

PROGRAMME SPECIFICATION	 Newcastle University
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1	Awarding Institution	Newcastle University
2	Teaching Institution	Newcastle University
3	Final Award	MSc
4	Programme Title	Cyber Security
5	UCAS/Programme Code	5144F/P
6	Programme Accreditation	British Computer Society
7	QAA Subject Benchmark(s)	Computing
8	FHEQ Level	7
9	Date written/revised	May 2023

10	Programme Aims
	<ol style="list-style-type: none"> 1. To equip students with the skills and knowledge required to develop and assess secure and resilient computer-based systems 2. To provide a qualification enhancing employment prospects in dependable computing 3. To develop research skills 4. To develop and improve key skills in written and oral communication and in teamwork 5. To develop and improve skills in using the literature and information technology resources relevant to dependable computing 6. To encourage the development of creativity skills 7. To develop skills in critical assessment, analysis and storage of information 8. To provide a programme which meets the accreditation requirements of the appropriate professional bodies, thus providing a basis for further professional development and lifelong learning 9. To address the relevant professional, legal and ethical issues relevant to the development, assessment and maintenance of secure and resilient systems 10. To provide an international perspective on developments in computer security and resilience. 11. To provide a programme which meets the FHEQ at Masters level and takes appropriate account of the draft subject benchmark statements in Computing.

11	Learning Outcomes
	<p>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.</p>

Knowledge and Understanding	
	<p>On completing the programme students should be able to demonstrate:</p> <ol style="list-style-type: none"> A1 Understanding of the theory underpinning dependability, security and resilience in computer-based systems A2 Knowledge of advanced techniques for assessing information security A3 Knowledge of the major methods for assessing system resilience A4 Knowledge of the major fault tolerance techniques applicable in computing system design A5 Understanding of the technologies for the design of trustworthy interactive systems, including human and cyber-physical aspects. A6 Understanding of the computer aided verification techniques relevant to security in distributed systems A7 Understanding of the principles underlying high integrity software development using advanced static analysis and formal techniques

A8 Understanding of major professional, legal and ethical issues associated with work in secure and resilient computing systems
 A9 Understanding of the international character of contemporary developments in security and resilience.

Teaching and Learning Methods

The primary method of imparting knowledge and understanding is lectures supported by practical work in classes and laboratories (A1-A9). Fundamental motivation (A1), is further reinforced through case study material describing real-world failures of security and resilience. Knowledge of leading technologies (A2-A6), is assisted through the practical laboratory work in addition to the lectures. Professional, legal and ethical issues (A8) are addressed explicitly in the dependability context and reinforced in the core technical modules and again in the group project. The international character of developments in the subject (A9) is emphasised in the research skills module and individual project. Through the many case studies underpinning studies in secure systems, Students will be encouraged to deepen understanding by independent reading in the relevant technical and scientific literature, supported by guidance in information literacy skills (in induction and prior to the group and individual projects) and subject-specific guidance given in lectures.

Assessment Strategy

Technical knowledge and understanding is primarily assessed through unseen written examinations (A1-9). In the case of major technical methods (A2-A6), assessment is also based on coursework based on practical exercises.

Intellectual Skills

- On completing the programme students should:
- B1 Be able to propose, conduct and write up an extended research project involving, where appropriate, a literature review, problem specification, design, verification, implementation and analysis
 - B2 Be able to design, implement and validate new software for secure or resilient applications
 - B3 Be able to organise and take part in systematic dependability analyses of existing systems
 - B4 Have expertise in the use and applicability of up-to-date software development tools
 - B5 Be able to assess the main social and technical factors relevant to secure system operation
 - B6 Be able to apply the leading techniques for security in network and internet environments, including cryptography and public key infrastructures
 - B7 Be able to apply the major methods for assessing system resilience
 - B8 Be able to deploy fault tolerance appropriately in system design

Teaching and Learning Methods

Intellectual skills are imparted through lectures on research project planning (B1) and through one-to-one and small group supervisions during the individual project. Specific design, validation skills (B2,B4,B6,B8) are introduced in practical classes. Assessment skills (B3,B5,B7) are introduced through practical case studies in taught modules. Throughout the programme, the emphasis is on skills development through practical experience. Students are encouraged to acquire relevant skills through: the group and individual projects, which have a research element (B1); individual modules' laboratory classes in design (B2,B4,B6,B8), and dependability assessment methods (B3,B5,B7). The group project aims to encourage students to learn how skills specific to sub-disciplines (B2-B7) interact in design and assessment.

Assessment Strategy

Intellectual skills are primarily assessed by means of reports, designs and software developed by students in coursework activities and private study (B6-B8). The individual project deliverables (proposal, presentation and dissertation) are the main vehicles for assessment of B1. Reports from individual and group projects are used for assessment of B2, B4, B5. For B6-B8, assessment is based on project reports from coursework supplemented by focussed problems in unseen written examinations.

Practical Skills
<p>On completing the programme students should be able to:</p> <p>C1 Critically evaluate research and literature relating to security and resilience of computer-based systems</p> <p>C2 Evaluate and use appropriate tools and techniques</p> <p>C3 Undertake critical evaluation (theoretical and empirical) of alternative solutions</p> <p>C4 Solve design problems</p>
Teaching and Learning Methods
<p>Practical skills are developed through practical study skills sessions in information research and literacy (C1) and practical design classes as part of the practical component of each module (C2,3,4). Students are encouraged to acquire these skills through preparing seminars and presentations on current topics in computer security and resilience (C1), through the preparation and presentation of design and tooling alternatives in practical classes and the group project (C2,3,4)</p>
Assessment Strategy
<p>Practical skills are primarily assessed through practical work. C1 is assessed through specific coursework exercises, a seminar and dissertation at the end of the individual project. C2-C4 are primarily assessed in individual and group-based coursework and the final project. C3 and C4 are also assessed, in part, via unseen written examinations.</p>
Transferable/Key Skills
<p>On completing the programme students should have:</p> <p>D1 The ability to communicate orally in a professional context</p> <p>D2 Written communication skills, including an appreciation of the role of peer review of papers, software, proposals and other research and development products</p> <p>D3 Information literacy skills, including the ability to use computer-based resources for research in the professional literature and the capacity to undertake critical review</p> <p>D4 The ability to work as part of a team, including group-based learning, research and development activity</p> <p>D5 Creativity skills: recognising and responding to opportunities for innovation</p> <p>D6 Planning and organisation skills</p>
Teaching and Learning Methods
<p>Communication skills (D1,D2) are imparted through seminars on oral presentation and technical writing within the module on research skills, the group and individual projects. Skills in computer-based information resources (D3) are promoted through specialist classes provided in conjunction with the University Library's Information Literacy programme. Team working skills (D4) are developed in the group project module through introductory lectures on team working issues and guidance during the project. Creativity skills are introduced in practical classes, as well as the group and individual projects. Planning and organisation skills (D6) are stressed throughout the practical aspects of the programme, notably in the preparation for the group and individual projects. Students are encouraged to practise communication skills (D1) through group working, informal and formal presentations, and through written reports associated with practical exercises, the group and individual project (D2). Skills in using computer-based information resources (D3) are encouraged by research-related exercises. Team working skills (D4) are practised through students collaborating in a major team-based project. Creativity skills (D5) are encouraged by tackling design problems which grow in the level of challenge, from specialised technical modules to group and individual projects.</p>
Assessment Strategy
<p>Key skills are primarily assessed through practical work (D1-D6). D1 is assessed by means of student presentations following practical work involving research and literature review, in the group and individual projects. D2 and D3 are assessed via reports submitted as parts of coursework and project work, including a specific research skill module, as well as the final dissertation. D4-D6 is assessed primarily via observation of teams during the group project. D5 and D6 are additionally assessed by observation during the individual project.</p>

12 Programme Curriculum, Structure and Features

Basic structure of the programme

The programme is studied over one year full time, or two years part time. There is a single stage to the programme, requiring the study of 180 credits. A 10 credit module consists of 100 hours of student effort, covering lectures, practical classes, small group teaching and private study, completion of coursework and revision. Most modules vary in size from 5 credits to 15 credits. There is one 90-credit module containing the individual project.

The programme is divided into three phases. Phase 1 lays foundations in the principles of computer security and resilience (A1, A3, A4) and follows this with material on specialist sub-disciplines which develop core technical knowledge (A1-A6) and also introduce professional (A7) and subject-specific skills through their practical and coursework components (B2-B8). This phase is composed of six 10-credit modules in Semester 1. Phase 2 integrates the material covered in the sub-disciplines by exploring and assessing the security of complex systems, including social and technical elements. Some practice-related knowledge is introduced at this stage (A7,A8) but the emphasis is on developing professional and cognitive skills. Design and dependability evaluation skills are developed in a module focussed on security analysis of complex systems (B2-B4) while essential research and communication skills (C1, D1-D3) are explicitly developed in a seminar-based module on topics of current research interest with a strong international emphasis (A9). A group project module is a major way of developing professional skills in development and evaluation (B3-B5, B7, B8) and cognitive skills relating to design and tools selection (C2-C4). Team working skills (D4) are explicitly developed. Other key skills in communication are developed through oral and written reporting (D1, D2) on planning and design activities in the project (D5, D6). This phase is composed of 30 credits in three modules in Semester 2.

Phase 3 of the programme emphasises research skills, creativity and management of independent work through a substantive research-related project selected by the student in consultation with an academic supervisor. It consists of an initial phase in which students are given further training in cognitive and key skills (C1, D2, D3, D6) essential to the management of an individual research-related project, culminating the production of an assessed research proposal. The execution of the project concentrates on the development of specific subject skills in the chosen project area (B1, B4, B7, B8), higher cognitive and key skills (C2, C3, C4, D2, D5, D6). This phase commences in Semester 2 and carries on to the end of the programme.

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

Subject to agreement with industry, the project work can be undertaken with a sponsoring company.
Modules in the first semester are taught in intensive mode.

Programme regulations (link to on-line version)

[-R5144FP](#)

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

The BCS have approved this programme for accreditation for CITP Further Learning Element, CEng/CSci (Partial Fulfilment).

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 programme is provided in:

The University Prospectus : <https://www.ncl.ac.uk/postgraduate/>

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.