

Royal Holloway, University of London
Programme specification for an undergraduate award
BSC COMPUTER SCIENCE AND MATHEMATICS (GG41)

Section 1 – Introduction to your programme

This programme specification is a formal document, which provides a summary of the main features of your programme and the learning outcomes that you might reasonably be expected to achieve and demonstrate if you take full advantage of the learning opportunities that are provided. Further information is contained in the College prospectus, and in various handbooks, all of which you will be able to access online. Alternatively, further information on the College's academic regulations and policies can be found [here](#). Further information on the College's Admissions Policy can be found [here](#).

Your degree programme in **BSc Computer Science and Mathematics** provides a progressive structure in which you are able to gain ever-wider knowledge and understanding, and appropriate skills. The programme contains a combination of mandatory and elective 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 you to develop your own interests through informed choice among specialist options. There is a free choice of final stage courses reflecting both core material, such as compiler theory, and currently important research areas such as machine learning, information security, software language engineering, intelligent agents, computational finance and bioinformatics.

While Royal Holloway keeps all the information made available under review, programmes and the availability of individual course units, especially optional course units are necessarily subject to change at any time, and you are therefore advised to seek confirmation of any factors which might affect your decision to follow a specific programme. In turn, Royal Holloway will inform you as soon as is practicable of any significant changes which might affect your studies.

The following is brief description for some of the most important terminology for understanding the content of this document:

Degree programme – Also referred to as 'degree course' or simply 'course', these terms refer to the qualification you will be awarded upon successful completion of your studies.

Course unit – Also referred to as 'module', this refers to the individual units you will study each year to complete your degree programme. Undergraduate degrees at Royal Holloway comprise a combination of course units to the value of 120 credits per year. On some degree programmes a certain number of optional course units must be passed for a particular degree title.

Section 2 – Programme details			
Date of specification update	April 2019	Location of study	Egham Campus
Programme award and title	BSc Computer Science and Mathematics	Level of study	Undergraduate
Programme code	1069	UCAS code	GG41
Year of entry	2019/20		
Awarding body	Royal Holloway, University of London		
Department or school	Computer Science	Other departments or schools involved in teaching the programme	Department of Mathematics
Mode(s) of attendance	Full-time	Duration of the programme	Three years
Accrediting Professional, Statutory or Regulatory Body requirement(s)	None		
Link to Coursefinder for further information:	https://www.royalholloway.ac.uk/studying-here/	For queries on admissions:	study@royalholloway.ac.uk

Section 3 – Degree programme structure

3.1 Mandatory course unit information

The following table summarises the mandatory modules which students must take in each year of study

Year	Course code	Course title	Contact hours*	Self-study hours	Written exams**	Practical assessment**	Coursework**	Credits	FHEQ level	Course status (see below)
1	CS1811	Object Oriented Programming I	31	119	90	0	10	15	4	MNC
1	CS1812+	Object Oriented Programming II	31	119	90	0	10	15	4	MNC
1	CS1822++	Programming Laboratory	66	234	0	0	100	30	4	MNC
1	MT1710	Calculus	47	103	90	0	10	15	4	MC
1	MT1720	Functions of Several Variables	44	106	90	0	10	15	4	MC
1	MT1810	Number Systems	44	106	90	0	10	15	4	MC
1	MT1820	Matrix Algebra	44	106	90	0	10	15	4	MC
2	CS2800	Software Engineering	33	117	60	0	40	15	5	MNC
2	CS2810	Team Project	40	110	0	0	100	15	5	MNC
2	CS2860	Algorithms and Complexity	33	117	90	0	10	15	5	MC
2	MT2630	Graphs and Optimisation	33	117	100	0	0	15	5	MC
2	MT2800	Linear Algebra and a Group Project	50	100	80	10	10	15	5	MC

This table sets out the most important information for the mandatory courses on your degree programme. These courses are central to achieving your learning outcomes, so they are compulsory, and all students on your degree programme will be required to take them. You will be automatically registered for these courses each year. Mandatory courses fall into two categories; 'condonable' or 'non-condonable'.

In the case of mandatory 'non-condonable' (MNC) courses, you must pass the course before you can proceed to the next year of your programme, or to successfully graduate with a particular degree title. In the case of mandatory 'condonable' (MC) courses, these must be taken but you can still progress or graduate even if you do not pass them. Please note that although Royal Holloway will keep changes to a minimum, changes to your degree programme may be made where reasonable and necessary due to unexpected events. For example; where requirements of relevant Professional, Statutory or Regulatory Bodies have changed and programme requirements must change accordingly, or where changes are deemed necessary on the basis of student feedback and/or the advice of external advisors, to enhance academic provision.

*Contact hours come in various different forms, and may take the form of time spent with a member of staff in a lecture or seminar with other students. Contact hours may also be laboratory or, studio-based sessions, project supervision with a member of staff, or discussion through a virtual learning environment (VLE). These contact hours may be with a lecturer or teaching assistant, but they may also be with a technician, or specialist support staff.

**The way in which each course on your degree programme is assessed will also vary, however, the assessments listed above are all 'summative', which means you will receive a mark for it which will count towards your overall mark for the course, and potentially your degree classification, depending on your year of study. On successful completion of the course you will gain the credits listed. 'Coursework' might typically include a written assignment, like an essay. Coursework might also include a report, dissertation or portfolio. 'Practical assessments' might include an oral assessment or presentation, or a demonstration of practical skills required for the particular course.

3.2 Optional course units

In addition to mandatory course units, there will be a number of optional course units available during the course of your degree. The following table lists a selection of optional course units that are likely to be available. However, not all may be available every year. Although Royal Holloway will keep changes to a minimum, new options may be offered or existing ones may be withdrawn. For example; where reasonable and necessary due to unexpected events, where requirements of relevant Professional, Statutory or Regulatory Bodies (PSRBs) have changed and programme requirements must change accordingly, or where changes are deemed necessary on the basis of student feedback and/or the advice of External Advisors, to enhance academic provision. There may be additional requirements around option selection, so it is important that this specification is read alongside your department's Student Handbook, which you can access via their [webpage](#).

Year 1	Year 2	Year 3
None	CS2910: Artificial Intelligence (AI)	CS3003: IT Project Management (SE)
	IY2760: Introduction to Information Security	CS3110: Bioinformatics
	IY2840: Computer and Network Security	CS3220: Digital Audio and Applications
	MT2220: Vector Analysis and Fluids	CS3470: Compilers and Code Generation
	MT2320: Probability	CS3480: Software Language Engineering (SE)
	MT2860: Groups and Group Functions	CS3510: Functional Programming and Applications (SE)
		CS3810: Half Unit Project
		CS3821: Full Unit Project
		CS3846: Human-Computer Interaction (SE)
		CS3870: Advanced Algorithms and Complexity
		CS3920: Machine Learning (AI)
		CS3930: Computational Finance (AI)
		CS3940: Intelligent Agents and Multi-agent Systems (AI)
		IY3501: Security Management (IS)
		IY3606: Smart Cards/Token Security and Applications (IS)
		IY3609: Digital Forensics (IS)
		IY3612: Cyber Security (IS)
		IY3660: Applications of Cryptography (IS)

		IY3840: Malicious Software (IS)
		MT3000: Mathematics Project
		MT3110: Number Theory
		MT3130: Complexity Theory

3.3 Other course unit requirements

+ You may take CS1813 Software Development instead of CS1812 at the discretion of the department.

++ You may take CS1821 Programming Fundamentals instead of CS1822 at the discretion of the department.

Year 2 – Computer Science

In addition to the mandatory courses you must choose one further non-project CS2XXX or IY2XXX course

Year 2 – Mathematics

You must choose 30 credits of Mathematics courses (see Mathematics handbook for options)

Year 3- Computer Science

You must choose **either** CS3821 **or** CS3810

Plus

Two or three further non-project CS or IY elective courses – to a total of 60 credits of Computer Science, excluding CS3490 and CS3870.

Year 3 – Mathematics You must choose 60 credits of Mathematics courses (see Mathematics handbook for options).

Note: 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.

Section 4 - Progressing through each year of your degree programme

For further information on the progression and award requirements for your degree, please refer to Royal Holloway's Academic Regulations. As part of your degree programme you may also be required to complete a course to develop your academic writing skills. This course does not carry credit but passing it is a requirement to progress to the next year of study.

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

Students on degree programmes with Year in Industry need to fulfil the requirements set out in the departmental Year in Industry Handbook in order to progress to the placement and be eligible for the degree title.

Section 5 – Educational aims of the programme

The aims of this programme 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, 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 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.

Section 6 - Programme learning outcomes

In general terms, the programmes provide opportunities for students to develop and demonstrate the following learning outcomes. (*Categories – Knowledge and understanding (K), Skills and other attributes (S), and Transferable skills (*)*)

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| <ul style="list-style-type: none"> • knowledge and understanding of the essential facts, concepts, principles and theories relating to computing and computer applications (K); • 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 (K); • 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 (K); • 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 (K); • depending on their programme of studies, students may also gain a 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 (K); | <ul style="list-style-type: none"> • 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 (S); • employ the research skills needed to investigate a defined topic under supervision, through an extended individual project (S); • 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 (S);* • problem identification, analysis and solution using critical assessment and reasoned argument (S);* • taking responsibility for own learning and developing habits of reflection on that learning (S);* • skills in written communication, project documentation, verbal presentation; numeracy and computation (S);* • use of information technology (including spreadsheets, databases, word processing, email and WWW) (S); * • information handling and retrieval (including the use of libraries and computer technology) (S);* • ability to work autonomously, and to demonstrate time management and organisational skills (S);* |
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Section 7 - 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 individual 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](#)

Section 8 – Additional costs

There are no single associated costs greater than £50 per item on this degree programme.

These estimated costs relate to studying this particular degree programme at Royal Holloway. General costs such as accommodation, food, books and other learning materials and printing etc., have not been included, but further information is available on our website.

Section 9 – Indicators of quality and standards

QAA Framework for Higher Education Qualifications (FHEQ) Level	4-6
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Your programme is designed in accordance with the FHEQ to ensure your qualification is awarded on the basis of nationally established standards of achievement, for both outcomes and attainment. The qualification descriptors within the FHEQ set out the generic outcomes and attributes expected for the award of individual qualifications. The qualification descriptors contained in the FHEQ exemplify the outcomes and attributes expected of learning that results in the award of higher education qualifications. These outcomes represent the integration of various learning experiences resulting from designated and coherent programmes of study.

QAA Subject benchmark statement(s)	http://www.qaa.ac.uk/quality-code/subject-benchmark-statements
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Subject benchmark statements provide a means for the academic community to describe the nature and characteristics of programmes in a specific subject or subject area. They also represent general expectations about standards for the award of qualifications at a given level in terms of the attributes and capabilities that those possessing qualifications should have demonstrated.

Section 10 – Further information

This specification provides a concise summary of the main features of the programme and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate when taking full advantage of the learning opportunities that are available. More detailed information on course units, including teaching and learning methods, and methods of assessment, can be found via the online [Course Catalogue](#). The accuracy of the information contained in this document is reviewed regularly by the university, and may also be checked routinely by external agencies, such as the Quality Assurance Agency (QAA).

Your programme will be reviewed regularly, both by the university as part of its cyclical quality enhancement processes, and/or by your department or school, who may wish to make improvements to the curriculum, or in response to resource planning. As such, your programme may be revised during the course of your study at Royal Holloway. However, your department or school will take reasonable steps to consult with students via appropriate channels when considering changes. All continuing students will be routinely informed of any significant changes.

Section 11 – Intermediate exit awards (where available)

You may be eligible for an intermediate exit award if you complete part of the programme as detailed in this document. Any additional criteria (e.g. mandatory course units, credit requirements) for intermediate awards is outlined in the sections below.

Award	Criteria	Awarding body
Diploma in Higher Education (DipHE)	Pass in 210 credits of which at least 90 must be at or above FHEQ Level 4 and at least 120 of which must be at or above FHEQ Level 5	Royal Holloway and Bedford New College
Certificate in Higher Education (CertHE)	Pass in 120 credits of which at least 90 must be at or above FHEQ Level 4	Royal Holloway and Bedford New College

Section 12 - Associated award(s)