BSc (Hons) Computer Science Programme Specification

https://www.bradford.ac.uk/courses/ug/computer-science-bsc/

Academic Year:	2024/25
Degree Awarding Body:	**University of Bradford**
Final and interim award(s):	**Bachelor of Science (Honours)** [Framework for Higher Education Qualifications (FHEQ) level 6] **Bachelor of Science** [Framework for Higher Education Qualifications (FHEQ) level 6] **Diploma of Higher Education** [Framework for Higher Education Qualifications (FHEQ) level 5] **Certificate of Higher Education** [Framework for Higher Education Qualifications (FHEQ) level 4]
Programme accredited by:	**BCS The Chartered Institute for IT**
Programme duration:	**3 years full time** **4 years full-time** including a year of study abroad or work placement
UCAS code:	**I100** (3 years) **I101** (4 years)
QAA Subject benchmark statement:	**Computing**
Date last confirmed by Faculty Board:	**July 2021**

Please note: This programme specification has been published in advance of the academic year to which it applies. Every effort has been made to ensure that the information is accurate at the time of publication, but changes may occur given the interval between publishing and commencement of teaching. Any change which impacts the terms and conditions of an applicant's offer will be communicated to them. Upon commencement of the programme, students will receive further detail about their course and any minor changes will be discussed and/or communicated at this point.

Introduction

In the digital age that we are living in, computers infiltrate every aspect of our lives. Computer science's positive impact on the world is far-reaching, where we see technologies from the digital industry facilitating communication, inspiring innovation, empowering entrepreneurship, fuelling invention and productivity, streamlining research, driving societal change, and resolving business and societal challenges, preparing for and responding to crises all over the world. Thus, we need computer scientists to theorise, design, develop, and apply the software and hardware for the programmes we use.

This Computer Science programme concentrates on the theoretical foundations of computation, information representation and data processing, problem solving and computer technology, and their industry, commercial and research applications. It

incorporates ideas from many other disciplines, including mathematics, engineering, management and graphics, and has a close affinity with digital communications as illustrated by the Internet, World Wide Web, and wireless communication technologies.

The BSc (Hons) Computer Science is offered by the School of Computer Science, AI and Electronics as part of the Faculty of Engineering and Digital Technologies at the University of Bradford, which includes a renowned tradition of undergraduate and postgraduate programmes concerned with the understanding, design, and exploitation of computation and computer technology.

Exposure to industry is deeply embedded within this programme in a number of ways. The programme is industry informed with our Industry Advisory Board (IAB), a membership comprised of industry representatives from both regional and national companies, reviewing our provision of the programme and advising on our programme enhancements. The launch of the Computing Enterprise Centre offers to our students the opportunity to develop industry-based projects in the second and final years and also provides industry-sponsored competitive internships. We support industry placements and collaborate with local, national and international organisations offering such job offers through our industry contacts and extended network of successful graduates.

The undergraduate and postgraduate programmes offered by our School are accredited by or aligned to professional bodies including the British Computer Society (BCS) and The Chartered Institute for IT and computing professionals, the Association of Computing Machinery (ACM) and GCHQ. The accreditation of our programmes, starting with the BSc Computer Science, means that successful honours graduates are exempted from further examinations for BCS membership and ensures that our graduates are not only exposed to industry throughout their course but also are employment ready upon graduation.

The student societies with links to professional bodies afford further opportunities for students to engage with industry, such as Pi Soc as the first ever BCS Student Chapter, and our ACM Student Chapter. The School encourages and offers support to these societies in their participation in industry and research led activities including programming competitions, data dives and extra-curricular collaborations and visits.

Our placement scheme also provides students with the opportunity to work in a company for up to one year as part of their studies, further enhancing their discipline specific and transferable skills.

The School also places great emphasis on research and research-informed teaching, and there are opportunities for students to join one of our research teams and their projects, and progress on to postgraduate taught programmes or research degrees on completion of their first degree.

Upon completing the programme, you will become more than just a programmer - you will also develop skills in communication, teamwork, systems design and entrepreneurship.

Programme Aims
The aim of the programme is to provide students with a sound grounding in the fundamentals of computer science, software development (programming) and the tools and applications that modern computer scientists use.

This aim will be achieved by:

A1   Providing students with a core of fundamental modules, in stages 1 and 2, that are essential to all computer scientists, plus a wide range of options, particularly in the final stage, so that students may choose the area in which they are strong or wish to specialize, which builds on the knowledge and understanding gained earlier.

A2   Providing the support in the form of lectures, labs and tutorials that will enable students to develop their personal portfolio of skills and knowledge, in line with the School of Computer Science, AI and Electronics' commitment to providing a high standard of academic delivery and environment, supported by up-to-date computing facilities, hardware devices and software tools.

A3   Developing discipline and personal transferable skills so that during studies and on graduation students may move directly into responsible positions in industry or commerce (such as placement, graduate schemes respectively) and as business innovators, or may pursue further programmes of study.

A4   Enabling development of problem analysis and computational solutions by application of fundamental principles and concepts of computer science, such as abstraction, data representation, logic, algorithms and digital technologies.

A5   Promoting educational opportunities and interest in academic development for ethnic minorities, women, mature and alternatively qualified students, as well as for school-leavers and traditionally qualified students.

Programme Learning Outcomes
To be eligible for the award of Certificate of Higher Education at FHEQ level 4, students will be able to:

P1   Describe the history and development of computer science and outline important concepts and topics within the field.

P2   Outline the professional, ethical, security, industrial and research dimensions of the discipline of computer science.

P3   Demonstrate knowledge of fundamental concepts of computer science, and the environment in which they operate; basics of software construction and the tools required to support it, develop skill in constructing software.

P4   State and explain relevant models, principles and practices applicable to the study of computers, computer architecture and systems.

P5   Demonstrate knowledge of a range of underlying theories, logical and mathematical foundations relevant to computer science.

P6   Work effectively as individuals and in groups.

P7   Collect, manage and present information, ideas and concepts, interpret data using suitable techniques, and communicate efficiently with a range of audiences.

Additionally, to be eligible for the award of Diploma of Higher Education at FHEQ level 5, students will be able to:

P8   Apply methods, methodology, knowledge, skills and standards to build and test complex software systems through teamwork.

P9   Apply knowledge of investigative and research principles to demonstrate an understanding of how to develop computing designs, databases, and processes.

P10 Develop computational thinking for problem solving, algorithm design and assessing efficiency of different implementations.

P11 Demonstrate the use of practical computer science skills in designing, developing and monitoring communication networks.

P12 Demonstrate fundamental understanding of various applications of AI techniques in solving computational problems.

P13 Apply knowledge of the fundamentals of numerical analysis to develop and implement efficient numerical algorithms.

P14 Communicate effectively with industry and other computing professionals and demonstrate personal and technical skills.

Additionally, to be eligible for the exit award of Ordinary Degree of Bachelor at FHEQ level 6, students will be able to:

P15 Demonstrate a systematic understanding of key aspects of their field of study, including acquisition of coherent and detailed knowledge informed by aspects of Computer Science.

P16 Deploy accurately established techniques of analysis and enquiry within Computer Science.

P17 Show conceptual understanding that enables students to devise and sustain arguments, and/or to solve problems, using ideas and techniques, and to describe and comment upon particular aspects of current research, or equivalent scholarship, or practice in Computer Science.

P18 Develop an ability to make critical use of relevant literature to discuss aspects of current research in the discipline, to make use of primary sources, to manage and communicate their own learning, and to recognise the uncertainty, ambiguity and limits of knowledge.

Additionally, to be eligible for the award of Honours Degree of Bachelor at FHEQ level 6, students will be able to:

P19 Develop a systematic understanding of the fundamental concepts and theories of computer science including detailed knowledge of hardware, computer architecture, information, and communication technologies.

P20 Show a firm grasp of the mathematical foundations of computing and how they underpin the formal specification and design of commercial or research applications.

P21 Analyse problems and develop solutions using leading edge ideas and techniques.

P22 Competence in the use of major software application packages.

P23   Exercise initiative in information management, interpretation and presentation of Computer Science tools, products and solutions.

P24   Apply knowledge in core computer science areas such as computer systems analysis, design, programming and administration, and specialise in artificial intelligence, computer graphics, large and distributed systems and their use and security.

P25   Demonstrate professional interest and expertise for a variety of careers such as software designer, scientific programmer, application developer, graphics programmer, data scientist, system administrator, financial analyst, IT project manager, IT consultant or computing researcher that match both learners and employers' expectations.

Curriculum

The curriculum may change, subject to the University's programme approval, monitoring & review procedures.

Stage 1 (Level 4)

FHEQ Level	Module Title	Type	Credits	Study Period	Module Code
4	Mathematics for Computing	Core	20	Semester 1	COS4014-B
4	Technical and Professional Skills	Core	20	Semester 1	COS4015-B
4	Fundamentals of Programming	Core	20	Semester 1	COS4016-B
4	Computer Architecture and Systems Software	Core	20	Semester 2	COS4001-B
4	Internet Technologies	Core	20	Semester 2	COS4018-B
4	Software Design and Development	Core	20	Semester 2	COS4017-B

At the end of stage 1 (level 4), students will be eligible to exit with the award of **Certificate of Higher Education** if they have successfully completed at least 120 credits and achieved the award learning outcomes.

The exit award of Certificate DOES NOT CONFER ELIGIBILITY TO REGISTER WITH BCS.

Stage 2 (Level 5)

FHEQ Level	Module Title	Type	Credits	Study Period	Module Code
5	Database Systems	Core	20	Semester 1	COS5020-B
5	Data Structures and Algorithms	Core	20	Semester 1	COS5021-B
5	Artificial Intelligence	Core	20	Semester 1	COS5028-B
5	Numerical Analysis	Core	20	Semester 2	COS5018-B
5	Enterprise-Pro	Core	20	Semester 2	COS5019-B
5	Computer Communications and Networks	Core	20	Semester 2	COS5025-B

At the end of stage 2 (level 5), students will be eligible to exit with the award of **Diploma of Higher Education** if they have successfully completed at least 240 credits and achieved the award learning outcomes.

The exit award of Diploma DOES NOT CONFER ELIGIBILITY TO REGISTER WITH BCS.

Stage 3

Stage 3 of the programme comprises 80 core credits and 40 option credits to be taken as 2 of the following 20 credit modules.

FHEQ Level	Module Title	Type	Credits	Study Period	Module Code
6	Final Year Project	Core	40	Semesters 1+2	COS6006-D
6	Numerical Methods and Computer Graphics	Core	20	Semester 1	COS6021-B
6	Concurrent and Distributed Systems	Core	20	Semester 2	COS6012-B
6	Cyber Security	Option	20	Semester 1	COS6008-B
6	Large Scale Data Driven Applications	Option	20	Semester 1	COS6009-B
7	Mobile Application Development	Option	20	Semester 1	COS7025-B
6	Principles of Security Technologies	Option	20	Semester 2	COS6025-B
6	Machine Learning	Option	20	Semester 2	COS6026-B
6	Software Systems Design and Testing	Option	20	Semester 2	COS6028-B

The exit award of Ordinary BSc DOES NOT CONFER ELIGIBILITY TO REGISTER WITH BCS.

At the end of stage 3, students will be eligible for the FHEQ Level 6 award of **Honours Degree of Bachelor** if they have successfully completed at least 360 credits.

The award of BSc (Hons) CONFERS ELIGIBILITY TO REGISTER WITH BCS.

Placement and/or Study Abroad

This programme provides the option for students to undertake a work placement between Stages 2 and 3. Students wishing to take this option will be registered for the 4-year programme.

Students can alternatively go abroad for a year after their second year.

- On successful completion of the ENG5002-Z placement module, students will be eligible for the award of **University Diploma in Industrial Studies**.

- On successful completion of the ENG5004-Z study abroad experience module, students will be eligible for the award of **University Diploma in Industrial Studies** (**International**).

For further information about study abroad opportunities please refer to https://www.bradford.ac.uk/study/abroad/.

Learning and Teaching Strategy

Our Learning and Teaching Strategy is to provide a nurturing and supportive environment that enables students to become an independent learners and problem solvers. Students will be supported via various approaches including e.g. learning in small groups and in practical laboratory sessions where discussions and formative feedbacks are embedded, having the support of lecturers, demonstrators and project supervisor, who all provide academic support and guidance. Students will also have their own personal academic tutor who provide academic and pastoral care throughout the programme of study. Students will also have the opportunity to be part of the University of Bradford Computing Society for students, PiSoc, as well as the Peer Assisted Learning (PAL) scheme, where students are able to meet with other fellow Computer Science students at different stages of their study. The programme is designed to develop your knowledge and skills in ways to allow gradual transition from one stage to the next.

From Stage 1 onwards, students will experience a wide range of teaching and learning environments and a consistent balance between direct academic delivery, and individual and group study. Concepts, principles and theories are explored in formal lectures, practiced in associated tutorials and seminars, and demonstrated and experimented in laboratory classes. Practical skills are developed in laboratory sessions. Professional and personal skills are developed through the Technical and Professional Skills module which involves communications skills, library skills, group work and presentations. The Enterprise-Pro module develops an appreciation of how to manage group dynamics whilst working on a substantial computing and software engineering exercise. Honours students undertake a major individual project in their final year, drawing together the knowledge and experience gained throughout the programme. The project provides the opportunity for students to demonstrate the ability to solve problems using current ideas and current, innovative techniques that are at the forefront of computing and applied multidisciplinary disciplines.

Each 20-credit module on the programme requires students to commit 200 hours of study. Many of these hours will be formally timetabled - lectures, laboratories, seminars and tutorials – and others will involve students carrying out private study or group work. The balance between these forms of study changes as students pass through the three years of the programme. There are many contact hours (time spent with academic tutors) in all stages of the programme; in the final year students will also be expected to manage their plan for the individual project, under the general guidance of their academic tutors.

In addition, the learning and teaching on the programme are informed by industry and by staff undertaking KTP projects, national and EU funded research projects and consultancy work that embed new knowledge and concepts into our teaching materials and curriculum planning; and inviting industrial speakers. Throughout the academic year industry speakers and researchers are also invited to give talks and lectures that inform and inspire our students about current and future developments within their disciplines. For further information on industry talks and research seminars please refer to https://www.bradford.ac.uk/ei/computer-science/research/.

Innovative projects initiated by industry are also embedded within a number of the modules, such as Technical and Professional Skills (level 4), Enterprise-Pro (level 5) and

Final Year Project (level 6), through our Computing Enterprise Centre, allowing students to work on topics that are highly relevant to their future careers throughout the course.

Students will also have the opportunity to interact with our Independent Computing Industry Advisory Board members and a wider audience of industry contacts during the Final Year Project Showcase, which allows them to demonstrate their work and to receive feedback and ideas from professionals within the discipline.

Further, the programme employs several advanced active learning methods. For example, Team Based Learning (TBL) strategies are integrated within several modules. We also endeavour to use team teaching methods where lecturing staff can contribute their specialised research and knowledge into the curriculum.

Throughout the programme, we make use of case studies so that students can apply their theoretical understanding to real-world issues. In this way, abstract concepts are brought to life through practical activities.

We use CANVAS to share course materials and reading lists, communicate with students, track student participation, facilitate discussions, support formative and summative assessments and provide feedback. Students can use Canvas independently to revise materials, ask questions and interact with lecturers and other students using discussions, practise and assess their understanding using quizzes, or for finding resources for further reading.

In addition to the standard technology enhanced learning approaches, we embed technologies to deliver key concepts in an interactive environment that strongly links theory with practical skills. For example: in programming lectures, a remote desktop application allows lecturers to demonstrate coding in an environment identical to that in our cutting-edge labs; our Enterprise-Pro module (level 5) requires and supports students to develop their projects using an industry standard tool for collaborative team-based software development. This allows students to develop industry standard skills based on real working practice.

Our curriculum development is informed by the research conducted by academic members of staff within the School, exposing students to current developments within the related fields of expertise. Knowledge and experience from Industrial partners are also integrated within the programme through both our Industry Advisory Board and research projects through case studies, lab-based activities and invited talks, ensuring that research findings are at the heart of our curriculum.

Equality, diversity and inclusion are embedded in our programme's learning and teaching activities. We celebrate differences and ensure that everyone has equal opportunities to achieve their desired outcomes. Students are also instilled with the understanding of ethical and professional issues within the context of computer science and IT and the responsibilities around these issues. Students will be encouraged to explore a diverse range of digital technologies and theories and engage constructively with businesses and communities to enrich their understanding of the impact of Computer Science on everyone's everyday lives and embrace the values of equality, diversity and inclusion in their development of Computer Science solutions. This approach will equip students with

the wider perspective of the relevance of Computer Science for the betterment of businesses and society.

Assessment Strategy

Methods of assessment are varied, and progress will be assessed using a mix of formal examinations, presentations and seminar papers, reports, laboratory tests, essays, coursework assignments, and projects. Formative assessments are also used to allow feedback to be provided, strengths and areas of improvement to be identified. The appropriate method is chosen so that students may demonstrate the learning outcomes of each module.

All our staff have achieved, or are working towards, Fellowship of the Higher Education Academy (FHEA). As part of our commitment to Excellence in Learning and Teaching, we conduct research into innovative and effective teaching and assessment methods. For example, assessment for our Final Year Project module was enhanced by incorporating regular formative and summative feedback opportunities to enhance the final outcomes, based on a research project conducted by staff within the School that culminated in a journal publication.

Assessment Regulations

This Programme conforms to the standard University Undergraduate Assessment Regulations which are available at the following link: www.bradford.ac.uk/regulations

Admission Requirements

We take into consideration a number of factors when assessing your application. It's not just about your grades; we take the time to understand your personal circumstances and make decisions based on your potential to thrive at university and beyond.

A typical offer for students applying through the UCAS scheme would be 112 points. The applicable UCAS tariff online at www.brad.ac.uk/courses/ug/computer-science-bsc/ provides admission information relevant to the current recruitment cycle and therefore may be different to when this document was originally published.

Students are required to have GCSE English and Maths at a minimum grade of 4 or grade C or equivalent.

Recognition of Prior Learning

Applications are welcome from students with non-standard qualifications or mature students (those over 21 years of age on entry) with significant relevant experience and will be considered on individual basis by academic tutors.

If applicants have prior certificated learning or professional experience which may be equivalent to parts of this programme, the University has procedures to evaluate and recognise this learning in order to provide applicants with exemptions from specified modules or parts of the programme.

Minor Modification Schedule

Version Number	Brief description of Modification	Date of Approval (Faculty Board)

1	Specification reformatted and made accessible. Hypertext links updated.	October 2020
2	Learning outcomes updated	July 2021
3	Amendments for 2021 Academic Year	August 2021
4	LOs corrected. Removal of one optional module.	March 2022
5	Annual changes for 2022 academic year	March 2022
6	Updates for periodic review	April 2023
7	Annual changes for 2024 Academic Year	April 2024