Course Specification

Course Summary Information				
1	**Course Title**		BSc (Hons) Computer Science with Artificial Intelligence with Foundation Year	
2	**Course Code**	**UCAS Code**	US1381F	
3	**Awarding Institution**		Birmingham City University	
4	**Teaching Institution(s)** (if different from point 3)			
5	**Professional Statutory or Regulatory Body (PSRB) accreditation** (if applicable)			

6	**Course Description**
	The BSc (Hons) Computer Science with Artificial Intelligence with Foundation Year course is aimed at developing strong computing skills in artificial intelligence. The development of core skills in this domain tops the list of grand challenges facing British industry, which features in the government's industrial strategy. The course is aimed at producing computer scientists for roles such as computer programmer, software developer, website designer, and artificial intelligence and machine learning engineer. Skilled in cyber security, cloud computing, deep learning, natural language processing and computer vision, graduates deliver high-value software solutions for modern economy. Available in the UK to home and international students, the course enables you to study a diverse programme, ensuring you are incredibly well-equipped for employment within the industry once completing your degree. **What's covered in the course?** Throughout the course, you will have opportunities to interact with a curriculum that is supported by commercial and industrial content and partners. The Foundation Year course option enables you to study for our BSc (Hons) degree over an extended full-time duration of four years by including a Foundation Certificate (year one of four). The Foundation Certificate provides a broad study programme that underpins the follow-on degree. In order to progress to the next year of your degree, it is necessary to achieve a pass in all of the modules of the Foundation Certificate. In your first year, you will share five out of six modules with the BSc (Hons) Computer Science course. The first year covers fundamental concepts, such as computer programming, algorithms and data structures, computer systems, website development and introductory artificial intelligence, and nurtures your creativity with an innovation project. In the second year, you will consolidate your learning with four computer science modules and two artificial intelligence specific modules. The computer science modules teach advanced topics, including cyber security and software design, as well as core topics, such as object-oriented

	programming and Backend Web-services Development and Database Engineering . The other two modules teach artificial intelligence and machine learning and deploying software with machine learning operations. You will have the opportunity to take a professional placement year between your third and fourth year, which we highly recommend, as it will give you an invaluable opportunity to hone your expertise, try out a potential career path and get relevant workplace experience that is valued by many employers, boosting your CV. In the final year, you will study cutting-edge techniques in modern computing, including deep neural networks, modern data stores, cloud computing and natural language processing. In addition, you will complete an individual project to demonstrate your technical skills and general employability in preparation for your career. The individual project simulates typical graduate workplace tasks that require in-depth knowledge and skills in a specific area of computer science and artificial intelligence. This will include a consideration of wider issues and the ability to manage activities and resources, and to generate, implement and report on solutions to meet objectives.

7	**Course Awards**		
7a	**Name of Final Award**	**Level**	**Credits Awarded**
	Bachelor of Science with Honours Computer Science with Artificial Intelligence	6	480
	Bachelor of Science with Honours Computer Science with Artificial Intelligence with Professional Placement Year	6	600
7b	**Exit Awards and Credits Awarded**		
	Foundation Certificate Computing	3	120
	Certificate of Higher Education Computer Science	4	240
	Diploma of Higher Education Computer Science with Machine Learning	5	360
	Bachelor of Science Computer Science with Artificial Intelligence	6	420

8	**Derogation from the University Regulations**
	Not applicable.

9	**Delivery Patterns**		
Mode(s) of Study	**Location(s) of Study**	**Duration of Study**	**Code(s)**
Full Time with Foundation Year	City Centre	4 years	US1381F
Full Time with Professional Placement Year and Foundation Year	City Centre	5 years	US1383F

10	**Entry Requirements**
	The admission requirements for this course are stated on the course page of the BCU website at https://www.bcu.ac.uk , or may be found by searching for the course entry profile located on the UCAS website.

11	**Course Aims**
	Artificial Intelligence (AI) regularly attracts significant media coverage with breakthroughs in business, science, and technology. Therefore, skills development in Data and Artificial Intelligence tops the list of four grand challenges facing British industry as featured within the government's industrial strategy. To respond to this national call, inspired by a global demand for these skills, BSc Computer Science with Artificial Intelligence will produce computer science graduates skilled in the most modern methods in AI including machine learning, deep learning, natural language processing, and a wide range of tools for evaluating, storing, integrating and processing data to deliver high-value software solutions to the challenges faced by the modern economy. While most of these specialist subjects will be taught in the final year, the earlier years will also have some modules on AI and related topics. Job indicators across the UK show a growth in the popularity of the term 'Artificial Intelligence' with increasing salary figures. The recruitment of AI-trained practitioners is growing at an unprecedented rate as its use spreads across all technology-enabled industries. Such is the shortage of skills in AI due to its cross sectoral adoption that it prompted the Office for Students (OfS) to issue a call for proposals in 2019 to produce conversion postgraduate programmes in AI that allow people from all academic backgrounds to take up this discipline. The Faculty of Computing, Engineering and the Built Environment at Birmingham City University has invested heavily in the disciplines related to AI, such as the highly successful £1.7M RAISE Project that responded to the OfS call to develop the highly popular MSc Artificial Intelligence course. Together with MSc Big Data Analytics, the two courses recruit heavily; therefore, an undergraduate programme in this discipline not only bolsters the technological economy, but also produces a pipeline of graduates who can further specialise with taught or research postgraduate courses. Top IT skills for AI jobs include: • Machine Learning • AI - Deep Neural Networks • Structured Query Language (SQL), • Big-data infrastructure such as Modern Datastores • Natural Language Processing • Data Management and Machine Learning Operations, without which nearly 80% of Machine Learning projects do not make it into production.

	Also, a well-rounded AI practitioner in industry must have a solid background in computer science such as computer programming, software design and web development. BSc Computer Science with Artificial Intelligence teaches all the above (and more) to reflect the industrial trends.

12	**Course Learning Outcomes**
	Knowledge and Understanding
1	Demonstrate systematic understanding of essential facts, concepts, theories and principles of computer science and artificial intelligence.
2	Evaluate and recognise contemporary tools and technologies to compose solutions relevant to the domain of computer science/artificial intelligence to meet a set of agreed requirements.
3	Know the roles and responsibilities of a professional working within the computing profession.
4	Analyse the social, environmental, ethical, legal, economic and commercial impact of the computer science/artificial intelligence solutions.
	Skills and other attributes
5	Critically appraise theories and effectively deploy a range of techniques and tools for the modelling, design and implementation of computer-based systems for the purposes of comprehension, problem solving, prediction and the understanding of trade-offs.
6	Identify the requirements and practical constraints of computer science/artificial intelligence solutions considering a wide range of aspects.
7	Plan strategies for computing problems and their future developments using modern research.
8	Effectively communicate information and ideas concerning problems and solutions in the field of computer science and artificial intelligence.
9	Work effectively as a member of a team, and undertake management and planning activities, recognising the different roles within a team and different ways of organising teams.

13	**Level Learning Outcomes**
	Upon completion of Level 4 / the Certificate of Higher Education, you will be able to:
1	Apply problem solving skills to design, implement and test efficient algorithmic solutions to programming problems.
2	Demonstrate a knowledge of computing systems foundations and appraise relevant techniques.
3	Collaboratively produce an innovative and opportunistic Minimum Viable Product.
4	Appraise and apply ethically-sound statistical analysis models to simple datasets.
5	Design and produce a standards-compliant computing-based product to meet key end-user requirements.
	Upon completion of Level 5 / the Diploma of Higher Education, you will be able to:
1	Demonstrate knowledge of Computer Science and Machine Learning to develop data driven, robust, and secure software applications in a legal and commercial context.
2	Apply frameworks to design and implement web applications connected to databases for online storing and retrieving of information.
3	Problem-solve to design, model, implement, test and deploy software and machine learning solutions.
4	Collaborate to achieve target outcomes and effectively communicate the solutions.
	Upon completion of 60 credits at Level 6 / the Bachelors Degree, you will be able to:
1	Critically evaluate and defend principal theories and technologies associated with modern information storage and Artificial Intelligence driven insight development.

2	Select and accurately apply specialist data processing methods and tools for diverse data sources from real world problems that may be ambiguously described.
3	Investigate, design, and implement Artificial Intelligence solutions based on modern theory and practice for supporting future sustainability and scalability.
4	Demonstrate initiative in an independent or collaborative environment to deliver research informed solutions to agreed standards.

14	**Course Learning, Teaching and Assessment Strategy**
	Teaching focuses on application-oriented problem-solving in computer science and artificial intelligence so that the relevance for you as a learner is clear. Modules use real-world examples to justify what, and how, tools and techniques are taught. Each level of study reinforces the skills and knowledge gained earlier to develop you as an increasingly independent learner who can investigate theory and practice to synthesise innovative software solutions. The modules are taught in a research informed fashion but with modern industrial tools; in several modules the content is also aligned with industrial badges. Therefore, you consistently enhance your technical abilities and understanding by analysing and examining theory, evaluating alternative solutions and thereby constructing practical implementations that fuel business and modern living. Hence, the course produces highly employable graduates, who can formulate principled solutions for the technology driven economy and design artefacts to realise those solutions. Across the breadth of modules, you experience flipped learning, group tasks and peer review, as well as exposure to industry-standard development paradigms in laboratory sessions. Via practices such as encouraging you to investigate problem sets of your own choice or inviting you to research on a topic from a selection of given choices the teaching practice cultivates an independent learning mindset that is nurtured further across higher levels. For each module, an assessment brief details the requirements to achieve a particular grade/mark against each grading criterion. These breakdowns or differentiated descriptors articulate how the level of achievement will be marked. Formative evaluation is a consistent theme where you are required to complete various in-class or in-lab tasks that are graded either automatically or solutions are provided to them. Teaching sessions also consistently highlight how learning across the semester culminates into summative deliverables. Each module also supports the submission of assessments via dedicated sessions either during normal teaching weeks or in the assessment weeks. For some modules with large student numbers, workshop style support sessions are arranged in summer to help the students resit the module. As part of the school's *Reimagining the* Curriculum initiative, multiple modules across various levels align their assessment tasks so you can assess the impact of different (and increasingly sophisticated) methods taught across levels on the same task. This helps you benchmark the technology taught across various levels and critically appraise the role of technological diversity and development stack along the business verticals. To evaluate the societal impact of modern technology and to reflect the University's commitment to a sustainable and resilient future, consistent attention is paid to non-technical issues such as the commercial impact, ethics, data protection, and sustainability as per the UN's Sustainable Development Goals, which are assessed across different modules.

15	Course Requirements

15a

Level 3:

In order to complete this course, you must successfully complete all the following CORE modules (totalling 120 credits):

Module Code	Module Name	Credit Value
CMP3010	Fundamental Mathematics	20
CMP3014	Fundamentals of Digital Technology	20
CMP3012	Web Application Design	20
CMP3016	Emerging Technologies	20
CMP3015	Independent Practice	20
CMP3009	Foundations of Programming	20

Level 4:

In order to complete this course, you must successfully complete all the following CORE modules (totalling 120 credits):

Module Code	Module Name	Credit Value
CMP4267	Computer Systems	20
DIG4166	Website Design and Development	20
CMP4272	Data Structures and Algorithms	20
CMP4285	Innovation Project	20
CMP4266	Computer Programming	20
CMP4294	Introduction to Artificial Intelligence	20

Level 5:

In order to complete this course, you must successfully complete all the following CORE modules (totalling 120 credits):

Module Code	Module Name	Credit Value
CMP5332	Object Oriented Programming	20
CMP5387	Backend Web-services Development and Database Engineering	20
CMP5367	Artificial Intelligence and Machine Learning	20
CMP5329	Cyber Security	20
CMP5354	Software Design	20
CMP5366	Data Management and Machine Learning Operations	20

Professional Placement Year (optional)

In order to qualify for the award of Bachelor of Science with Honours Computer Science with Artificial Intelligence with Professional Placement Year and Foundation Year, you must successfully complete all of the modules listed as well as the following Level 5 module:

Module Code	Module Name	Credit Value
PPY5004	Professional Placement	120

Level 6:

In order to complete this course, you must successfully complete all the following CORE modules (totalling 120 credits):

Module Code	Module Name	Credit Value
CMP6232	Deep Neural Networks and Ethics	20
CMP6233	Modern Datastores and Data Protection	20
CMP6231	Natural Language Processing	20
CMP6210	Cloud Computing	20
CMP6200	Individual Honours Project	40

15b	Structure Diagram

All modules are core 20 credits, unless otherwise stated.

Level 3

SEMESTER ONE	SEMESTER TWO
CMP3010 Fundamental Mathematics CMP3014 Fundamentals of Digital Technology CMP3012 Web Application Design	CMP3016 Emerging Technologies CMP3015 Independent Practice CMP3009 Foundations of Programming

Level 4

CMP4266 Computer Programming CMP4267 Computer Systems DIG4166 Website Design and Development	CMP4272 Data Structure and Algorithms CMP4294 Introduction to Artificial Intelligence CMP4285 Innovation Project

Level 5

CMP5332 Object Oriented Programming CMP5387 Backend Web-services Development and Database Engineering CMP5367 Artificial Intelligence and Machine Learning	CMP5329 Cyber Security CMP5354 Software Design CMP5366 Data Management and Machine Learning Operations

Professional Placement Year 4 (optional)
Professional Placement Module (120 Credits)

Level 6

CMP6233 Modern Datastores and Data Protection CMP6232 Deep Neural Networks and Ethics	CMP6231 Natural Language Processing CMP6210 Cloud Computing
Individual Honours Project (40 Credits)	

16	Overall Student Workload and Balance of Assessment

Overall student *workload* consists of class contact hours, independent learning and assessment activity, with each credit taken equating to a total study time of around 10 hours. While actual contact hours may depend on the optional modules selected, the following information gives an indication of how much time students will need to allocate to different activities at each level of the course.

- *Scheduled Learning* includes lectures, practical classes and workshops, contact time specified in timetable
- *Directed Learning* includes placements, work-based learning, external visits, on-line activity, Graduate+, peer learning
- *Private Study* includes preparation for exams

The *balance of assessment* by mode of assessment (e.g. coursework, exam and in-person) depends to some extent on the optional modules chosen by students. The approximate percentage of the course assessed by coursework, exam and in-person is shown below.

Level 3

Workload

37% time spent in timetabled teaching and learning activity

Activity	Number of Hours
Scheduled Learning	456
Directed Learning	400
Private Study	344
Total Hours	1200

Balance of Assessment

Assessment Mode	Percentage
Coursework	78%
Exam	0
In-Person	22%

Level 4

Workload

24% time spent in timetabled teaching and learning activity

Activity	Number of Hours
Scheduled Learning	288
Directed Learning	468
Private Study	444
Total Hours	1200

Balance of Assessment

Assessment Mode	Percentage
Coursework	69%
Exam	13%
In-Person	18%

Level 5

Workload

24% time spent in timetabled teaching and learning activity

Activity	Number of Hours
Scheduled Learning	288
Directed Learning	473
Private Study	439
Total Hours	1200

Balance of Assessment

Assessment Mode	Percentage
Coursework	53%
Exam	20%
In-Person	27%

Level 6

Workload

17% time spent in timetabled teaching and learning activity

Activity	Number of Hours
Scheduled Learning	202
Directed Learning	258
Private Study	740
Total Hours	1200

Balance of Assessment

Assessment Mode	Percentage
Coursework	80%
Exam	0%
In-Person	20%