PROGRAMME SPECIFICATION	

1	**Awarding Institution**	Newcastle University
2	**Teaching Institution**	Newcastle University
3	**Final Award**	BSc (Hons)
4	**Programme Title**	Computing Science, Computing Science (Networked Systems and Internet Technologies), Computing Science (Games and Virtual Environments), Computing Science (Software Engineering), Computing Science (Bioinformatics),Computing Science with Industrial Placement, Computing Science with Industrial Placement (Networked Systems and Internet Technologies), Computing Science with Industrial Placement (Games and Virtual Environments), Computing Science with Industrial Placement (Software Engineering) Computing Science with Industrial Placement (Bioinformatics)
5	**UCAS/Programme Code**	G400, G420, G450, G600, G401, G421, G451, G603, G4XX, G4XY
6	**Programme Accreditation**	British Computer Society
7	**QAA Subject Benchmark(s)**	Computing
8	**FHEQ Level**	6
9	**Date written/revised**	24 May 2011

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, or to specialise in their final year in one of four areas:
    a. Students who graduate with a degree in Computing Science (Networked Systems and Internet Technologies) or Computing Science with Industrial Placement (Networked Systems and Internet Technologies) 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.

b. Students who graduate with a degree in Computing Science (Games and Virtual Environments) or Computing Science with Industrial Placement (Games and Virtual Environments) 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.

c. Students who graduate with a degree in Computing Science (Software Engineering) or Computing Science with Industrial Placement (Software Engineering) will have particular knowledge and skills related to the development of large-scale fundamental and application software systems. They will be equipped to develop as professionals to assume lead technical and team management roles in such developments. We envisage graduates going on to employment in technical positions in software houses and with companies designing and deploying software in specific industry sectors; some may also seek to develop market-niche software in small or start-up companies.

d. Students who graduate with a degree in Computing Science (Bioinformatics) or Computing Science with Industrial Placement (Bioinformatics) will have particular knowledge and skills related to the development of bioinformatics, computational biology, neuroinformatics applications for data analysis, modelling and simulation. They will be equipped to develop as professionals to assume lead technical and team management roles in such developments. We envisage graduates going on to employment in technical and management positions in software houses and companies developing bioinformatics, neuroinformatics and computational biology software, and pharmaceutical and biotechnology companies; some may also seek to develop market-niche software in small or start-up companies.

3. To provide a programme that equips students with subject-specific and transferable skills that will enable them to pursue a variety of careers within, and outside, the IT industry, including research.
4. To provide a programme which meets the accreditation requirements of appropriate professional bodies, thus providing the basis for further professional development and lifelong learning.
5. To provide a programme which meets the FHEQ at Honours level and which takes appropriate account of the subject benchmark statements in Computing.
6. 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 programme provides 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.

The strategy of the degree programmes is to give a broad coverage of the subject of Computing Science in Stages 1 and 2, an when taken, the industrial placement between stages 2 and 3, and then to offer specialisation at Stage 3 in the form of a wide range of optional modules.

Those students who specialise in the area of Networked Systems and Internet Technologies are eligible for the award of the degree of Computing Science (Networked Systems and Internet Technologies) or Computing Science with Industrial Placement (Networked Systems and Internet Technologies).

Those students who specialise in the area of Games and Virtual Environments are eligible for the award of the degree of Computing Science (Games and Virtual Environments) or Computing Science with Industrial Placement (Games and Virtual Environments).

Those students who specialise in the area of Software Engineering are eligible for the award of the degree of Computing Science (Software Engineering) or Computing Science with Industrial Placement (Software Engineering).

Those students who specialise in the area of Bioinformatics are eligible for the award of the degree of Computing Science (Bioinformatics) or Computing Science with Industrial Placement (Bioinformatics).

The following identifies the generic Intended Learning Outcomes for all programmes and specific outcomes for a particular specialisation. There will be variation depending on the options taken at Stage 3 and the nature of any industrial placement.

Knowledge and Understanding

On completing the programme students should have gained and be able to demonstrate knowledge and understanding of:

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 Computing Science
A4. Techniques for the development of data representations and algorithms
A5. Computer and network organisation and hardware architectures
A6. Professional issues, including legal and ethical aspects of professional practice, professional development, social roles and effects of computing systems
A7. Research techniques

A successful student for the degree of Computing Science (Networked Systems and Internet Technologies) or Computing Science with Industrial Placement (Networked Systems and Internet Technologies) will additionally have gained and be able to demonstrate knowledge and understanding of:

A8. Technological foundations of networked systems, in depth and breadth
A9. Middleware and integration standards and platforms
A10. Fundamental networked and internet protocols and algorithms
A11. Techniques for networked and Internet programming
A12. Solutions for secure and reliable networked and internet computing

A successful student for the degree of Computing Science (Games and Virtual Environments) or Computing Science with Industrial Placement (Games and Virtual Environments) will additionally have gained and be able to demonstrate knowledge and understanding of:

A13. Technological foundations of computer graphics systems, including computer games and virtual reality platforms
A14. The mathematical principles and algorithmic basis of computer graphics
A15. Design issues and development techniques for computer graphics, games and virtual environments
A16. Human requirements and technical capabilities of modern virtual environments, games and graphics platforms
A17. Fundamental problems and approaches in artificial intelligence, as applied to computer games, visualisation and virtual environments

A successful student for the degree of Computing Science (Software Engineering) or Computing Science with Industrial Placement (Software Engineering) will additionally have

gained and be able to demonstrate knowledge and understanding of:

A18. Advanced knowledge of modern software engineering processes
A19. Understanding of software architectures and their theoretical foundations
A20. Understanding of design techniques for large-scale and complex software systems
A21. Knowledge of basic principles of advanced software CASE tools
A22. In-depth knowledge of validation and verification techniques
A23. Awareness of software project management techniques
A24. Understanding of legal issues affecting software projects

A successful student for the degree of Computing Science (Bioinformatics) or Computing Science with Industrial Placement (Bioinformatics) will additionally have gained and be able to demonstrate knowledge and understanding of:

A25. Current bioinformatics, computational biology and neuroinformatics software
A26. Theoretical foundations of bioinformatics, computational biology and neuroinformatics
A27. Aspects of biological systems that are relevant for bioinformatics, computational biology and neuroinformatics
A28. Biologically inspired computing methods and techniques
A29. Software techniques used to develop bioinformatics, computational biology and neuroinformatics applications
A30. Ethical and legal issues affecting the development of bioinformatics, computational biology and neuroinformatics software

Intended learning outcomes A8-A30 may have been achieved by students of other degrees depending on the options taken at Stage 3.

Teaching and Learning Methods

Lectures are the main way of imparting knowledge and understanding (A1-A30), 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*, or *background* reading, as well as scientific papers and other learning materials including appropriate web URLs. 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-A30).

Intellectual Skills

On completing the programme students should have skills in the areas of:

B1. Carrying out the process of software development, including: the analysis of system requirements; the production of system specifications using appropriate models and techniques; software validation and verification
B2. Using a variety of advanced (especially object-oriented) programming languages and paradigms
B3. Using a variety of computer-based (including operating) systems
B4. Applying theoretical concepts of computing science in the design and analysis of systems and algorithms
B5. Identifying and implementing appropriate algorithms and data structures
B6. Using and providing network information services

A successful student for the degree of Computing Science (Networked Systems and Internet Technologies) or Computing Science with Industrial Placement (Networked Systems and Internet Technologies) will have additional skills in the areas of:

B7. Designing and building realistic networked systems and Internet applications
B8. Identifying and analysing issues such as security and reliability in networked systems and Internet applications
B9. Integrating a wide variety of protocols and platforms
B10. Articulating the key contributions of emerging and future networked and internet computing technologies

A successful student for the degree of Computing Science (Games and Virtual Environments) or Computing Science with Industrial Placement (Games and Virtual Environments) will have additional skills in the areas of:

B11. Developing and/or implementing graphics algorithms and applications in standard software environments
B12. Modelling, rendering and interaction in 3D graphical environments
B13 Mathematical techniques for the manipulation of 3D geometry
B14. Implementing artificial intelligence algorithms in a declarative programming language

A successful student for the degree of Computing Science (Software Engineering) or Computing Science with Industrial Placement (Software Engineering) will have additional skills in the areas of:

B15. Validation and verification techniques for designs and software
B16. Using software Architecture Description Languages
B17. Making informed choices among software tools and techniques
B18. Project management, including estimation and planning

A successful student for the degree of Computing Science (Bioinformatics) or Computing Science with Industrial Placement (Bioinformatics) will have additional skills in the areas of:

B19. Software development using software languages and development environments specific to bioinformatics, computational biology and neuroinfromatics (e.g. Python, Matlab, and similar software)
B20. Using large scale online bioinformatics and neuroinformatics databases
B21. Making informed choices among software tools and techniques relevant for bioinformatics, computational biology and neuroinfromatics applications
B22. Implementing biologically inspired computation algorithms

Intended learning outcomes B7-B22 may have been achieved by students of other degrees depending on the options taken at Stage 3.

Teaching and Learning Methods

B1-B6 feature prominently in all modules. In particular a team project at Stage 2 gives

students experience of working with others (see D7 below) to engineer a complex piece of software (B2, B4, B5). When taken, the industrial placement will require students to produce solutions to a customer's requirements (B1-B6). In many cases the industrial placement when taken, and an individual project at Stage 3 will require students to develop a large piece of software to a customer's requirements (B1, B2, B4, B5). In all other modules, coursework is used to develop these skills (B1-B22).

Assessment Strategy

Subject-specific and professional skills are assessed by coursework (B1-B22).

Practical Skills

On completing the programme students should have:

C1. The ability to conduct investigations using the technical and professional literature
C2. The ability to use and evaluate appropriate tools and techniques
C3. The ability to undertake empirical evaluation of alternative solutions
C4. The ability to solve problems by identifying suitable approaches using computer-based systems
C5. The ability to reason abstractly about the structure and behaviour of computer systems

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), and to reason about computer systems (C5).

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 should be able to use the following skills:

D1. Written communication, particularly technical writing
D2. Problem solving
D3. Interpersonal communication
D4. Initiative
D5. Oral presentation
D6. Adaptability
D7. Teamwork
D8. Numeracy
D9. Planning and organisation
D10. Computer literacy

Teaching and Learning Methods

Key skills feature throughout the programme; teamwork in the Stage 2 team project and when taken, the industrial placement (D7); oral presentation, interpersonal communication, and planning and organisation in the final year research methods and individual project modules, as well as the Stage 2 team project and when taken, the industrial placement (D3, D5, D9); written communication in all modules, but especially in the team and final year projects and when taken, the industrial placement (D1); numeracy is covered by a Mathematics module at Stage 1 and exercises in the programming modules (D8); computer literacy, problem solving, initiative and adaptability are necessarily covered throughout the programme (D2, D4, D6, D10).

Assessment Strategy

Key (transferable) skills are assessed by both written and oral presentations (D1-D10). Teamwork in the Stage 2 team project 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

This programme has 3 Stages and when an industrial placement is taken, an intercalating year between stages 2 and 3. Students are required to take 120 credits at each Stage (except during an intercalating year).

Students take six compulsory 20-credit 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. At Stage 1 students who have taken A-level Mathematics (or equivalent) take MAS1404 Mathematics for Computing Science. Those without this qualification take CSC1013 Foundation Mathematics for Computing Science. For both sets of students further mathematical concepts are covered as and where necessary in modules at each Stage. However, certain modules at Stage 3, as indicated in the Degree Programme Handbook, may not be available to those students who have taken CSC1013.

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 at Stage 3, however all students must take the 40-credit individual project module CSC3095.

Students who take CSC3002 Reliability and Fault Tolerance, CSC3101 Distributed Systems, CSC3102 System and Network Security and CSC3103 Internet Technologies and E-Commerce are eligible for the award of a degree in Computing Science (Networked Systems and Internet Technologies) or Computing Science with Industrial Placement (Networked Systems and Internet Technologies).

Students who take CSC3201 Graphics, CSC3202 Computer Games Development, CSC3203 Artificial Intelligence for Games and CSC3204 Advanced Graphics and Virtual Environments are eligible for the award of a degree in Computing Science (Games and Virtual Environments) or Computing Science with Industrial Placement (Games and Virtual Environments).

Students who take CSC3004 Understanding Programming Languages, CSC3005 Real-time Programming in Java, CSC3303 Software Project Management and CSC3304 Software Verification Technologies are eligible for the award of a degree in Computing Science (Software Engineering) or Computing Science with Industrial Placement (Software Engineering).

Students who take CSC3XXX Bioinformatics Algorithms, CSC3YYY Biologically Inpsired Computing, CSC3006 Evolution of Complex Systems and CSC3104 Middleware and Web Services are eligible for the award of a degree in Computing Science (Bioinformatics) or Computing Science with Industrial Placement (Bioinformatics).

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

Students may elect to study one or two semesters of their final year abroad at one of our ERASMUS partner institutions.

Students taking one of the industrial placement degrees will take an industrial placement year between Stages 2 and 3.

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

Programme regulations (link to on-line version)
http://www.ncl.ac.uk/regulations/programme/2011-2012/comp.php

13 Criteria for admission

Entry qualifications

A Levels

ABB/AAC (not General Studies). GCSE Mathematics grade B required.

Scottish Qualifications

BBBBB at Higher Grade. Mathematics required at grade 2 Standard Grade (or Intermediate 2 equivalent)if not offered at Higher Grade. Combinations of Highers and Advanced Highers accepted.

International Baccalaureate

Minimum of 30 points in the IB Diploma. Standard Level Mathematics or Mathematical Studies required at grade 5 if not offered at Higher Level.

Irish Leaving Certificate

ABBBB

Access Qualifications

A unit in Mathematical Studies essential. At least 15 level 3 credits in a science subject at Distinction. In addition, at least 30 level 3 credits at a minimum of Merit.

BTEC Level 5 HND

Applicants will be considered on an individual basis.

BTEC Level 3 Extended Diploma (formerly BTEC National Diploma)

Applicants will be considered on an individual basis.

Advanced Diploma

Advanced Diploma in Engineering or in Information Technology acceptable. Minimum grade B in Principal Learning and Extended Project required, and minimum grade B in a numerate A level (e.g. Mathematics, Physics, Chemistry, Computing, IT). GCSE Mathematics required at minimum grade B if not offered at a higher level.

Cambridge Pre-U

D3,M2,M2/D3,D3,M3 in Principal Subjects. GCSE Mathematics grade B required.

Admissions policy/selection tools

Applicants are invited to visit the School for interview and to see the University and to meet staff current undergraduates on the programme. Attendance is strongly encouraged but not compulsory and applicants who are not based in the UK are not expected to attend.

Additional Requirements
None.

Level of English Language capability
For applicants whose first language is not English we ask for IELTS 6.5 or equivalent.

14 Support for Student Learning

Induction
During the first week of the first semester students attend an induction programme. New students will be given a general introduction to University life and the University's principle support services and general information about the School and their programme, as described in the Student Handbook and their Degree Programme Handbook. New and continuing students will be given detailed programme information and the timetable of lectures/practicals/labs/tutorials/etc. The International Office offers an additional induction programme for overseas students.

Study skills support
Students will learn a range of Personal Transferable Skills, including Study Skills, as outlined in this Programme Specification. Some of this material, e.g. time management is covered in the appropriate Induction Programme. Students are explicitly tutored on their approach to both team and individual projects. Specific help is available to improve writing skills:

http://www.ncl.ac.uk/students/wdc/learning/

Academic support
The initial point of contact for a student is with a lecturer, module leader or their tutor (see below). Thereafter the Degree Programme Director or Head of School may be consulted. Issues relating to the programme may be raised at the Staff Student Committee and/or at the Board of Studies.
Industrial Placement (when taken)
During the industrial placement, students will have a supervisor from the School as well as an industrial supervisor as detailed in the School's Placement Handbook.

Pastoral support
All students are assigned a personal tutor whose responsibility is to monitor the academic performance and overall well-being of their tutees. In addition the University offers a range of support services, including the Student Advice Centre, the Counselling and Wellbeing team, the Mature Student Support Officer and a Childcare Support Officer. For details of all student support services see:

http://www.ncl.ac.uk/undergraduate/life/support/

Support for students with disabilities
The University's Disability Support Service provides help and advice for disabled students at the University - and those thinking of coming to Newcastle. It provides individuals with: advice about the University's facilities, services and the accessibility of campus; details about the technical support available; guidance in study skills and advice on financial support arrangements; a resources room with equipment and software to assist students in their studies. For further details see:

http://www.ncl.ac.uk/students/wellbeing/disability-support/

Learning resources
The University's main learning resources are provided by the Robinson and Walton Libraries (for books, journals, online resources), (http://www.ncl.ac.uk/library/) and Information Systems

and Services, which supports campus-wide computing facilities:

http://www.ncl.ac.uk/iss/teaching/

The School of Computing Science has well equipped computer laboratories consisting of networked PCs with dedicated labs for each stage of the programme. In particular the School hosts a videoconferencing suite, funded through the HEFCE Centre of Excellence in Teaching and Learning programme. Key software used in the support and delivery of the programme is available to students free of charge. The University's Robinson Library has available multiple copies of all recommended undergraduate texts. Many of the reading list books are available free of charge online.

All new students whose first language is not English are required to take an English Language test in the Language Centre. Where appropriate, in-sessional language training can be provided. The Language Centre houses a range of resources for learning other languages which may be particularly appropriate for those interested in an Erasmus exchange :

http://www.ncl.ac.uk/langcen/

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

Module reviews
All modules are subject to review by questionnaires which are considered by the Staff Student Committee and Board of Studies. Changes to existing modules or the introduction of new modules are considered at the School Teaching and Learning Committee and at the Board of Studies. Student opinion is sought at the Staff Student Committee and/or the Board of Studies. New modules and major changes to existing modules are subject to approval by the Faculty Teaching, Learning and Student Experience Committee.

Programme reviews
The Board of Studies conducts an Annual Monitoring and Review of the degree programme and reports to Faculty Teaching, Learning and Student Experience Committee.

External Examiner reports
External Examiner reports are considered by the Board of Studies. The Board responds to these reports through Faculty Teaching, Learning and Student Experience Committee.

Student evaluations
All modules, and the degree programme, are subject to review by student questionnaires. Informal student evaluation is also obtained at the Staff Student Committee and the Board of Studies. The National Student Survey is sent out every year to final-year undergraduate students and consists of a set of questions seeking the students' views on the quality of the learning and teaching in their HEIs. Further information is at www.thestudentsurvey.com/. With reference to the outcomes of the NSS and institutional student satisfaction surveys actions are taken at all appropriate levels by the institution.

Mechanisms for gaining student feedback
Feedback is channelled via the Staff Student Committee and the Board of Studies.

Faculty and University Review Mechanisms
The programme is subject to the University's Internal Subject Review process:

http://www.ncl.ac.uk/quilt/assets/documents/qsh-isr-policy.pdf

Accreditation reports
A request for accreditation by the British Computer Society of the degrees in Computing Science (Bioinformatics) and Computing Science with Industrial Placement (Bioinformatics)

will be made once the first cohort has graduated. All other programmes covered by this Degree Programme Specification were accredited by the British Computer Society in October 2008.

Additional mechanisms
None.

16 Regulation of assessment

Pass mark
The pass mark is 40.

Course requirements
Progression is subject to the University's Undergraduate Progress Regulations and Undergraduate Examination Conventions (http://www.ncl.ac.uk/regulations). In summary, students must pass, or be deemed to have passed, 120 credits at each Stage. Limited compensation up to 40 credits and down to a mark of 35 is possible at each Stage and there are resit opportunities, with certain restrictions.

Weighting of stages
The marks from Stages 2 and 3 will contribute to the final classification of the degree
The weighting of marks contributing to the degree for Stages 2 and 3 is 50 : 50

Common Marking Scheme
The University employs a common marking scheme, which is specified in the Undergraduate Examination Conventions, namely

	Modules used for degree classification	**Modules not used for degree classification**
<40	Fail	Failing
40-49	Third Class	Basic
50-59	Second Class, Second Division	Good
60-69	Second Class, First Division	Very Good
70+	First Class	Excellent

Role of the External Examiner
An External Examiner, a distinguished member of the subject community, is appointed by Faculty Teaching, Learning and Student Experience Committee, following recommendation from the Board of Studies. The External Examiner is expected to:

- See and approve examination papers
- Moderate examination and coursework marking
- Attend the Board of Examiners
- Report to the University on the standards of the programme

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

The University Prospectus (see http://www.ncl.ac.uk/undergraduate/)

The School Brochure http://www.ncl.ac.uk/computing/

The University Regulations (see http://www.ncl.ac.uk/regulations/docs/)

The Degree Programme Handbook
(see https://www.cs.ncl.ac.uk/teaching/handbooks/current)

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. The accuracy of the information contained is reviewed by the University and may be checked by the Quality Assurance Agency for Higher Education.

Annex

Mapping of Intended Learning Outcomes onto Curriculum/Modules

Notes:

1. MAS1404 and CSC1013 are alternative compulsory modules.
2. Modules qualified by (NSIT) are compulsory for students wishing to have the degree title Computing Science (Networked Systems and Internet Technologies) or Computing Science with Industrial Placement (Networked Systems and Internet Technologies) and are optional for all other programmes.
3. Modules qualified by (GVE) are compulsory for students wishing to have the degree title Computing Science (Games and Virtual Environments) or Computing Science with Industrial Placement (Games and Virtual Environments) and are optional for all other programmes.
4. Modules qualified by (SE) are compulsory for students wishing to have the degree title Computing Science (Software Engineering) or Computing Science with Industrial Placement (Software Engineering) and are optional for all other programmes.
5. Modules qualified by (BI) are compulsory for students wishing to have the degree title Computing Science (Bioinformatics) or Computing Science with Industrial Placement (Bioinformatics) and are optional for all other programmes.

Intended Learning Outcome	Module codes (Compulsory in Bold)
A1	**CSC1011, CSC1012, CSC1014, CSC1016, CSC2011, CSC2012, CSC2013, CSC2014, CSC2015,** CSC3004 (SE), CSC3005 (SE), **CSC3095**, CSC3101 (NSIT), CSC3103 (NSIT), CSC3202 (GVE), CSC3504, CSC3XXX (BI), CSC3YYY (BI)
A2	**CSC1011, CSC1012, CSC1014, CSC2011, CSC2012, CSC2013, CSC2014, CSC2015, CSC2016,** CSC3002 (NSIT), CSC3003, CSC3005 (SE), **CSC3095,** CSC3201 (GVE), CSC3202 (GVE), CSC3304 (SE), CSC3303 (SE), CSC3XXX (BI).
A3	**CSC1013/MAS1404, CSC1016, CSC2012, CSC2014, CSC2015, CSC2016,** CSC3004 (SE), CSC3101 (NSIT), CSC3YYY (BI), CSC3201 (GVE), CSC3503, **MAS1404**
A4	**CSC1011, CSC1012, CSC2011, CSC2012, CSC2015, CSC2016,** CSC3002 (NSIT), CSC3005 (SE), CSC3006 (BI), CSC3101 (NSIT), CSC3201 (GVE), CSC3503, CSC3XXX (BI), CSC3YYY (BI)
A5	**CSC1016, CSC2013,** CSC3002 (NSIT), CSC3003, CSC3005 (SE)
A6	**CSC1015, CSC2015,** CSC3002 (NSIT), CSC3003, CSC3006 (BI), CSC3101 (NSIT), CSC3202 (GVE), CSC3303 (SE), CSC3XXX (BI), CSC3YYY (BI)
A7	**CSC3095**
A8	CSC3101 (NSIT)
A9	CSC3101 (NSIT)
A10	CSC3101 (NSIT)
A11	CSC3103 (NSIT)
A12	CSC3101 (NSIT), CSC3102 (NSIT)
A13	CSC3201 (GVE), CSC3202 (GVE), CSC3204 (GVE), CSC3503
A14	CSC3201 (GVE), CSC3202 (GVE), CSC3204 (GVE), CSC3503
A15	CSC3202 (GVE), CSC3203 (GVE), CSC3204 (GVE), CSC3503
A16	CSC3201 (GVE), CSC3202 (GVE), CSC3204 (GVE), CSC3503

A17	CSC3203 (GVE), CSC3204 (GVE), CSC3503
A18	CSC3303 (SE), CSC3304 (SE)
A19	**CSC1016**
A20	CSC3304 (SE)
A21	CSC3303 (SE), CSC3304 (SE)
A22	CSC3304 (SE)
A23	CSC3303 (SE)
A24	CSC3303 (SE)
A25	CSC3XXX (BI)
A26	CSC3XXX (BI), CSC3006 (BI)
A27	CSC3XXX (BI), CSC3006 (BI)
A28	CSC3YYY (BI)
A29	CSC3XXX (BI), CSC3YYY (BI), CSC3104 (BI)
A30	CSC3XXX (BI), CSC3YYY (BI), CSC3104 (BI)
B1	**CSC1011, CSC1012, CSC1014, CSC1016, CSC2011, CSC2012, CSC2014, CSC2015,** CSC3002 (NSIT), CSC3003, CSC3004 (SE), CSC3005 (SE), **CSC3095,** CSC3103 (NSIT), CSC3201 (GVE), CSC3202 (GVE), CSC3303 (SE)
B2	**CSC1011, CSC1012, CSC1014, CSC1016, CSC2011, CSC2015,** CSC3005 (SE), **CSC3095,** CSC3102 (NSIT), CSC3103 (NSIT), CSC3504
B3	**CSC1011, CSC1012, CSC1014, CSC1016, CSC2011, CSC2012, CSC2013, CSC2015,** CSC3002 (NSIT), CSC3005 (SE), **CSC3095,** CSC3103 (NSIT), CSC3202 (GVE), CSC3504, CSC3XXX (BI)
B4	**CSC1012, CSC1013/MAS1404, CSC1014, CSC1016, CSC2012, CSC2014, CSC2015, CSC2016,** CSC3003, CSC3004 (SE), CSC3005 (SE), CSC3201 (GVE), CSC3XXX (BI), CSC3YYY (BI)
B5	**CSC1011, CSC1012, CSC1014, CSC1016, CSC2011, CSC2014, CSC2015, CSC2016,** CSC3002 (NSIT), CSC3005 (SE), CSC3103 (NSIT), CSC3201 (GVE), CSC3202 (GVE), CSC3503, CSC3XXX (BI), CSC3YYY (BI)
B6	**CSC1011, CSC1012, CSC1014, CSC1015, CSC1016, CSC2012, CSC2013, CSC2015,** CSC3003, CSC3005 (SE), CSC3101 (NSIT), CSC3103 (NSIT), CSC3202 (GVE)
B7	CSC3101 (NSIT), CSC3103 (NSIT)
B8	CSC3101 (NSIT), CSC3102 (NSIT)
B9	CSC3103 (NSIT)
B10	CSC3102 (NSIT), CSC3103 (NSIT)
B11	CSC3201 (GVE), CSC3202 (GVE), CSC3204 (GVE), CSC3503
B12	CSC3201 (GVE), CSC3202 (GVE), CSC3204 (GVE)
B13	CSC3201 (GVE), CSC3202 (GVE), CSC3204 (GVE)
B14	CSC3203 (GVE)
B15	CSC3304 (SE)
B16	**CSC1016**
B17	CSC3303 (SE), CSC3304 (SE)
B18	CSC3303 (SE)
B19	CSC3XXX (BI), CSC3YYY (BI)
B20	CSC3XXX (BI)
B21	CSC3XXX (BI), CSC3YYY (BI), CSC3104 (BI)
B22	CSC3YYY (BI)

C1	**CSC1015, CSC1016, CSC2012, CSC2013, CSC2014, CSC2015,** CSC3002 (NSIT), CSC3003, CSC3006 (BI)**, CSC3095,** CSC3102 (NSIT), CSC3103 (NSIT), CSC3201 (GVE), CSC3202 (GVE), CSC3504, CSC3XXX (BI), CSC3YYY (BI)
C2	**CSC1011, CSC1012, CSC1013/MAS1404, CSC1014, CSC1015, CSC1016, CSC2011, CSC2012, CSC2013, CSC2014, CSC2015, CSC2016,** CSC3003, CSC3004 (SE), CSC3005 (SE), CSC3006 (BI), **CSC3095,** CSC3101 (NSIT), CSC3102 (NSIT), CSC3103 (NSIT), CSC3201 (GVE), CSC3202 (GVE), CSC3XXX (BI), CSC3YYY (BI)
C3	**CSC1011, CSC1012, CSC1014, CSC1015, CSC1016, CSC2011, CSC2012, CSC2014, CSC2015, CSC2016,** CSC3003, CSC3006 (BI), **CSC3095,** CSC3102 (NSIT), CSC3103 (NSIT), CSC3201 (GVE), CSC3202 (GVE), CSC3503, CSC3XXX (BI), CSC3YYY (BI)
C4	**CSC1011, CSC1012, CSC1013/MAS1404, CSC1014, CSC1016, CSC2011, CSC2012, CSC2014, CSC2015, CSC2016,** CSC3002 (NSIT), CSC3003, CSC3005 (SE), CSC3006 (BI), **CSC3095,** CSC3101 (NSIT), CSC3102 (NSIT), CSC3103 (NSIT), CSC3201 (GVE), CSC3202 (GVE), CSC3503, CSC3504, CSC3XXX (BI), CSC3YYY (BI)
C5	**CSC1016, CSC2011, CSC2012, CSC2013, CSC2014, CSC2015, CSC2016,** CSC3002 (NSIT), CSC3004 (SE), CSC3006 (BI), CSC3103 (NSIT), CSC3202 (GVE), CSC3503, CSC3XXX (BI), CSC3YYY (BI)
D1	**CSC1011, CSC1012, CSC1014, CSC1015, CSC1016, CSC2012, CSC2013, CSC2014, CSC2015,** CSC3002 (NSIT), CSC3003, CSC3006 (BI), **CSC3095,** CSC3201 (GVE), CSC3202 (GVE), CSC3303 (SE), CSC3503, CSC3504
D2	**CSC1011, CSC1012, CSC1013/MAS1404, CSC1014, CSC1015, CSC1016, CSC2011, CSC2012, CSC2013, CSC2014, CSC2015, CSC2016,** CSC3002 (NSIT), CSC3004 (SE), CSC3005 (SE), CSC3006 (BI), **CSC3095,** CSC3101 (NSIT), CSC3102 (NSIT), CSC3103 (NSIT), CSC3201 (GVE), CSC3202 (GVE), CSC3503, CSC3504, CSC3XXX (BI), CSC3YYY (BI)
D3	**CSC1015, CSC2014, CSC2015,** CSC3004 (SE), CSC3006 (BI), **CSC3095,** CSC3303 (SE)
D4	**CSC1011, CSC1012, CSC1013/MAS1404, CSC1014, CSC1015, CSC1016, CSC2012, CSC2014, CSC2015,** CSC3002 (NSIT), CSC3003, CSC3004 (SE), CSC3005 (SE), CSC3006 (BI), **CSC3095,** CSC3102 (NSIT), CSC3201 (GVE), CSC3202 (GVE), CSC3XXX (BI), CSC3YYY (BI)
D5	**CSC1015, CSC2015,** CSC3006 (BI), **CSC3095**
D6	**CSC1011, CSC1012, CSC1013/MAS1404, CSC1014, CSC1015, CSC1016, CSC2015, CSC2016,** CSC3006 (BI), **CSC3095,** CSC3102 (NSIT), CSC3202 (GVE)
D7	**CSC1015, CSC2015,** CSC3004 (SE), CSC3006 (BI), CSC3303 (SE)
D8	**CSC1013/MAS1404, CSC2014, CSC2015, CSC2016**, CSC3005 (SE), CSC3102 (NSIT), CSC3201 (GVE), CSC3202 (GVE), CSC3XXX (BI), CSC3YYY (BI)
D9	**CSC1011, CSC1012, CSC1014, CSC1015, CSC1016, CSC2012, CSC2014, CSC2015,** CSC3003, CSC3006 (BI), **CSC3095,** CSC3201 (GVE), CSC3202 (GVE), CSC3303 (SE), CSC3XXX (BI), CSC3YYY (BI)

D10	**CSC1011, CSC1012, CSC1014, CSC1015, CSC1016, CSC2011, CSC2012, CSC2014, CSC2015, CSC2016,** CSC3002 (NSIT), CSC3003, CSC3005 (SE), **CSC3095,** CSC3103 (NSIT), CSC3201 (GVE), CSC3202 (GVE), CSC3504, CSC3XXX (BI), CSC3YYY (BI)