

**PROGRAMME SPECIFICATION**

<b>1</b>	<b>Awarding Institution</b>	Newcastle University
<b>2</b>	<b>Teaching Institution</b>	Newcastle University
<b>3</b>	<b>Final Award</b>	MComp (Hons)
<b>4</b>	<b>Programme Title</b>	Computer Science Computer Science with Study Abroad Computer Science (Mobile and Distributed Systems) Computer Science with Study Abroad (Mobile and Distributed Systems) Computer Science (Games Engineering) Computer Science with Study Abroad (Games Engineering) Computing Science (Bio-Computing) Computing Science with Study Abroad (Bio-Computing) Computing Science (Security and Resilience) Computing Science with Study Abroad (Security and Resilience)
<b>5</b>	<b>UCAS/Programme Code</b>	G405 G406 I120 I121 I610 I611 I522 I523 I192 I193
<b>6</b>	<b>Programme Accreditation</b>	British Computer Society
<b>7</b>	<b>QAA Subject Benchmark(s)</b>	Computing
<b>8</b>	<b>FHEQ Level</b>	7
<b>9</b>	<b>Last updated</b>	15 May 2012

**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 3<sup>rd</sup> and 4<sup>th</sup> years. Students studying for the G405 and G406 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 I120, I121, I610, I611, I522, I523, I192, I193 programmes specialise in their last two (3<sup>rd</sup> and 4<sup>th</sup>) years in one of three areas:
  - a. Students may choose to specialise in Mobile and Distributed Systems. These students 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 may choose to specialise in Games 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.
  - c. Students may choose to specialise in Bio-Computing. These students will have particular knowledge and skills related to the development of computing applications relevant to biological sciences, for example applications in bioinformatics, neuroinformatics, computational systems biology, or biological modelling. 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 focusing on the development of software systems for medical and biological applications; some may also seek to develop market-niche software in small or start-up companies.
  - d. 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, including research.
4. To provide programmes which meet the accreditation requirements of appropriate professional bodies, thus providing the basis for further professional development and lifelong learning.
5. To provide programmes which meet the FHEQ at Masters Levels and which takes appropriate account of the subject benchmark statements in Computing.
6. For those students taking a programme with study abroad, to provide students with the opportunity to develop their skills within an international setting.

## 11 Learning Outcomes

The programmes provide opportunities for students to develop and demonstrate knowledge and understanding, qualities, skills and other attributes in areas of computing science. The programme outcomes cover 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, and then to offer specialisation at Stage 3 and Stage 4 in the form of a wide range of optional modules.

The following identifies the generic Intended Learning Outcomes for the programmes. There will be variation depending on the nature of the study abroad (if that is part of the programme), and the options taken at Stage 3 and Stage 4.

### Knowledge and Understanding

On completing any of the programmes 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 Computer 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

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 Mobile and Distributed Systems specialism will additionally have gained and be able to demonstrate knowledge and understanding of:

- A8. technological foundations of networked systems, in depth and breadth
- A9. mobile systems development
- A10. fundamental networked and internet protocols and algorithms
- A11. techniques for networked and Internet programming, including advanced topics
- A12. solutions for secure, reliable and trusted networked and internet computing, including trust and dependability enhancements

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

- A13. the technological foundations of computer games systems and virtual reality platforms
- A14. the mathematical principles and algorithmic basis of computer graphics
- A15. design issues and advanced development techniques for computer graphics and games engineering
- A16. human requirements and technical capabilities of modern games, graphics platforms, and virtual environments
- A17. fundamental and advanced problems and approaches in artificial intelligence, as applied to computer games, visualisation and virtual environments

A18-A24 reserved.

A student taking modules from the Bio-Computing specialism 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

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.

#### **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.

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

A student taking modules from the Mobile and Distributed Systems specialism will additionally have 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, including trust and dependability computing
- B10. articulating the key contributions of emerging and future networked and internet computing technologies

A student taking modules from the Games Engineering specialism will additionally have 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

B15-B18 reserved.

A student taking modules from the Bio-Computing specialism will additionally have skills in the areas of:

- B19. software development using software languages and development environments specific to Bio-computing, computational biology and neuroinformatics (e.g. Python, Matlab, and similar software)
- B20. using large scale online Bio-computing and neuroinformatics databases
- B21. making informed choices among software tools and techniques relevant for Bio-computing, computational biology and neuroinformatics applications
- B22. implementing biologically inspired computation algorithms

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.

**Teaching and Learning Methods**

B1-B6 feature prominently in all modules. In particular a team project at Stage 2 and Stage 4 gives students experience of working with others (see D7 below) to engineer a complex piece of software (B2, B4, B5). 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, B5). 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 and evaluate appropriate tools and techniques
- C3. undertake empirical evaluation of alternative solutions
- C4. solve problems by identifying suitable approaches using computer-based systems
- C5. 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, 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 any of the programmes 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 all programmes; teamwork in the Stage 2 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, D9); 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 (D8); computer literacy, problem solving, initiative and adaptability are necessarily covered throughout all programmes (D2, D4, D6, D10).

### **Assessment Strategy**

Key (transferable) skills are assessed by both written and oral presentations (D1-D10). 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).

## **12 Programme Curriculum, Structure and Features**

### **Basic structure of the programme**

All programmes have 4 Stages 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, I121, I611, I523 and I193) the calculation of credits will be done according to the credit conversion rules included in the partnership agreement with the partner institution.

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 take CSC1025 Mathematics. Further mathematical concepts are covered as and where necessary in modules at each Stage.

A wide range of optional modules is available to G405, I120, I610, I522 and I192 students at Stage 3. However, all must take the 40-credit individual project module CSC3095 and in the case of I120, I610, I522 and I192 students, 40 credits of specialist modules. An equivalent project module will be compulsory for study abroad students.

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 CSC8205 (CSC8390 for Bio-Computing) and the 30-credit individual project module CSC8498.

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.

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

Students on G406, I121, I611, I523 and I191 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)**

<http://www.ncl.ac.uk/regulations/programme/>

## **13 Criteria for admission**

### *Entry qualifications*

A Levels

AAB (excluding General Studies and Critical Thinking). GCSE Mathematics grade B required.

Scottish Qualifications

AAABB 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

35 points. Standard Level Mathematics or Mathematical Studies required at grade 5 if not offered at Higher Level.

#### Irish Leaving Certificate

A1A1A1B1B

#### 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.

#### Cambridge Pre-U

D3,D3,M2 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**

The Student Services portal provides links to key services and other information and is available at: <http://www.ncl.ac.uk/students/>



### *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 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.

Numeracy support is available through Maths Aid and help with academic writing is available from the Writing Centre (further information is available from the Robinson Library).

### *Academic support*

The initial point of contact for a student is with a lecturer or module leader, or their tutor (see below) for more generic issues. Thereafter the Degree Programme Director or Head of School may be consulted. Issues relating to the programmes may be raised at the Staff-Student Committee, and/or at the Board of Studies.

### *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 one-to-one counselling and guidance or group sessions / workshops on a range of topics, such as emotional issues e.g. Stress and anxiety, student finance and budgeting, disability matters etc. There is specialist support available for students with dyslexia and mental health issues. Furthermore, the Union Society operates a Student Advice Centre, which can provide advocacy and support to students on a range of topics including housing, debt, legal issues etc.

### *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.

### *Learning resources*

The University's main learning resources are provided by the Robinson and Walton Libraries (for books, journals, online resources) and Information Systems and Services, which supports campus-wide computing facilities:

All new students whose first language is not English are required to take an English Language test in the Language Centre. Where appropriate, in-session 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.

**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 Board of Studies. Changes to, or the introduction of new, modules are considered at the Board of Studies and/or the School Teaching and Learning Committee. 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 programmes and reports to Faculty Teaching, Learning and Student Experience Committee. The FTLSEC takes an overview of all programmes within the Faculty and reports any Faculty or institutional issues to the University 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 and Learning Committee. External Examiner reports are shared with institutional student representatives, through the Staff-Student 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/](http://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.

*Accreditation reports*

The Stage 1, Stage 2 and Stage 3 parts of the programmes covered by this Degree Programme Specification were accredited by the British Computer Society in October 2008. A request for accreditation by the British Computer Society will be made in 2013.

*Additional mechanisms*

None.

## 16 Regulation of assessment

### *Pass mark*

The pass mark for Level 7 modules is 50, and for Level 4, 5 and 6 modules is 40.

### *Course requirements*

Progression is subject to the University's Undergraduate Progress Regulations and Integrated Masters Examination Conventions. In order to progress a student must meet the internal progression thresholds at the end of Stages 2 and 3, which are 60% at the end of Stage 2, and 60% at the end of Stage 3. Students not meeting the threshold at the end of Stage 2 will be transferred on to the appropriate Bachelor's Degree programme. Students not meeting the threshold at the end of Stage 3 will not be permitted to progress to Stage 4 and will be considered for the appropriate Stage 3 exit award. Compensation rules do apply to this programme at Stages 1, 2 and 3 along with reassessment opportunities and these are fully outlined in the Examination Conventions.

### *Weighting of Stages*

Marks from all modules studied at Stages 2, 3 and 4, may contribute to degree classification as specified in the relevant degree programme regulations.

### *Common Marking Scheme*

The University employs a common marking scheme, which is specified in Integrated Masters Examination Conventions, namely:

#### **Summary description applicable to Honours level Degree Classification Modules (levels 4-6)**

<39	Fail
40-49	Third Class
50-59	Second Class, Second Division
60-69	Second Class, First Division
70 or above	First Class

#### **Summary description applicable to level 7 Degree Classification Modules**

<39	Fail
40-49	Fail
50-59	Second Class, Second Division
60-69	Second Class, First Division
70 or above	First Class

### *Role of the External Examiner*

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

- i. See and approve assessment papers
- ii. Moderate examination and coursework marking
- iii. Attend the Board of Examiners
- iv. Report to the University on the standards of the programme

In addition, information relating to the programmes 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 <http://www.ncl.ac.uk/computing/current/documents/StudentHandbook.pdf>)

Please note. This specification provides a concise summary of the main features of the programmes 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.

**Mapping of Intended Learning Outcomes onto Stage 1, 2 and 3 Modules**

Notes:

1. Modules in bold text are compulsory for all students.
2. Modules qualified by (MD) are compulsory for students wishing to have the degree title Computer Science (Mobile and Distributed Systems) or Computer Science with Industrial Placement (Mobile and Distributed Systems) and are optional for all other programmes.
3. Modules qualified by (GE) are compulsory for students wishing to have the degree title Computer Science (Game Engineering) or Computer Science with Industrial Placement (Game Engineering) and are optional for all other programmes.
4. Modules qualified by (BI) are compulsory for students wishing to have the degree title Computer Science (Bio-computing) or Computer Science with Industrial Placement (Bio-computing) and are optional for all other programmes.
5. Modules qualified by (SR) are compulsory for students wishing to have the degree title Computer Science (Security and Resilience) or Computer Science with Industrial Placement (Security and Resilience) and are optional for all other programmes.



	CSC1021	CSC1022	CSC1023	CSC1024	CSC1025	CSC1026	CSC2011	CSC2012	CSC2013	CSC2014	CSC2015	CSC2016	CSC3095	CSC3002 SR	CSC3003	CSC3004	CSC3005	CSC3006 BI	CSC3101 MD	CSC3102 MD, SR	CSC3103 MD	CSC3122 MD	CSC3201 GE	CSC3202 GE	CSC3203 GE	CSC3204 GE	CSC3303	CSC3304 SR	CSC3423 BI	CSC3424 BI	CSC3503	CSC3504 BI	CSC3621 SR		
B1	X	X		X		X	X	X		X	X		X	X	X	X	X			X	X	X	X				X								
B2	X	X		X		X	X				X		X			X				X	X	X											X		
B3	X	X		X		X	X	X	X		X		X	X		X					X	X		X							X		X		
B4		X		X	X	X		X		X	X	X				X	X						X							X	X				
B5	X	X		X		X	X			X	X	X		X			X				X		X	X					X	X	X				
B6	X	X	X	X		X		X	X		X				X		X			X	X			X											
B7																				X		X													
B8																				X	X														
B9																					X	X													
B10																				X	X														
B11																							X	X		X					X				
B12																							X	X		X									
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	CSC1021	CSC1022	CSC1023	CSC1024	CSC1025	CSC1026	CSC2011	CSC2012	CSC2013	CSC2014	CSC2015	CSC2016	CSC3095	CSC3002 SR	CSC3003	CSC3004	CSC3005	CSC3006 BI	CSC3101 MD	CSC3102 MD, SR	CSC3103 MD	CSC3122 MD	CSC3201 GE	CSC3202 GE	CSC3203 GE	CSC3204 GE	CSC3303	CSC3304 SR	CSC3423 BI	CSC3424 BI	CSC3503	CSC3504 BI	CSC3621 SR			
C1			X	X				X	X	X	X		X	X	X		X	X	X	X	X	X	X	X					X	X		X				
C2	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X					X	X						
C3	X	X	X	X		X	X	X		X	X	X	X		X			X		X	X	X	X	X	X				X	X	X					
C4	X	X		X	X	X	X	X		X	X	X	X	X	X		X	X	X	X	X	X	X	X	X				X	X	X	X		X		
C5				X			X	X	X	X	X	X		X		X		X				X		X					X	X	X					

	<b>CSC1021</b>	<b>CSC1022</b>	<b>CSC1023</b>	<b>CSC1024</b>	<b>CSC1025</b>	<b>CSC1026</b>	<b>CSC2011</b>	<b>CSC2012</b>	<b>CSC2013</b>	<b>CSC2014</b>	<b>CSC2015</b>	<b>CSC2016</b>	<b>CSC3095</b>	<b>CSC3002 SR</b>	<b>CSC3003</b>	<b>CSC3004</b>	<b>CSC3005</b>	<b>CSC3006 BI</b>	<b>CSC3101 MD</b>	<b>CSC3102 MD,SR</b>	<b>CSC3103 MD</b>	<b>CSC3122 MD</b>	<b>CSC3201 GE</b>	<b>CSC3202 GE</b>	<b>CSC3203 GE</b>	<b>CSC3204 GE</b>	<b>CSC3303</b>	<b>CSC3304 SR</b>	<b>CSC3423 BI</b>	<b>CSC3424 BI</b>	<b>CSC3503</b>	<b>CSC3504 BI</b>	<b>CSC3621 SR</b>		
D1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
D2	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
D3			X						X	X	X	X	X				X										X								
D4	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
D5			X								X	X	X					X																	
D6	X	X	X	X	X	X					X	X	X					X	X	X				X											
D7			X								X				X		X										X								
D8					X				X	X	X					X			X				X	X					X	X					
D9	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
D10	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

### Mapping of Intended Learning Outcomes onto Stage 4 Modules

Notes:

1. Modules in bold text are compulsory for all students.
2. Modules qualified by **(MD)** are compulsory and modules qualified by (MD) are optional for students wishing to have the degree title Computer Science (Mobile and Distributed Systems) or Computer Science with Industrial Placement (Mobile and Distributed Systems).
3. Modules qualified by **(GE)** are compulsory and modules qualified by (GE) are optional for students wishing to have the degree title Computer Science (Game Engineering) or Computer Science with Industrial Placement (Game Engineering).
4. Modules qualified by **(BI)** are compulsory and modules qualified by (BI) are optional for students wishing to have the degree title Computer Science (Bio-computing) or Computer Science with Industrial Placement (Bio-computing).
5. Modules qualified by **(SR)** are compulsory and modules qualified by (SR) are optional for students wishing to have the degree title Computer Science (Security and Resilience) or Computer Science with Industrial Placement (Security and Resilience).



	CSC8101 MD	CSC8103 MD	CSC8104 MD	CSC8106 MD	CSC8108 MD, GE	CSC8109 MD	CSC8201 MD, SR	CSC8202 MD, SR	CSC8205 MD, SR, GE	CSC8498	CSC8102 SR	CSC8105 SR	CSC8203 SR, GE	CSC8204 SR	CSC8206 SR	CSC8404 SR	CSC8406 SR	CSC8501 GE	CSC8502 GE	CSC8503 GE	CSC8506 GE	CSC8308 BI	CSC8313 BI	CSC8314 BI	CSC8390 BI	BIO8009 BI	MAS8401 BI	CSC8305 BI	CSC8311 BI
A1			X	X	X	X	X						X			X	X	X	X	X									X
A2	X			X	X	X	X				X	X	X			X	X	X											X
A3						X						X								X							X	X	
A4	X	X			X							X			X	X			X	X								X	
A5			X								X																		
A6					X	X	X						X	X							X								
A7										X																			
A8			X			X							X																
A9			X	X	X	X																							
A10		X					X				X																		
A11	X	X	X	X							X	X	X																
A12						X	X				X	X	X																
A13																			X										
A14																			X	X									
A15																		X			X								
A16				X								X							X	X	X								
A17																				X									
A25																						X	X						
A26																						X	X						X
A27																							X						
A28																								X		X			
A29																							X	X	X	X	X	X	
A30																								X			X		

	CSC8101 MD	CSC8103 MD	CSC8104 MD	CSC8106 MD	CSC8108 MD, GE	CSC8109 MD	CSC8201 MD, SR	CSC8202 MD, SR	CSC8205 MD, SR, GE	CSC8498	CSC8102 SR	CSC8105 SR	CSC8203 SR, GE	CSC8204 SR	CSC8206 SR	CSC8404 SR	CSC8406 SR	CSC8501 GE	CSC8502 GE	CSC8503 GE	CSC8506 GE	CSC8308 BI	CSC8313 BI	CSC8314 BI	CSC8390 BI	BIO8009 BI	MAS8401 BI	CSC8305 BI	CSC8311 BI
B1			X	X	X	X							X	X				X	X	X	X	X	X						
B2			X	X	X								X	X	X	X		X	X	X	X	X	X						
B3				X	X	X					X	X	X	X	X	X				X	X	X	X						
B4		X			X	X	X				X			X					X	X	X	X	X	X				X	
B5	X		X		X	X		X					X	X	X	X			X	X	X	X	X	X				X	
B6			X		X	X								X							X	X		X					
B7	X				X							X																	
B8							X	X			X		X																
B9		X	X	X	X						X	X																	
B10					X	X						X	X																
B11												X							X	X									
B12																		X	X										
B13																		X	X	X									
B14																		X	X										
B19																								X			X	X	
B20																						X	X	X					X
B21																					X	X	X						X
B22																							X				X	X	

	CSC8101 MD	CSC8103 MD	CSC8104 MD	CSC8106 MD	CSC8108 MD, GE	CSC8109 MD	CSC8201 MD, SR	CSC8202 MD, SR	CSC8205 MD, SR, GE	CSC8498	CSC8102 SR	CSC8105 SR	CSC8203 SR, GE	CSC8204 SR	CSC8206 SR	CSC8404 SR	CSC8406 SR	CSC8501 GE	CSC8502 GE	CSC8503 GE	CSC8506 GE	CSC8308 BI	CSC8313 BI	CSC8314 BI	CSC8390 BI	BIO8009 BI	MAS8401 BI	CSC8305 BI	CSC8311 BI	
C1					X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				
C2	X		X		X	X			X	X		X	X	X	X	X	X	X	X	X	X	X	X	X				X		
C3		X	X		X	X			X	X		X	X	X	X	X	X	X	X	X	X	X	X	X						
C4				X	X	X			X	X		X	X	X	X	X	X	X	X	X	X	X	X	X				X		
C5				X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					X	

