth	CS3822 core, CS3920 core Five further non-project CS3XXX half units
Final	CS4822, CS4100, CS4810, CS4200 core One further non-project courses from the above Stage 4/5 list to a total of 0.5 units of Computer Science

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Progression and award requirements

The progression and award requirements are essentially the same across all MSci Degree programmes at Royal Holloway. Students must pass units to the value of at least three units on each stage of the programme. 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 (see programme structure above). To progress from stage two to the following stage the student must achieve at their first attempt an average calculated to two decimal places of 50.00% or above. To progress from the penultimate to final stage 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 penultimate stage average is weighted as 2. MSci Students who fail to progress from stage two will be transferred to a BSc programme. MSci students who fail to progress to the final stage will also be transferred to a BSc programme. In particular:- students taking MSci Computer Science and MSci Computer Science (Year in Industry) who fail to progress will be transferred to BSc Computer Science; students taking MSci Computer Science (Information Security) and MSci Computer Science (Information Security) with a Year in Industry who fail to progress will be transferred to BSc Computer Science (Information Security); students taking MSci Computer Science (Artificial Intelligence) and MSci Computer Science (Artificial Intelligence) with Year in Industry who fail to progress will be transferred to BSc Computer Science (Artificial Intelligence). Likewise, students taking any of the above MSci degree programmes may at the end of year three change to the equivalent BSc programme.

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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 additional academic, pastoral and welfare advice.
- All staff are available and accessible. Initial contact can be arranged via email or through the departmental office.
- Representation on the Staff-Student Committee.
- 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.

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Admission requirements

The Department's standard conditional offer is available on the [Course Finder](#) web page. However, the Department also has considerable flexibility in its admissions and offers policy and strongly encourages applications from non-standard applicants. We are particularly looking for students with some aptitude for Computer Science: this could be demonstrated by, for example, an A-level with a technical component, such as Maths, Physics, Chemistry or Economics, an interest in a particular field of Computer Science, experience in programming or through an interview with us.

Students whose first language is not English may also be asked for a qualification in English Language at an appropriate level. It may also be helpful to contact the [Admissions Office](#) for specific guidance on the entrance requirements for particular programmes.

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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](#).

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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 Assessment Exercise (RAE 2008) conducted by the Higher Education Funding Council (HEFCE). The new scoring system for the RAE 2008 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. 60% of the College's research profile is rated as world-leading or internationally excellent outperforming the national average of 50%. The College is ranked 16th in the UK for research of 4* standard and 18th for 3* and 4* research.

The Computer Science Department is internationally recognised for the excellence of its research. In RAE 2008, 99% of the department's research publications were rated as of international quality, with over a quarter recognised as world leading, and a further half internationally excellent.

In the 2008 National Student Survey the Computer Science Department was second equal in the UK (first equal in England) rankings for Computer Science departments.

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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).

MSci Honours Degree programmes in Computer Science

MSci Computer Science (G403)

MSci Computer Science with Year in Industry (G404)

Specialist Honours Degree programmes within Computer Science

MSci Computer Science (Artificial Intelligence) (G4G7)

MSci Computer Science (Artificial Intelligence) with Year in Industry (GG74)

Combined Honours Degree programmes with Computer Science as a major component

MSci Computer Science (Information Security) (G500)

MSci Computer Science (Information Security) with Year in Industry (G502)

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