Royal Holloway, University of London
Course specification for an undergraduate award
BSC COMPUTER SCIENCE (ARTIFICIAL INTELLIGENCE) (G4G7)

Section 1 – Introduction to your course

This course specification is a formal document, which provides a summary of the main features of your course 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 polices can be found here. Further information on the College's Admissions Policy can be found here.

Your degree programme in **BSc Computer Science (Artificial Intelligence)** 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. In the final stage of the programme, you undertake a project, which accounts for 25% of your studies in the final stage. There is a free choice of other 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, courses and the availability of individual modules, especially optional modules 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 course. 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 course – May also be referred to as 'degree programme' or simply 'programme', these terms refer to the qualification you will be awarded upon successful completion of your studies.
Module – May also be referred to as 'course', this refers to the individual units you will study each year to complete your degree course. Undergraduate degrees at Royal Holloway comprise a combination of modules in multiples of 15 credits to the value of 120 credits per year. On some degree courses a certain number of optional modules must be passed for a particular degree title.

Section 2 – Course details			
Date of specification update	February 2022	**Location of study**	Egham Campus
Course award and title	BSc Computer Science (Artificial Intelligence)	**Level of study**	Undergraduate
Course code	1059	**UCAS code**	G4G7
Year of entry	2022/23		
Awarding body	Royal Holloway, University of London		
Department or school	Computer Science	**Other departments or schools involved in teaching the course**	N/A
Mode(s) of attendance	Full-time	**Duration of the course**	3 years
Accrediting Professional, Statutory or Regulatory Body requirement(s)	British Computer Society (BCS), and European Quality Assurance Network for Informatics Education (EQANIE). To comply with British Computer Society and EQANIE accreditation requirements students must successfully complete the degree programme and pass the final year project.		
Link to Coursefinder for further information:	https://www.royalholloway.ac.uk/studying-here/	**For queries on admissions:**	https://royalholloway.ac.uk/applicationquery

Section 3 – Degree course structure

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

Year	Module code	Module title	Contact hours*	Self-study hours	Written exams**	Practical assessment**	Coursework**	Credits	FHEQ level	Module status (see below)
1	CS1811	Object oriented programming I	44	106	70	0	30	15	4	MNC
1	CS1812++	Object oriented programming II	33	117	60	0	40	15	4	MNC
1	CS1822+++	Programming Laboratory	66	234	0	0	100	30	4	MNC
1	CS1840	Internet Services	31	119	80	0	20	15	4	MC
1	CS1860	Mathematical Structures	39	111	90	0	10	15	4	MC
1	CS1870	Machine Fundamentals	38	112	90	0	10	15	4	MC
1	CS1890	Software Design	34	116	0	0	100	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	CS2850	Operating Systems	44	106	60	0	40	15	5	MC
2	CS2855	Databases	44	106	70	0	30	15	5	MC
2	CS2860	Algorithms and Complexity	33	117	70	0	30	15	5	MC
2	IY2760	Introduction to Information Security	33	117	60	0	40	15	5	MC

3	CS3822	Full Unit Project in Artificial Intelligence	3.7	296.3	0	0	100	30	6	MC

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

In the case of mandatory 'non-condonable' (MNC) modules, you must pass the module before you can proceed to the next year of your course, or to successfully graduate with a particular degree title. In the case of mandatory 'condonable' (MC) modules, 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 course 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 course 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 module on your degree course 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 module, and potentially your degree classification, depending on your year of study. On successful completion of the module 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 module.

3.2 Optional modules

In addition to mandatory modules, there will be a number of optional modules available during the course of your degree. The following table lists a selection of optional modules 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 course 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; please contact the Department for further information.

Year 1	Year 2	Year 3
None	CS2900: Multi-dimensional Data Processing (AI)	CS3000: Randomness in Computing
	CS2910: Symbolic Artificial Intelligence (AI)	CS3003: IT Project Management (SE)
	IY2840: Computer and network security	CS3110: Bioinformatics

		CS3470: Compilers and Code Generation
		CS3480: Software Language Engineering (SE)
		CS3490: Computational Optimization
		CS3510: Functional Programming and Applications (SE)
		CS3870: Advanced Algorithms and Complexity
		CS3920: Machine Learning (AI)
		CS3930: Computational Finance (AI)
		CS3940: Intelligent agents and multi-agent systems (AI)
		CS3945: Semantic Web (AI)
		CS3990: Natural Language Processing (AI)
		IY3501: Security management (IS)
		IY3606: Smart Cards, RFIDs and Embedded Systems Security (IS)
		IY3609: Digital forensics (IS)
		IY3612: Cyber security (IS)
		IY3660: Applications of Cryptography (IS)
		IY3840: Malicious Software (IS)
		PC3001: User-centred design

3.3 Optional module 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.

In **Year 2**: you will take 2 further non-project elective module(s) starting with CS2 from the AI strand.

In **Year 3**: you will take 2 further non-project elective module(s) starting with CS3 or PC3 or IY3 from the AI strand; and you will take 4 further non-project elective module(s) starting with CS3 or PC3 or IY3.

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 course

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 course you may also be required to complete a module to develop your academic writing skills. This module does not carry credit but passing it is a requirement to progress to the next year of study.

All first year undergraduate students are required to take and pass the non-credit bearing Moodle-based Academic Integrity module SS1001 in order to progress into the second year of study (unless their course includes the alternative mandatory SS1000 module). The pass mark for the module assessment is stated in the on-line Academic Integrity Moodle module. Students may attempt the assessment as often as they wish with no penalties or capping. Students who meet the requirements for progression as stipulated in the College's Undergraduate Regulations (Section: Conditions for progression to the next stage) but fail to pass the Moodle-based Academic Integrity module will not be permitted to progress into their second year of academic study at the College.

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.

Section 5 – Educational aims of the course

The aims of this course 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 - Course learning outcomes

In general terms, the courses 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 (*)*)

- 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);
- 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);*

Section 7 - Teaching, learning and assessment
Teaching and learning is mostly by means of lectures; seminars; study groups; essay consultations; oral presentations and guided independent study. Assessment of knowledge and understanding is typically by formal examinations, coursework, examined essays, translation exercises, online tests and exercises, oral presentations and the dissertation or long essay. In addition, students may be involved in workshops and may produce various forms of creative or editorial work. A breakdown of assessment types for individual modules is shown in section 3.

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 course 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
Your course 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 courses of study.	
QAA Subject benchmark statement(s)	http://www.qaa.ac.uk/quality-code/subject-benchmark-statements
Subject benchmark statements provide a means for the academic community to describe the nature and characteristics of courses 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 course 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 modules, including teaching and learning methods, and methods of assessment, can be found via the online Module 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 course 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 course 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 course as detailed in this document. Any additional criteria (e.g. mandatory modules, credit requirements) for intermediate awards is outlined in the sections below.

Award	Criteria	Awarding body
BSc Computer Studies	If you do not meet the accreditation requirements for BSc Computer Science but otherwise meet the University's standard requirements for an honours award, you will be eligible for a BSc Computer Studies as an exit award.	Royal Holloway, University of London
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)	
BSc Computer Science (Artificial Intelligence) with a Year in Industry (2446)	