Course Specification

BSc Computer Science with Artificial Intelligence
EECU096

MSci Computer Science with Artificial Intelligence
EECU097

Faculty of Engineering, Environment and Computing
School of Computing, Electronics and Mathematics
Academic Year: 2021/22

BSc/MSci Computer Science

1. Introduction

The Coventry University Computer Science offering includes a complementary suite of awards based around a core BSc programme. Students can opt for an additional MSci year, a placement year, a study year abroad and various combinations of these.

In all cases the course is designed to produce graduates with the technical and transferable skills needed in a wide range of careers and industries; whether these are established ones such as software development and database maintenance, or emerging one applying new developments in machine learning and security.

Key Themes

The course has several key themes centred on computational thinking, by which we mean the ability to develop and understand algorithmic solutions to problems. This is backed up by the practical skill of programming developed in a variety of relevant languages chosen to complement each other and show the spectrum of techniques and tools available. Students will learn about the underlying architecture that supports computation, both the traditional computer and the new cloud based computation infrastructure which is increasingly prevalent. The course includes a key theme of data science where students work with (potentially very large) datasets, learning the appropriate storage, software and statistical techniques. Students will experience how all the previous skills should be combined in the development of an entire product, including the modern tools used in industry such as version control and automated unit testing; the methodologies and design techniques which support such development; and the ethical, social and legal considerations required in such development. Through the study of the above students will also development important degree level transferable skills including both group and individual work, time management, written and verbal presentation to both experts and non-experts, and critical reflection on their own and others work.

In Levels 4 and 5 students study a suite of mandatory modules that cover the topics above and give an essential grounding in Computer Science. In Level 6 students take specialist modules in two of the most important emerging topics of computer science: machine learning and security. These are supplemented by a choice of two optional modules from a choice of four covering mobile app development, web API development, parallel programming and advanced programming paradigms. In all cases students undertake an individual research project at Level 6, under the supervision of an academic member of staff.

In addition to the key topics covered, the programme also offers:
- Activity Led Learning (ALL) with access to the industrial strength collaboration coding platforms such as Github.
- Opportunities to participate in field trips and Online International Learning (OIL) projects, allowing students to interact online with those at universities overseas on a project.
- extracurricular activities in the Computer Science Club that enables students, with support of academics, to acquire knowledge and skills in learning up-to-date technologies.
- novel and engaging learning approaches that place students at the centre of their learning, such as flipped classroom, interactive e-learning technology and research inspired teaching.
- guest speakers from industry professionals to discuss their experience and offer advice on employability.
- industry recognised network certifications through the Add+Vantage system.
- state-of-the-art facilities in the modern Engineering and Computing Building.
- option to undertake a placement year or study year abroad in-between Level 5 and 6 of their degree.
- Culturae Mundi and Linguae Mundi services which run events and courses to celebrate the multiculturalism and multilingualism present on campus.
- The Telent Team service that supports students in undertaking a placement year and provides Level 4 and 5 students with a great deal of valuable advice.

Integrated Masters (MSci) Option

Students have the option to undertake an additional year of study to convert their BSc qualification into an MSci. This process is known as an integrated masters, with the additional year of study at Masters level but forming part of a single degree award. The MSci year focusses on three advanced topics: computational intelligence, e.g. neural networks and evolutionary algorithms; security, e.g. penetration testing and secure software development, and advanced programming applications including parallel programming on GPUs and computer vision techniques. Students also undertake an advanced research project as part of their MSci year.

The requirements to undertake the MSci Level are to obtain an average module grade of 60% or more at Level 6 and a mark of at least 60% on their project (module 6001CEM). Students who enrolled on the MSci option but do not satisfy the progression criteria are awarded the BSc degree.

Commercial and International Experiences

The course actively collaborates with many commercial partners and participates in a number of events throughout the academic year to enable students to interact with potential employers. Students on the course have the option of undertaking a placement year between their second and third years of study on the BSc. The faculty has an award winning placement and employability service, The Telent Team, which can advise and assist students on their placement applications.

Students receive the opportunity to develop their skills and knowledge at the international level through participation in Online International Learning project activities with students from Universities abroad and participation in field trips. They may also opt to spend a year studying abroad via the Erasmus (European Region Action Scheme for the Mobility of University Students) programme.

Add+Vantage

The Coventry University Add+Vantage system offers all students the opportunity a range of work experience, career development and new learning opportunities each year. For example, students considering pursuing a career in teaching can use Add+Vantage Scheme to volunteer in schools. Those preparing for a global marketplace can learn a new language. Those looking for a more technical experience can take advantage of options in Adobe Photoshop, the European Computer Driving Licence (ECDL), or CISCO, all of which can lead to extra qualifications.

2 Available Award(s) and Modes of Study

Title of Award	Mode of attendance	UCAS Code	FHEQ Level
MSci Computer Science in Computer Science with Artificial Intelligence	4 Years FT or 5 Years FT including SW	G401	7
			6
	3 Years FT or 4 Years FT including SW		6
BSc (Hons) Computer Science with Artificial Intelligence			
Fall-back:	Fall-back		6
BSc Computer Science with Artificial Intelligence	Fall-back		5
DipHE Computing	Fall-back		4

CertHE Computing				

3 Awarding Institution/Body	Coventry University
4 Collaboration	N/A
5 Teaching Institution and Location of delivery	Coventry University
6 Internal Approval/Review Dates	Date of approval: 03/2018 Date for next review: 2027/2028
7 Course Accredited by	
8 Accreditation Date and Duration	
9 QAA Subject Benchmark Statement(s) and/or other external factors	The BSc/MSci Honours Computer Science with Artificial Intelligence degree has been designed with the QAA and British Computer Society (BCS) benchmarks in mind and will be submitted to accreditation by the BCS as satisfying the requirements for CITP and partial CEng and CSci registration. Quality Assurance Agency for Higher Education (QAA) Computing Benchmark Statement (can be accessed at: http://www.qaa.ac.uk/en/Publications/Documents/SBS-Computing-16.pdf) QAA benchmarking standards for Taught Masters Degrees in Computing (can be accessed at: http://www.qaa.ac.uk/en/Publications/Documents/SBS-Masters-degree-computing.pdf)
10 Date of Course Specification	February 2021
11 Course Director	Dr Mark Elshaw (BSc and MSci)

12 Outline and Educational Aims of the Course

The main educational aim of the BSc course is for students to acquire knowledge, skills and experience in the theory and practice of computer science as required in a wide range of professions. This includes practical abilities in particular the ability to write code in a high level programming language but also the use of appropriate software and technology such as database systems and version control systems. It includes the core knowledge of the field ranging from how the modern computer and computing infrastructure works to what the limits of computation are.

More specific aims of the course are to:
- gain fundamental understanding of subject areas in the field, knowledge of emergent technologies and the latest tools and techniques.
- develop transferable skills such as critical reflection, clear communication, the ability to work as part of a team, and independent and creative thought.
- acquire transferable and professional skills through projects in preparation for employment in industry, business or education.
- acquire additional skills, such as independent and creative thinking, to pursue further studies and research.

In addition, The MSci course aims to consolidate and strengthen the above skills, applying them to new emerging domains and computer science based research. More specific aims of the MSci course are to:
- enhance the understanding of emerging methods and more advanced tools and technologies in computer science.
- gain understanding of more advanced topics, such as Computer Vision, Evolutionary Algorithms and Ethical Hacking.
- further develop skills to conduct in-depth research in computer science related topics.

13 Course Learning Outcomes

On successful completion of the BSc course, a student will be able to develop skills related to:

B1. **COMPUTATIONAL THINKING:**
develop and understand algorithms to solve problems; measure and optimise algorithm complexity; appreciate the limits of what may be done algorithmically in reasonable time or at all.

B2. **PROGRAMMING:**
create working solutions to a variety of computational and real world problems using an appropriate programming language (or languages) for the task.

B3. **ARCHITECTURE & SECURITY:**
understand the underlying architecture that supports the modern computer, including both traditional operating systems and modern internet based infrastructure, with a focus on maintaining their security.

B4. **DATA SCIENCE AND ARTIFICIAL INTELLIGENCE:**
work with (potentially large) datasets; using appropriate storage technology; applying statistical analysis to draw meaningful conclusions; and using modern machine learning tools to discover hidden patterns. Understand the concepts associated with the various fields of artificial intelligence including machine learning, intelligence agents and reasoning under uncertain conditions.

B5. **SOFTWARE DEVELOPMENT**:
develop a product from the initial stage of requirement / analysis all the way through development to its final stages of testing / evaluation.

B6. **PROFESSIONAL PRACTICE**:
understand professional practices of the modern IT industry which include those technical (e.g. version control / automated testing) but also social, ethical & legal responsibilities.

B7. **TRANSFERABLE SKILLS:**
apply a wide variety of degree level transferable skills including time management, team working, written and verbal presentation to both experts and non-experts, and critical reflection on own and others work.

B8. **ADVANCED WORK:**
apply the above to advanced topics selected according to the interests of individual students.

On successful completion of the MSci course, a student will (in addition to the learning outcomes of the BSc course) be able to develop skills related to:

M1. **COMPUTATIONAL INTELLIGENCE:**
critically evaluate and apply emerging technologies in the field of computational intelligence, such as neural networks, evolutionary algorithms, fuzzy logic, and computer vision technology.

M2. **INFORMATION RETRIEVAL AND ANALYSIS:**
critically evaluation of approaches to retrieve and represent information in an intelligence manner. This will include gaining information from diverse sources, analysing that information and representing the information in a manner understandable for humans.

M3. **ADVANCED PROGRAMMING:**
extend their existing programming skills into the emerging field of GPU programming, as well as applications in computational intelligence and security.

M4. **ADVANCED TRANSFERABLE SKILLS:**
apply a wide range of postgraduate level transferable skills in project design, data analysis, science communication, critical evaluation (of own and others work) and problem solving.

14 Course Structure and Requirements, Levels, Modules, Credits and Awards

Cascade of Awards:

MSci Route

MSci (Hons) in Computer Science with Artificial Intelligence
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BSc (Hons) in Computer Science with Artificial Intelligence
↓
BSc in Computer Science with Artificial Intelligence
↓
Diploma of Higher Education in Computing
↓
Certificate of Higher Education in Computing

BSc Route

BSc (Hons) in Computer Science with Artificial Intelligence
↓
BSc in Computer Science with Artificial Intelligence
↓
Diploma of Higher Education in Computing
↓
Certificate of Higher Education in Computing

To achieve the award of Honours or Unclassified degree from study on the programme a student must achieve the minimum credits specified in the University academic regulations.

The requirement for a BSc Honours award is as follows:
1. Achievement of 360 CATS credits at Levels 4, 5 and 6.
2. A pass in all of the mandatory modules in the recommended programme of study for the named award. The project module must be included in the calculation of the class of award for all Honours Degree awards.

The requirement for a BSc unclassified award is as follows:
1. Achievement of 300 CATS credits at Levels 4, 5 and 6.
2. A pass in all of the mandatory modules, except the project, in the recommended programme of study for the named award.

The requirement for a DipHE award in Computing is as follows:
1. Achievement of 240 CATS credits at Levels 4 or 5 made up from modules specified as part of the BSc or BSc (Hons) Computing programme.

The requirement for a CertHE award in Computing is as follows:
1. Achievement of 120 CATS credits at Levels 4 or 5 made up from modules specified as part of the BSc or BSc (Hons) Computing programme.

The requirements for undergraduate awards can be found on the Coventry University Academic Regulations webpage (http://www.coventry.ac.uk/life-on-campus/the-university/key-information/registry/academic-regulations/) under **Section 6: Regulations for the Undergraduate Curriculum Framework.**

The requirements for taught Postgraduate awards (MSci) can be found on the Coventry University Academic Regulations webpage (http://www.coventry.ac.uk/life-on-campus/the-university/key-information/registry/academic-regulations/) under **Section 7: Regulations for Taught Postgraduate Awards.**

Progression Criteria:
- To progress from Level 4 to Level 5 students must obtain at least 90 of the 120 available credits.
- To progress from Level 5 to professional training (5012CEM), students will be required to have gained at least 90 of the 120 available credits at Level 5.
  To progress from Level 5 to Level 6 students must obtain at least 90 of the 120 available credits.
- To progress from Level 6 onto Level 7 (and thus change degree from BSc to MSci) students must:
  - request to transfer to the MSci if they entered on the BSc;
  - obtain an average module grade of 60% or more at Level 6; and
  - obtain a mark of at least 60% on their project (module 6001CEM).

Students who entered on the MSci but do not satisfy the progression criteria are awarded the BSc degree.

Modules within the course, their status (whether mandatory or optional), the levels at which they are studied and their credit values are identified in the table below.

Module Credit Level	Module Code	Title	Credit Value (Assessment Credit)	Mandatory/ Optional	Course Learning Outcomes
4	4000CEM	Programming and Algorithms	20 (15)	Mandatory	B1, B2, B6
4	4001CEM	Software Design	20 (15)	Mandatory	B5, B6, B7
4	4002CEM	Mathematics for Computer Science	20 (15)	Mandatory	B1, B7
4	4003CEM	Object Oriented Programming	20 (15)	Mandatory	B1, B2, B6
4	4004CEM	Computer Architecture and Networks	20 (15)	Mandatory	B1, B3
4	4005CEM	Database Systems	10 (5)	Mandatory	B2, B4, B6
4	4006CEM	CS ALL Project 1	0 (15)	Mandatory	B1, B2, B5, B6, B7, B8
4	4007CEM	CS ALL Project 2	0 (15)	Mandatory	B1, B2, B3, B4, B5, B6, B7, B8
4	Add+Vantage		10		
5	5000CEM	Introduction to Artificial Intelligence	10 (10)	Mandatory	B1, B4, B6, B7
5	5001CEM	Software Engineering	20 (20)	Mandatory	B2, B5, B6, B7
5	5002CEM	Theory Of Computation	20 (20)	Mandatory	B1, B7
5	5003CEM	Advanced Algorithms	20 (15)	Mandatory	B1, B2, B6
5	5004CEM	Operating Systems and Security	20 (20)	Mandatory	B3, B6
5	5005CEM	Data Science	20 (10)	Mandatory	B2, B4, B6
5	5011CEM	Big Data Programming Project	0 (15)	Mandatory	B1, B2, B4, B6, B7, B8
5	Add+Vantage		10		
5	5012CEM	Professional Training Year	0 (0)	Optional	B1, B2, B4, B6, B7, B8
5	5013CEM	International Experience Year	0 (0)	Optional	B1, B2, B4, B7, B8

Select one of the following project pairs 6000CEM and 6001CEM OR 6060CEM and 6062CEM.					
6	6000CEM	Individual Project Preparation	10 (10)	Mandatory	B5, B6, B7, B8
6	6001CEM	Individual Project	20 (20)	Mandatory	B1, B5, B6, B7, B8 (at a minimum)
6	6060CEM	Group Project Preparation	10 (10)	Mandatory	B5, B6, B7, B8
6	6062CEM	Group Project	20 (20)	Mandatory	B1, B5, B6, B7, B8 (at a minimum)
6	6005CEM	Security	20 (20)	Mandatory	B2, B3, B5, B6, B7, B8
6	6006CEM	Machine Learning and Related Applications	20 (20)	Mandatory	B1, B2, B4, B7, B8
6	Add+Vantage		10		
6	6058CEM	Intelligent Agents	20 (20)	Mandatory	B1, B2, B4, B5, B6, B7, B8
6	6057CEM	Artificial Neural Networks	20 (20)	Mandatory	B1, B2, B4, B5, B6, B7, B8

Level 7 (MSci Only)					
7	7000CEM	Individual Research Project Preparation	15 (15)	Mandatory	M3, M4 (at a minimum)
7	7001CEM	Individual Research Project	15 (15)	Mandatory	M3, M4 (at a minimum)
7	7002CEM	Computer Vision	15 (15)	Mandatory	M1, M3, M4
7	7120CEM	Natural Language Processing	15 (15)	Mandatory	M2
7	7072CEM	Advanced Machine Learning	15 (15)	Mandatory	M1, M3, M4
7	7051CEM	Web Applications and AI	15 (15)	Mandatory	M1, M2, M3, M4
7	7071CEM	Information Retrieval	15 (15)	Mandatory	M2, M3, M4
7	7082CEM	Big Data Management and Data Visualisation	15 (15)	Mandatory	M2, M3, M4

Placement Year - Professional Training Year (5012CEM) / International Experience Year (5013CEM)

Students have the option of choosing to undertake a placement year subject to application and approval with the relevant supporting teams between years 2 and 3 of the course.

For students who secure an approved industrial placement, they will be registered on 5012CEM. Upon successful completion of the module students will continue on the Sandwich (SW) award.

Students who secure an approved study abroad placement, they will be registered on 5013CEM. Upon successful completion of the module students will continue on the Full Time with Study Abroad (FY) award.

5012CEM or 5013CEM are non-credit bearing modules, pass/fail only. They cannot replace any course credits in the final award or be included in the overall award classification.

15 Criteria for Admission and Selection Procedure

UCAS entry profiles may be found at http://www.ucas.ac.uk/students/choosingcourses/entryrequirements

For details of acceptable equivalent qualifications for this course, please visit:
http://www.coventry.ac.uk/study-at-coventry/apply-now/entry-requirements-uk-eu-students/

Applications involving other UK or overseas qualifications, mature candidates, or for direct entry to later stages of the programme from candidates with experience are welcome and will be considered on their merit.

16 Academic Regulations and Regulations of Assessment

This Course conforms to the standard University Regulations.

17 Indicators of Quality Enhancement

The following are key indicators of quality and standards:
- The programme has been designed in accordance with the relevant QAA Computing subject benchmark statements for the subject and professional body requirements (see Section 9).
- Accreditation is to be sought from the British Computer Society (BCS) to ensure the course meets professional standards. See Sections 7 and 8.
- The course has a strong portfolio of industry-related research interests in the areas such as Machine Learning, Mobile Computing and Security. There are course team members active the Coventry University Research Centres including the Research Centre of Flow Measurement & Fluid Mechanics; the Institute for Future Transport and Cities; and the Research Centre for the Built and Natural Environment.
- The course has excellent links with local employers. Regular meetings of the Industry Advisory Board, made up of local employers, provide input to course management and development. Student projects are often informed by working with industrial and research partners.
- The last Research Excellence Framework (REF 2014) resulted in the following ratings for Computer Science & Informatics (5% World-leading, 37% Internationally Excellent, 55% International Recognition, 3% National Recognition).

The report of QAA's Institutional Audit undertaken in 2015 confirmed that:
- The maintenance of the threshold academic standards of awards offered on behalf of degree-awarding bodies and/or other awarding organisations meets UK expectations.
- The quality of student learning opportunities at the provider meets UK expectations
- The quality of the information produced by the provider about its provision meets UK expectations.
- The enhancement of student learning opportunities at the provider meets UK expectations.

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18 Additional Information

Enrolled students have access to additional, key sources of information about the course and student support including:

Documentation:

- Faculty Student Handbook
- Computer Science Course Handbook
- Module Guides
- Aula Course Page & Module Webs
- Module Information Directory and Module Descriptors

Support:

- Sigma Mathematics and Statistics Support Centre
- Programming Support Centre
- University Library
- EEC Student Portal https://share.coventry.ac.uk/students/EC/Pages/Home.aspx
- Coventry University Student Portal https://share.coventry.ac.uk/students/Pages/Index.aspx