Newcastle
University

1	**Awarding Institution**	Newcastle University
2	**Teaching Institution**	Newcastle University
3	**Final Award**	MComp (Hons)
4	**Programme Title**	Computer Science G405 Computer Science with Study Abroad G406 Computer Science with Industrial Placement I100 Computer Science (Game Engineering) I610 Computer Science with Industrial Placement (Game Engineering) I612 Computing Science (Cyber Security) I198 Computing Science with Industrial Placement (Cyber Security) I197 I196U BSc Computing Science (Study Abroad) – this code is not open for admission and is an exit award.
5	**UCAS/Programme Code**	G405, G406, I100, I610, I612, I197, I198
6	**Programme Accreditation**	G405, I100, I610, I612, I197, I198, I100 British Computer Society
7	**QAA Subject Benchmark(s)**	Computing
8	**FHEQ Level**	7
9	**Last updated**	September 2024
10	**Programme Aims**	

1. To produce graduates with the in-depth knowledge and skills necessary to exploit computing systems throughout their professional life. Graduates will have a clear understanding of the practical, theoretical, and professional foundations of Computing Science. They will have knowledge and experience of the fundamental techniques used in modern software engineering. They will also have an understanding of the architectural concepts underpinning computer and networking hardware platforms. They will be able to apply relevant theory to the solution of practical problems and to the analysis of existing algorithms and techniques, and to recommend techniques and algorithms appropriate to specific circumstances in the areas of fundamental systems and major applications. They will also be able to appreciate, develop and evaluate new algorithms, techniques, and other developments within the computing field.

2. To provide a flexible structure that allows students to follow a general programme in Computing Science for two years then specialise in their 3rd and 4th years. Students studying for the G405, G406 and I100 programmes will be able to design, build and integrate advanced networked computing systems in a range of application areas, such as mobile and wireless communications, computationally intensive financial and health applications, and business-critical enterprise applications involving multiple businesses and outsourcing. We envisage students growing into architect and chief architect roles for software product groups in start-ups or other enterprises and being able to initiate and lead consulting efforts for field implementations of networked computing solutions. Students studying for the

I198, I197, I610, I612, programmes specialise in their last two (3rd and 4th) years in one of two areas:

   a. Students may choose to specialise in Game Engineering. These students will be able to design, develop and implement computer graphics software and applications on a variety of architectures including games consoles, graphics workstations and advanced 3D virtual reality environments, and to exploit such software and hardware in entertainment, engineering design and scientific visualisation. We envisage graduates pursuing these activities in both the entertainment and the industrial sectors; some may also seek to develop market-niche software in small or start-up companies.

   b. Students may choose to specialise in Security and Resilience. These students will be able to design and develop software applications for secure and safety-critical systems. They will be able to work in multi-disciplinary teams in defence, security and aerospace industries. Graduates may also act as security specialists in consulting companies.

3. To provide programmes that equip students with subject-specific and transferable skills that will enable them to pursue a variety of careers within, and outside, the IT industry.

4. To provide programmes which meet the accreditation requirements of appropriate professional bodies (including Further Learning), thus providing the basis for further professional development and lifelong learning.

5. To provide a qualification enhancing employment prospects in the wide range of IT based careers.

6. To provide opportunities for students with a background in computer science to acquire further knowledge, both in breadth and depth, in a range of relevant advanced computer science topics.

7. To equip students with a range of advanced practical computing skills.

8. To provide students with the opportunities to acquire research skills.

9. To provide a foundation for students wishing to embark on a research career in academia or industry.

10. To provide programmes which meet the FHEQ at Masters Levels and which takes appropriate account of the subject benchmark statements in Computing.

11. For those students taking a programme with study abroad, to provide students with the opportunity to develop their skills within an international setting.

12. For those students taking a programme with industrial placement, to provide students with the opportunity to develop their skills within an industrial setting.

11	Learning Outcomes

The programmes provide opportunities for students to develop and demonstrate knowledge and understanding, qualities, skills, and other attributes in the following areas. The programme outcomes have references to the benchmark statements for Computing.

Knowledge and Understanding

On completing the programme students will have gained and be able to demonstrate competency in:

A1 a diverse range of programming paradigms and languages supported by programming language principles.
A2 the principles of software engineering.
A3 the theoretical and mathematical foundations of Computer Science.
A4 techniques for the development of data representations and algorithms.
A5 computer and network organisation and hardware architecture.

A6 the legal, ethical and social aspects of professional practice, personal development, social roles and effects of computing systems.
A7 research techniques.
A8 operating effectively in teams.
A9 the principles of cybersecurity.

Additionally, a student will have gained and be able to demonstrate knowledge and understanding of a range of topics depending on their compulsory or optional modules.

A student taking modules from the Game Engineering specialism will additionally have gained and be able to demonstrate knowledge and understanding of:

A15. the technological foundations of computer games systems and virtual reality platforms.
A16. the mathematical principles and algorithmic basis of computer graphics.
A17. design issues and advanced development techniques for computer graphics and Game Engineering.
A18. human requirements and technical capabilities of modern games, graphics platforms, and virtual environments.
A19. fundamental and advanced problems and approaches in artificial intelligence, as applied to computer games, visualisation, and virtual environments.

A student taking modules from the Security and Resilience specialism will additionally have gained and be able to demonstrate knowledge and understanding of:

A31. theoretical foundations of reliable systems design including fault-tolerance and fault-avoidance
A32. cryptographic techniques

Intended learning outcomes A8-A32 may have been achieved by students of other degrees depending on the options taken at Stage 3 and stage 4.

A33-A34 reserved.

Teaching and Learning Methods

Lectures are the main way of imparting knowledge and understanding (A1-A32), but tutorials are also used. Practical classes feature prominently, especially to support the Stage 1 programming modules (A1, A2). Visiting speakers provide seminars on aspects of being an IT professional (A6). Students are expected to contribute to their own learning experience by independent reading. They are provided with references to books which are categorised as *essential*, *recommended*, and *background* reading, as well as scientific papers and other learning materials including appropriate web URLs. In addition, when taken, the study abroad will involve the development of knowledge within an international setting. In addition, when taken, an industrial placement will involve the development of knowledge within an industrial setting.

Assessment Strategy

Knowledge and understanding are assessed by means of closed and open book written examinations, and coursework, including team and individual project reports and log books (A1-A32).

Intellectual Skills

On completing any of the programmes students should have skills in the areas of:

B1   carrying out the process of software development, including: the analysis of requirements; the production of specifications; and robust, reliable and secure software

B2   several programming languages and paradigms.
B3   designing useful and usable software.
B4   applying theoretical concepts in the design and analysis of software.

A student will have additional skills depending on their compulsory or optional modules.

A student taking modules from the Game Engineering specialism will additionally have skills in the areas of:

B12. developing and/or implementing graphics algorithms and applications in standard software environments.
B13. modelling, rendering and interaction in 3D graphical environments.
B14 mathematical techniques for the manipulation of 3D geometry.
B15. implementing artificial intelligence algorithms in a declarative programming language.

B16-B18 reserved.

A student taking modules from the Security and Resilience specialism will additionally have skills in the areas of:

B23.software development for dependable systems.

B24.implementing cryptographic algorithms.

Intended learning outcomes B7-B24 may have been achieved by students of other degrees depending on the options taken at Stage 3 and stage 4.

B25-B26 reserved.

Teaching and Learning Methods

B1-B4 feature prominently in all modules. In particular a team project at Stage 2 and Stage 4 gives students experiences of working with others (see D7 below) to engineer a complex piece of software (B2, B4). When taken, the industrial placement will require students to produce solutions to a customer's requirements (B1-B4). Individual projects at Stage 3 and Stage 4 will require students to develop large pieces of software to a customer's requirements (B1, B2, B4). In all other modules, coursework is used to develop these skills (B1-B24).

Assessment Strategy

Subject-specific and professional skills are assessed by coursework (B1-B24).

Practical Skills

On completing any of the programmes students should have the ability to:
C1   conduct investigations using the technical and professional literature
C2   use tools and techniques to support software development especially in teams
C3   address problems using theoretical analysis and empirical evaluation
C4   interacting with people to capture requirements and communicate the results
C5   produce technical documentation

Teaching and Learning Methods
All modules involve coursework, much of which involves problem solving skills (C4). This is especially so in the team and individual projects, and, when taken, the industrial placement where students need to select, evaluate, and apply appropriate tools and techniques (C2). Here and elsewhere students will need to investigate possible alternatives in the technical and professional literature (C1, C3).).

Assessment Strategy
Practical skills are assessed by a range of coursework (reports, design documents, etc.) (C1-C5).

Transferable/Key Skills
On completing the programme students will be able to demonstrate competency in: D1   effective communication skills D2   problem solving D3   initiative D4   adaptability D5   teamwork D6   numeracy D7   planning and organisation

Teaching and Learning Methods
Key skills feature throughout all programmes; teamwork in the Stage 2 and when taken, the industrial placement and Stage 4 team projects (D7); oral presentation, interpersonal communication, and planning and organisation in the Stage 3 and Stage 4 research methods and individual project modules, as well as the Stage 2 and Stage 4 team projects (D3, D5); written communication in all modules, but especially in the Stage 2 and Stage 4 team projects, and the Stage 3 and Stage 4 individual projects (D1); numeracy is covered by a Mathematics module at Stage 1 and exercises in the programming modules (D6); problem solving, initiative and adaptability are necessarily covered throughout all programmes (D2, D4).

Assessment Strategy
Key (transferable) skills are assessed by both written and oral presentations (D1-D7). Teamwork in the Stage 2 and Stage 4 team projects is assessed both by the module leader at team oral presentations and by a team monitor (a member of teaching staff) who attends team formal meetings (D5, D7). When taken, the industrial placement is assessed by the Module Leader with input from an industrial supervisor and on a pass/fail basis. No resit opportunity is available. Students who fail the placement are able to proceed to Stage 3 of the corresponding "without Industry" programme.

12	Programme Curriculum, Structure and Features

Basic structure of the programme

All programmes have 4 Stages and when an industrial placement is taken, an intercalating year between stages 2 and 3 and when a study abroad is taken (if it is part of the programme), the whole of Stage 3 shall be taken at a partner institution that offers an equivalent programme (curriculum, structure, features) for this stage. Students are required to take 120 credits at each Stage. In the case of students who take the study abroad option (G406) the calculation of credits will be done according to the credit conversion rules included in the partnership agreement with the partner institution.

Students take compulsory modules in each of Stages 1 and 2. The teaching of these modules is split equally across semesters 1 and 2 so that students study 60 credits in each semester.
Students taking one of the industrial placement degrees will take an industrial placement year between Stages 2 and 3.

A wide range of optional modules is available to all students in semester 1 of Stage 3.

Students study a group of compulsory modules and where available, a range of optional modules covering advanced computer science topics at Stage 4. However, all students must take the 5 credit research skills module and a 30-credit individual project module..

Relevant sections of the School's Placements Handbook which conforms to the University's Policies and Procedures for Assuring the Standards of Work-Based and Placement Learning will apply in the case of students taking a programme with study abroad or industrial placement.

Key features of the programme (including what makes the programme distinctive)

The program provides students with the opportunity to build a portfolio of work across three stages, demonstrating application of key learning outcomes in practical context.

Students on G406 will study Stage 3 abroad at one of our ERASMUS or other overseas partner institutions.

To gain BCS accreditation students are required to have studied Stage 2 and at least one of Stage 3 and Stage 4 at the Newcastle campus. Students must have also passed a problem-solving project at the first attempt.

Programme regulations (link to on-line version)

Master of Computing with Honours in:

Computer Science / Computer Science with Study Abroad / Computer Science with Industrial Placement

Computer Science (Game Engineering) / Computer Science with Industrial Placement (Game Engineering)

Computing Science (Security and Resilience) / Computing Science with Industrial Placement (Security and Resilience)

13	Support for Student Learning

Generic information regarding University provision is available at the following link.

Generic Information

14	Methods for evaluating and improving the quality and standards of teaching and learning

Generic information regarding University provision is available at the following link.

Generic Information

Accreditation reports
G405, I100, I610, I612, I197, I198, I100
British Computer Society

Additional mechanisms
None.

15	Regulation of assessment

Generic information regarding University provision is available at the following link.

Generic Information

In addition, information relating to the programmes is provided in:

The University Prospectus: http://www.ncl.ac.uk/undergraduate/degrees/#subject

Degree Programme and University Regulations: http://www.ncl.ac.uk/regulations/docs/

Please note. This specification provides a concise summary of the main features of the programme and of the learning outcomes that a typical student might reasonably be expected to achieve if she/he takes full advantage of the learning opportunities provided.

Mapping of Intended Learning Outcomes

Please note this course is not offered to study as from September 2023 but modules stated in case student needs to repeat stage 1

Module	Module Code	Type	Intended Learning Outcomes			
			A	B	C	D
Fundamentals of Computing	CSC1031	Compulsory	3, 4	4		6
Computer Systems Design	CSC1032	Compulsory	2, 3, 4, 5, 6,9	1, 3,4	1, 2, 3,5	7
Information Storage and Retrieval	CSC1033	Compulsory	1, 2, 3, 4,	1, 2, 3,4	1, 2, 3,4	2. 4. 6
Programming Portfolio 1	CSC1034	Compulsory	1, 2, 3, 4, 5, 6, 7, 8	1, 2, 3, 4	1, 2, 3, 4, 5	1, 2, 3, 4, 5, 6, 7
Programming Portfolio 2	CSC1035	Compulsory	1, 2, 3, 4, 5, 6, 7, 8	1, 2, 3, 4	1, 2, 3, 4, 5	1, 2, 3, 4, 5, 6, 7
Security Programming	CSC2031	Compulsory	1, 2, 3, 4, 6, 9	1, 2, 3, 4	1, 2, 3, 5	2, 4, 6
Algorithm Design & Analysis	CSC2032	Compulsory	2, 3, 4	4	3, 4	2, 4
Software Engineering Team Project	CSC2033	Compulsory	1, 2, 3, 4, 5, 6, 7, 8, 9	1, 2, 3, 4	1, 2, 3, 4, 5	1, 2, 3, 4, 5, 7
Introducing Contemporary Topics in Computing	CSC2034	Compulsory	1, 2, 3, 4, 7	1, 2, 3, 4	1, 2, 3, 5	2, 4,
Software Systems Design & Implementation	CSC2035	Compulsory	1, 2, 3, 5,	1, 2, 3, 4	3,5	2, 4
Major Project and Dissertation	CSC3094	Compulsory	1, 2, 3, 4, 5 ,6, 7, 9	1, 2, 3, 4	1, 2, 3, 4, 5	1, 2, 3, 4, 6, 7
Distributed Systems	CSC3121	Optional	1, 3,4,6,10, 12, 14	6, 8, 9,		
Graphics for Games	CSC3231	Optional (Comp for I610/I612)	1, 2, 15, 16,17	1, 2,3, 4,12,1 3 14	2, 3,	2, 3, 4, 6
Gaming Tech & Simulations	CSC3232	Optional (Comp for I610/I612)	1, 2, 3, 4, 5,15,16,17, 18,19	1, 2,3 4,14, 15	2, 3	2, 3, 4, 6
BioDesign and Natural Computing	CSC3431	Optional	1, 4, 6, 7	1, 2,3, 4	1, 2, 3,5	1, 2, 3, 4, 7
Biomedical Data Analysis & AI	CSC3432	Optional	1, 4, 7	2, 3,4	1, 2, 3, 4,5	1, 2, 3, 4, 6
Cryptography	CSC3631	Optional (Comp for I195, I196, I197/ I198)	1, 3, 4, 7,9, 32	1, 2,3,4, 24	1, 2, 3,5	2, 3, 4, 6
System and Network Security	CSC3632	Optional (Comp for I195, I196, I197/ I198)	1, 2, 3, 4, 5,6,7,9	1, 2,3, 4	1, 2, 3,5	2, 3, 4, 6

Fault Tolerant & Cyber Physical Systems	CSC3634	Optional	1, 2, 3, 4, 5, 6	1, 2, 3, 4	1, 2, 3, 4, 5	1, 2, 3, 4, 5, 6, 7
HCI Interaction Design	CSC3731	Optional	1, 6, 7, 8	3, 4	1, 2, 3,4	1, 2, 3, 4, 5,7
Predictive Analytics, Computer Vision & AI	CSC3831	Optional	1, 2, 3, 4,	1, 2,3,4	1, 2, 3,4, 5	2, 3, 4, 6, 7
Data Visualization and Visual Analytics	CSC3833	Optional	1, 2, 3, 4,	3, 4	1, 2, 3,	2, 3, 4, 6
Career Development for Final Year Students	NCL3007	Optional				1,2,3,4,5,6 ,7
Interclating Module for Computing Science Programmes	ICM0043	Compulsory for I100	6, 8	1	2, 4	1, 2, 3, 4, 5, 6, 7
MComp Study Abroad	ICM0045	Compulsory G406	6, 8	1	2, 4	1, 2, 3, 4, 5,6,7
G405, G406, I100						
Project and Dissertation for MComp	CSC8498	Compulsory	1, 2, 3, 4, 5,6,7,9	1, 2,3, 4	1, 2, 3,4, 5	1, 2, 3, 4, 6,7
Research Methods and Group Project in Computer Security & Resilience	CSC8208	Compulsory	1, 2, 3, 4, 5, 6, 8, 9, 31, 32	1, 2, 3, 4, 23, 24	2, 3, 4, 5	1, 2, 3, 4, 5, 6, 7
Engineering for AI	CSC8101	Optional	1, 2, 3, 4	1, 2, 3, 4	2, 3, 4	2, 6
Distributed Algorithms	CSC8103	Optional	2, 3, 4,	1, 3, 4	1, 2, 3, 5	1, 2, 6
Enterprise Middleware	CSC8104	Optional	1,2,3,4,5,31	1,2,3,4, 23	1,2,3,5	2,8
Cloud Computing	CSC8110	Optional	1, 2, 3, 4, 5	1, 2, 3, 4	2, 3	2, 6
Machine Learning	CSC8111	Optional	1, 3, 4	1, 2, 3, 4	1, 2, 3	2, 6
Internet of Things	CSC8112	Optional	1, 2, 5, 6,	1, 2,3,4	1,2, 3,5	2, 3, 5, 7
Information Security & Trust	CSC8202	Optional	1, 2, 3, 4, 5, 31	1, 2, 3, 4, 23	1, 2, 3, 5	2, 8
Secure Software Development	CSC8204	Optional	1, 2, 5	1, 2, 3, 4, 23	1, 2, 3	2, 6
Security of Complex Systems	CSC8207	Optional	2, 9, 32	1, 3,	1, 2, 3	1, 3, 5, 7

System Security	CSC8214	Optional	1, 2, 3, 5,	1, 2, 3, 4	1,2, 3, 4, 5	1, 3, 4, 6,7
Risk and Trust Management	CSC8216	Optional	1, 2, 3, 4, 5	1, 2, 3, 4, 5	1, 2, 3, 4,5	1, 3, 4, 6, 7
Model-Based Systems Engineering	CSC8701	Optional	1, 2, 3, 4, 5	1, 2, 3, 4, 5,	1, 2, 3, 4, 5	1,3, 4, 6, 7
Complex Data Visualization	CSC8636	Optional	1, 2, 3, 4, 5	1, 2, 3, 4, 5	1,2,3,4,5 ,	1, 2, 3, 4, 6, 7
Human AI Interaction and Futures	CSC8611	Optional	5, 6	2, 3, 4, 5	1, 2, 5	1, 2, 3, 4, 5
Deep Learning	CSC8637	Optional	1,2,3,4,5	1,2,3,4, 5	1,2,3,4,5	1,3,4,5,6,7
I197, I198						
Information Security and Trust	CSC8202	Compulsory	1, 2, 3, 4, 5, 31	1, 2, 3, 4, 23	1, 2, 3, 5	2, 8
Secure Software Development	CSC8204	Compulsory	1, 2, 5	1, 2, 3, 4, 23	1, 2, 3	2, 6
Security of Complex Systems	CSC8207	Compulsory	1, 2, 3, 4, 5,	1, 2, 3, 4, 5,	2, 3, 3, 4, 5	1, 3, 4, 6, 7
Research methods & Group Project in Computer Security and Resilience	CSC8208	Compulsory	1, 2, 3, 4, 5,6,8,9,31, 32	1, 2,3, 4,23,24	2, 3, 4, 5	1, 2, 3, 4, 5, 6,7
System Security	CSC8214	Compulsory	1, 2, 3, 5,6,9,31,32	1, 2,3,4, 23	2, 3	2, 6
Risk and Trust Management	CSC8216	Compulsory	1, 2, 3, 4, 5	1, 2, 3, 4, 5	1, 2, 3, 4,5	1, 3, 4, 6, 7
Project and Dissertation for MComp	CSC8498	Compulsory	1, 2, 3, 4, 5,6,7,9	1, 2,3, 4	1, 2, 3,4, 5	1, 2, 3, 4, 6,7
Cloud Computing	CSC8110	Optional	1, 2, 3, 4, 5	1, 2, 3, 4	2, 3	2, 6
Machine Learning with Project	CSC8635	Optional	4	4	2	2
I610, I612:						
Advanced Programming for Games	CSC8501	Compulsory	1, 2, 3, 4, 15,16,17	1, 2,3, 4	2, 3,	2, 6
Advanced Graphics for Games	CSC8502	Compulsory	1, 2, 3, 4, 15,16, 17, 18	1, 2,3, 4, 12, 13,14	2, 3	2, 6
Advanced Game Technologies	CSC8503	Compulsory	1, 2, 3, 4, 15,16,17, 18,19	1, 2,3, 4, 12, 13, 14, 15	2, 3	2, 6
Engineering Gaming Solutions within a Team	CSC8508	Compulsory	1, 2, 3, 4, 8, 15, 16, 17, 18, 19	1, 2, 3, 4, 12, 13, 14, 15	1, 2, 3, 4	1, 2, 3, 4, 5, 6, 7
Engineering for AI	CSC8101	Optional	1, 2, 3, 4	1, 2, 3, 4	2, 3, 4	2, 6
Security of Complex Systems	CSC8207	Optional	1, 2, 3, 4, 5,	1, 2, 3, 4, 5,	2, 3, 3, 4, 5	1, 3, 4, 6, 7