



MSc Network Systems

Faculty of Applied Sciences

Department of Computing, Engineering and Technology

PROGRAMME SPECIFICATION

Date of Validation Event:	
Date Approved by QMSC:	

Version History

Please complete each time a new version is drafted e.g.

Version	Occasion of Change	Change Author	Last Modified
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Guidance notes are in italics and should be deleted from any completed programme specification

1. Core information

Programme Title: Network Systems
Target award: MSc Network Systems
Interim or exit awards: Postgraduate Certificate Computing
Postgraduate Diploma Network Systems

Awarding body: University of Sunderland

Programme Assessment Board: Postgraduate Computing

QAA Subject Benchmark(s) Applicable: Computing
(<http://www.qaa.ac.uk/academicinfrastructure/benchmark/statements/computing07.asp>)

Accrediting Body / Bodies (if applicable): None

Other Points of Reference:

QAA Framework for Higher Education Qualifications (NB Level 4 covers postgraduate awards)

<http://www.qaa.ac.uk/academicinfrastructure/FHEQ/EWNI/default.asp>

NICATS level descriptors (NB Level 7 is the equivalent of taught postgraduate study)

http://www.nicats.ac.uk/doc/scr_prnc_guide.pdf

National credit guidelines

http://www.universitiesuk.ac.uk/Publications/Documents/Burgess_credit_report.pdf

University of Sunderland credit framework and regulations

<https://docushare.sunderland.ac.uk/docushare/dsweb/Get/Document-4773/AQH-F1-2++Postgraduate+New+Regulations+2009-10.pdf>

Collaborative partners and models of collaboration, if applicable: None

Modes of delivery and duration:

	Tick all that apply	Min number of years	Max number of years	Intake dates (months)	Any other issues
Full-time	✓	1	3		
Part-time	✓	3	9		
Sandwich					
Off-campus					
On-campus	✓			October & February	
Distance learning					
Work-based learning					
Collaborative					

2. Aims of the Programme

This M.Sc. programme is designed to provide computing, engineering and IT graduates with advanced skills and knowledge in the application of Network Systems Technology. The aim of the programme is to provide a postgraduate programme of study that will:

- Enable students to make critical assessments of network technology and its application.
- Furnish students with the skills necessary to contribute effectively, at a high level, to the design and implementation of a systematic and professional approach to Network Systems development.
- Enable students to identify the appropriate role of Network Systems in the development and implementation of IT strategies.
- Furnish students with the skills and knowledge necessary to make a significant contribution to research in the field of Networking.

3. Learning Outcomes of the Programme

3.1 Postgraduate Certificate in Computing (Stage 1)

In order to be awarded a *Postgraduate Certificate in Computing* the student will have met the following learning outcomes which are common across all postgraduate awards within the department:

Knowledge and Understanding

	Students will have demonstrated:
K1	A thorough appraisal and understanding of the current methods and concepts at the forefront of the academic discipline
K2	A thorough critical understanding of a key aspect of the academic discipline
K3	A critical understanding of the application of appropriate research techniques

Intellectual, Practical and Transferable skills

	Students will have demonstrated the ability to:
S1	Independently and objectively, critically review, consolidate and extend their knowledge to produce a systematic and coherent body of information
S2	The ability to work independently and make objective decisions relating to complex problems

3.2 Postgraduate Diploma Network Systems (Stage 2)

In order to be awarded a *Postgraduate Diploma in Network Systems* the student will have achieved the learning outcomes for the Certificate (stage 1) and in addition will have met the following additional learning outcomes:

Knowledge and Understanding

	Students will have demonstrated:
K4	A comprehensive understanding of the core protocols and technologies that are essential elements of network infrastructure.
K5	A comprehensive understanding of the core protocols and services that are an essential element of a client/server network
K6	A critical understanding of the advanced technologies and protocols used to implement a variety of specialist network services.
K7	Knowledge of the techno economic issues relating to Network Systems, including the use of virtualisation and cloud services to reduce costs and extend services.
K8	A critical understanding of network design practises.

Intellectual, Practical and Transferable skills

	Students will have demonstrated the ability to:
S3	The ability to deploy and test a range of network services across an existing network infrastructure.
S4	The ability to design a complex network system that integrates a range of technologies, protocols and services.
S5	The ability to create a complex network system that integrates a range of technologies, protocols and services from design documentation.
S6	The ability to assess network security risks and select, deploy and test suitable security protocols and technologies to protect network services.

3.3 MSc in Network Systems (Stage 3)

In order to be awarded a Master of Science in Network Systems the student will have achieved the learning outcomes for both the Certificate (stage 1) and Diploma (Stage 2) in addition to the following:

Knowledge and Understanding

	Students will have demonstrated:
K9	An understanding and critical awareness of project management concepts and techniques, including the use of advanced tools for the management of projects.
K10	Advanced knowledge in a highly specialised area in the discipline of network systems, via an individual project.

Intellectual, Practical and Transferable skills

	Students will have the ability to:
S7	Design and undertake independently, a major original research project on a topic which relates to the forefront of the academic discipline of network systems and reflect extensively and objectively on method, process and outcomes.
S8	Independently conduct research or advanced technical or professional activity in the area of network systems demonstrating self-direction and originality in tackling and solving problems, and critically evaluate sources.
S9	Deal with complex issues in network systems both systematically and creatively, make informed judgements in the absence of complete data, and communicate their conclusions clearly to specialist and non-specialist audiences.

4. Programme Structure and Content

Modules

Code	Module Title	Size
CETM11	Research Skills and Academic Literacy	15
CITM15	Network Infrastructure	30
CITM17	Client/Server Networking	15
CITM18	Virtualisation and Cloud Computing	15
CITM16	Network Design	15
CITM13	Digital Telephony	15
CITM14	Network Security	15
PROM01	Project	60

A detailed list of modules can be found in Appendix 1.

Programme regulations

The programme operates under University of Sunderland standard postgraduate regulations.

Programme Content

MSc Network Systems has been designed to enhance the skills and career opportunities of those students with existing qualifications in a science or engineering discipline. It aims to provide graduates with a sound understanding of how to design and deploy complex networks and network services. The modules have been carefully selected to provide a balanced approach to the design implementation and management of network devices, protocols and services. In addition, close attention has been given to ensuring that the curriculum is at the forefront of the academic discipline and clearly at “M” level in line with QAA framework benchmarks for postgraduate qualifications.

A generic award of a Postgraduate Certificate in Computing is available for those students who gain a minimum of 60 M-level credits from any of the taught modules within this programme (excluding the project). The second intermediate award of Postgraduate Diploma is available for students who wish to leave the course at the end of the taught component - having gained 120 M-level credits. Students “progress” from PG Certificate through to PG Diploma when they have completed the requisite number of credits.

A brief overview of the module content is given below:

Stage 1 - Postgraduate Certificate (PgC)

CETM11 Research Skills and Academic Literacy

This module is one taken by students on all Masters Programmes. The module is designed to prepare students for two critical activities related to academic discourse that are key requirements at this level: reading effectively and writing critically and effectively. These are key skills that will prepare students for critical reading and writing required not only in the other taught modules of the programme, but also in the 60 credit project module (PROM01) that all students take in the Masters stage of their programme.

CITM17 Client Server Networking

This module covers the design and deployment of a modern client/server network and the core services that are required to operate it.

CITM15 Network Infrastructure

This module examines the role of the networking devices that would be found in a large multi-site network and the core protocols and services that they use. This is a highly practical module and students will be expected to setup a number of prototype networks that utilise a range of routing, switching and wireless devices.

Stage 2 - Postgraduate Diploma (PgD)

CITM16 Network Design

This module looks at current network design strategies that aim to optimise network performance and provide ease of management and scalability. It will focus primarily on larger networks and will cover many design issues that larger networks have to face such as wireless LAN integration and server farm deployment. It will also examine a number of network management protocols and network support protocols that enable key design features to function. There is a significant practical element to this module and students will be expected to build prototype networks that follow good design practises and make use of the management and support protocols that are covered in the lectures.

CITM14 Network Security

This module examines the weaknesses in many of the core protocols and devices found within the modern network. It also considers how these weaknesses may be exploited and how a network engineer may harden the network against attack. Several current security protocols and security devices will be considered. The module will examine current VPN technologies, firewalls, Intrusion prevention and detection systems and edge security. This is a highly practical module and students will be expected to build, secure and defend a number of prototype networks using the University's laboratories.

CITM13 Digital Telephony

This module looks at the design and deployment of a network wide VoIP service. It will consider current best design and deployment practises and will examine the many protocols and issues surrounding the integration of a VoIP service into a network. This will include an examination of Quality of Service. This is a highly practical module so students will be expected to setup several prototype networks and provision them with VoIP and voice mail services in the University's laboratories.

CITM18 Virtualisation and Cloud Services

This module examines the impact of virtualisation and cloud services on modern networks. Students will examine the advantages and challenges that desktop and server virtualisation have brought to networking and the increasing dependence that companies have on cloud services. This module is highly practical so students will be expected to setup prototype networks that make use of both desktop and server virtualisation in the University's laboratories

Masters Stage

The Master's stage of the programme consists of the 60 credit project module PROM01. In this module the student will develop a practical deliverable as well as investigating an area of academic research that informs the practical aspect of the project. Any project will have a real client, who may come from either inside or outside of the institution, and has a need for a real practical deliverable.

Placements, Study Abroad and other work experience opportunities

Opportunities are available to undertake voluntary work through the university's volunteering centre. This can be an opportunity to obtain career-related work experience.

(<http://sls.sunderland.ac.uk/ces/>)

5. Teaching and Learning

Details of the teaching, learning and assessment for each module can be found in Appendix 3.

The general learning, teaching and assessment strategy used within this programme reflects the Faculty standard for postgraduate taught programmes.

The fact that the course is dealing with graduates and educating them to Masters level means that the students are expected, and have the ability, to carry out a significant quantity of unsupervised study. This may take the form of directed reading of research papers and advanced technical material or practical work on various software problems and packages.

The objective of the students-staff contact time is to set milestones and learning goals, and make new ideas and concepts accessible to the students. These ideas are then followed up in tutorials and in the students' own time. Tutorials are used within each module to provide support for lectures. The prime objectives of tutorial time are to allow in depth study of particular topics that have been introduced and also for practical exercises. A practical tutorial group will normally consist of about 20 students. As well as requiring a significant amount of individual study, the course also encourages group working. This is in recognition of the fact that a graduate of the course will, normally be employed in environments where significant demands will be made upon his or her ability to cooperate and collaborate with others.

One of the major factors that has influenced the delivery of the curriculum is the use of the university's Virtual Learning Environment (Sunspace). We have a departmental policy of a minimum presence, to ensure that at both a modular and programme level, students have access to staff, module descriptors, handbooks, taught materials, and feedback from Staff Student Consultative Committees (SSCCs) and Boards of Studies.

Negotiated learning is only used within the project module of this programme. In the project module, the negotiation will centre on the terms of reference that the student wishes to propose. A central objective within the terms of reference will be the delivery of the feasibility study or design required by the client. However, the route by which this is achieved, and the topic and scope of the research that will interlink with it, are decided under negotiation between the student and supervisor (these decisions will be ratified during project reviews).

The Department requires that student feedback on all modules is obtained. Students' views are sought through module questionnaires and by other methods, e.g. nominal feedback technique. Module leaders include a digest of student comments and a summary of their appraisal of the module when completing the Faculty's Module Quality Monitoring Summary (MQMS) form. There is also space on this form for comments from the module teaching team and a summary of student performance. MQMS forms are discussed by the appropriate Module Board. These are incorporated into Faculty's Annual Programme Reports and are retained on file by the Faculty Administrator for forwarding to other Faculty's' Programme Boards.

This feedback, and general student concerns, is discussed at the Board of Studies. Action taken (or planned to be taken) as the result of these discussions MUST be communicated back to students by the Student Representative on the Board of Studies and this feedback is formally documented. In addition the Programme Leader will hold meetings with the students on the programme at various times throughout the year in order to inform them about such actions. Assignments are expected to be marked and returned with adequate comments for students to understand why they have been given the mark they have, and what they have to do to improve

their performance. In addition the University standard is that all assignments should be marked and returned within 4 working weeks of submission for on-campus students and 5 weeks for off-campus students.

6. Assessment

See teaching, learning and assessment matrix, Appendix 3

The assessment throughout this programme is a mixture of methods appropriate to the modules under study. Each assessed 15 credit module will typically have no more than two items of assessed coursework, while each assessed 30 credit module will typically have three assessments as a maximum.

The students experience a diverse range of assessment strategies across the programme, enabling them to display various skills associated with Masters level learning. This will include research papers, case study analysis, practical assessment, system analysis/evaluation, formal paper reviews, and presentation. The assessment strategies chosen within each module are appropriate to the content and style of delivery and have been further selected in order to provide a rich mixture of diverse assessment strategies while ensuring that module aims and objectives can be accurately assessed.

While it would appear that the majority of assessment undertaken is that of an individual assignment it is important to note that there is a rich and wide diversity of different approach of this assessment within the modules on the programme. Individual assignments include different forms of assessment strategies. The CETM11 (Research Skills and Academic Literacy module) is assessed by a portfolio which includes a comparative review of two published research papers, and a research report where the students establish a research question and produce an abstract, introduction and outline methodology for an experiment relevant to the programme. Formative assessment is an important part of this module and includes an element whereby the students critically evaluate each other's work. CITM16 (Network Design) requires the students to write two technical reports while CITM13 (Digital Telephony) and CITM14 (Network Security) use a blend of written and time constrained practical assessments.

Finally, the project module PROM01 encompasses a wide range of assessment styles whereby students produce a practical deliverable for a real client, a substantial and methodical research report which informs development of the practical deliverable, a thorough evaluation of all stages of the project, and documentation evidencing project management and control of a substantial project.

Although group assessment is not encouraged in the programme, group work is encouraged throughout. For example, group based e-activities will be used in the Research Skills and Academic Literacy module, students will design and build networks in groups in the Network Infrastructure module and students will experience working in a team environment in the Network Security module

The departments approach to teaching, learning and assessment is that we should support the objectives set out in the University's Academic Quality Handbook. To this end, the department has agreed a set of learning, teaching and assessment principles at the programme level which directly supports the University strategy. Each programme should demonstrate whether and how each of these principles is addressed. Put simply therefore, the learning, teaching and assessment strategy for a programme is the manner by which these principles are addressed. The principles are listed below:

- The development and assessment of postgraduate intellectual skills: research skills, gathering and using information, synthesising information/data, applying methodologies, applying concepts, creating new concepts/ideas/products, analysing and evaluating, critical reasoning, information retrieval skills
- The development of learning/study skills with students taking responsibility for their own learning. This includes awareness of assessment honesty issues such as plagiarism
- The development and assessment of employability and enterprise skills including work-based learning and adherence to the University Careers Education and Information Guidance Policy
- An appropriate balance and variety of teaching, learning and assessment approaches, subject to the prevailing standards.
- The requirements of professional bodies including ethics and professionalism
- The use of on-line learning environments (e.g. SunSpace)
- The use of negotiated learning
- The use of flexible learning materials
- The integration of teaching, research and reach out
- Equal opportunities and widening participation
- Student feedback
- Comparability between on and off-campus provision

Many of the principles are addressed separately in other parts of this programme specification but this section will tie them together so that the strategy is clear and coherent rather than fragmented.

From the start, it was decided that these principles would form an integral part of the design process for this programmes. As a result, they have heavily influenced the design of the curriculum itself as well as the way the curriculum will be delivered. In both the design and delivery, attention has been paid to building on our strengths as well as addressing weaknesses or omissions which have come to light either through experience or the desire to adopt new ideas and initiatives.

Assessment criteria for the programme are detailed in Appendix 4

7. Student Support and Guidance

The overall strategy for support and guidance is three-pronged: accessibility to staff and resources; provision of relevant and reliable information and operation of a responsive system for managing problems as they arise.

Support and guidance is offered to students through a comprehensive set of mechanisms. All new students are given a week-long induction programme during which time they are exposed to various aspects of student academic life and much information on the University and its Services, the Department and their chosen programme of study. They are provided with programme information, talks by programme and module staff, library visits, talks by representatives from Student Services, the Student's Union, the Charter Office and the Careers Office.

All students have access to their Programme and Module Leaders as appointments can be made with staff. Students' problems generally will be dealt with through the Programme Leader. The students also have representation on the Boards of Studies. Programme Leaders meet regularly (normally every two weeks) with their tutees as a whole group to take soundings and obtain feedback on various issues. Additionally staff will take care to talk to students individually to provide important academic guidance.

Library facilities for students are provided across both campuses and offer an innovative learning environment, an electronic environment that offers access to CD-ROM, the campus network and the Internet, and areas for group and individual study. A summary of the major features of the Web provision, which will be available to the students, is given below:

- A complete staff list, telephone numbers, Email addresses and module responsibilities;
- A complete list of Department programmes, modules with links to programme structures and module descriptors;
- A generic student handbook including links to Department home pages, University sites e.g. Student Services, Careers, Information Services, Campus maps and various Department and University policy documents e.g. rules on cheating and collusion, the Modular Credit Scheme and Teaching & Learning policies;
- Health & Safety advice.
- The use of the University's Virtual Learning Environment to act as a student support and feedback mechanism.

All students have access to a personal tutor. At postgraduate level the students' personal tutor is their programme leader. Students can request to speak to their programme leader in confidence regarding any personal issues. In the case where a student for example would feel uncomfortable speaking with their programme leader (for example a female student may wish to speak with a female member of staff) then the programme leader will attempt to arrange for the student requests to be met as soon as possible.

All on-campus students have access to the University's central support services including Counselling, Disability Service, Health and Well-being, Chaplaincy, financial support and advice, International Office and Careers and Employability Service. The Students' Union provides an independent service which offers advice and support across the full range of personal and academic problems which students may encounter. Students wishing to lodge a complaint or an appeal can seek advice from the Students' Union or from Academic Services. Full details of all these services can be found on the University's web-site. Where appropriate, academic or support staff in the Faculty will sign-post students to these specialist services.

International Student Support

International students now form the basis of over 50% of our postgraduate students and projections suggest that this is likely to increase further over the next few years. With this in mind both the University and the Department are dedicated to ensuring that International students have the best possible support when deciding to study at Sunderland. The Centre of International Education (CIE) is responsible for providing the majority of the pre-arrival support that International students require. After arrival at the University CIE:

- Provide a registration/advice day exclusively for international students;
- Provide a choice of international student induction meetings designed to complement the Department based induction programme (this takes place in conjunction with the standard Department postgraduate induction week);
- Provide a choice of 'drop in' question and answer sessions to help with any problems you may have.

On-going support is provided with CIE and the Department and Computing, Engineering and Technology. During your time at the University we will:

- Provide International Student Support within the Centre for International Education with a fast appointment system;
- Provide access to Accommodation, Counselling, Financial Counselling, Careers, Chaplaincy and Health Care support;
- Advise students with disabilities or learning difficulties;
- Provide a comprehensive English language programme;
- Advise students on study skills, library and IT facilities.

Furthermore, a close liaison between the Department and CIE insures that all international students are well supported. In 2004 CIE held a University conference where best practice for the support of International students across the University was debated. In addition advice on supporting and teaching international students is being formulated from research work undertaken

and being fed through to postgraduate teaching teams, where the number of international students within cohorts is now predominant.

Furthermore, within the Department of Computing, Engineering and Technology a weekly international student forum is conducted which supports international students and provides study advice and pastoral support. This has proven to be very successful with international students and is now an integral part of the induction phase and timetable.

All on-campus students have access to the University's central support services including Counselling, Disability Service, Health and Well-being, Chaplaincy, financial support and advice, International Office and Careers and Employability Service. The Students' Union provides an independent service that offers advice and support across the full range of personal and academic problems that students may encounter. Students wishing to lodge a complaint or an appeal can seek advice from the Students' Union or from Academic Services. Full details of all these services can be found on the University's web site. Where appropriate, academic or support staff in the Faculty will signpost students to these specialist services.

8. Admissions

Entry point (delete those not required)	Standard entry requirements ¹	Entry with advanced standing ²	Other ³
Level 7 (Masters awards) – start of programme	An honours degree (2:2 or above) or equivalent in a computing, IT or engineering discipline	Not applicable	
Level 7 (Masters awards) – after Certificate phase	Not applicable	In line with University of Sunderland regulations	
Level 7 (Masters awards) – after Diploma phase	Not applicable	In line with University of Sunderland regulations	

Applicants whose first language is other than English must fulfil the University's minimum language skills requirement through one of the accepted mechanisms.

9. Programme Management and Quality Assurance

The programme is managed and quality assured through the University's standard processes. A Module Studies Board oversees modules and each year each module leader provides a brief report on the delivery of the module, identifying strengths and areas for development. The Programme Studies Board, which includes module leaders, student representatives and, where applicable, typical employers, is responsible for the programme as a whole, ensuring the coherence of the programme overall, its currency, progression, and alignment between the learning outcomes and modes of teaching, learning and assessment. Student achievement, including progression between levels and degree classification, is kept under review. The programme is reviewed annually and a report is sent to the Faculty Quality Management Sub-Committee, which in turn reports issues to Academic Board via the University's Quality Management Sub-Committee (QMSC) and Academic Experience Committee (AEC).

External examiners are appointed to oversee and advise on the assessment of the programme. They verify the comparability of the standards of the programme with the standards of similar programmes elsewhere in the UK and the quality of the assessment process. They are also invited to comment on proposed developments to the programme. Their reports are sent to the DVC (Academic) as well as to the Faculty; he requires a report from the Faculty on any major issues of concern raised by the external examiner.

The University reviews all programmes on a six-yearly cycle to identify good practice and areas for enhancement. Programmes are revalidated through this review process. These reviews include at least one academic specialist in the subject area concerned from another UK HEI.

Students' views are sought through module questionnaires and by other methods. The feedback informs module leaders' annual reports on their modules. Students are represented on the Programme and Module Studies Boards; in the former they are involved in discussion of external examiners' reports

10. Learning Environment and Resources

In terms of our teaching staff, the module leaders have been chosen with regard to their expertise in the subject area and in many cases they, and their teaching team, are working on relevant research and/or reach-out projects. This enables staff to practice research informed teaching thus providing students with an appreciation of relevant research themes, an idea of where and how the subject is developing in the future and, in many cases, “real world” case studies. External speakers are solicited from collaborating companies and our own recent graduates in order to provide students with access to relevant practitioners who can provide industrial context.

The list of module leaders involved in the delivery of this programme can be seen in Appendix 2.

The Department makes full use of the University’s Virtual Learning Environment (SunSpace) and our strategy is for every module and programme to have an online presence.

Key features of our current SunSpace provision include:

- Complete staff list, telephone numbers, Email addresses and module responsibilities;
- Complete list of Department modules with links to detailed module descriptors and, in many cases, extensive on-line learning resources;
- General student handbook including links to Department home pages, University sites e.g. Student Services, Careers and Employability Service, Information Services, Campus maps and various Department and University policy documents e.g. rules on cheating and collusion, the Modular Credit Scheme and Teaching & Learning policies;
- Department/Programme/Module timetables
- Department Standards
- A Code of Conduct for Use of the Computing Terraces
- Health & Safety advice
- Information about the Department’s research activities

Library facilities available at St Peters include a dedicated computing subject collection, a comprehensive range of electronic resources, open access areas for group and individual study, and dissertations / research working papers from the department are also housed in the library.

The Learning Resource Centre for St Peter’s Campus is situated in the Prospect building adjacent to the Dept. of Computing, Engineering and Technology. This provides a wide range of facilities including document scanning, laser and colour printing, photocopying and self-study space for the consultation of reference sources. The Learning Resource Centre also operates a hand-in and receipting service for the physical submission of assignments.

Specialist Resources

All students in the Department are provided with access to one of the most modern and best equipped computing environments in the UK. The David Goldman Informatics Centre features an open plan area made up of terraces which contain nearly 250 workstations comprising PCs and MACs. The computers on the terraces are installed with all the necessary software packages required and are available to the students on an open access basis 7:00am until 9:00pm weekdays. 24 hour computing facilities are available at the Murray Library and, in addition, the Remote Global Desktop Service means that students can access the full range of software required for their course remotely from their own home.

In support of independent study, students are provided free access to the Internet for their PDA's and laptops via a university wide wireless network and a number of designated areas with open-access wired networking points. A range of free software is also made available to students through volume licensing with partners such as Adobe, Symantec, Microsoft and Cisco. Premium titles such as Windows 8, MS PowerPoint, MS Project, Visio, Visual Studio and Adobe CS3 Web Standard are available free of charge to all students in the Department for the duration of their studies.

Beyond the terraces the department has a range of computing laboratories where specialised equipment is made available to students as required:

- The department has three dedicated networking laboratories (DG220, DG214 and RV208) each of which feature enough networking equipment to host up to 25 students. Each laboratory contains a range of routing, switching, firewall and wireless networking devices. We also have the equipment and licenses necessary to operate our own public GSM mobile cellular network.
- We host a small electronics laboratory where groups of up to 12 students can undertake practical classes in low level electronics. The lab features a number of high bandwidth oscilloscopes as well as function boards and signal generators suitable for teaching the electronic principles underpinning a range of computing and telecommunications subjects.
- Our robotics and mechatronics laboratories feature several programmable robots ranging from articulated robotic arms through to mobile autonomous robots such as the Khepra, Sony Aibo Dog and People Bots.
- The department hosts two high performance computing platforms (a high bandwidth Beowulf cluster and a commodity GRID computer) available to both students and researchers to carry out complex computational tasks such as distributed systems, parallel processing, and 3D rendering.
- The Software Hatchery is supported by the Sunderland Software City initiative and provides dedicated rooming and facilities to host any entrepreneurial activity. Students with business ideas can become resident in the hatchery as they attempt to grow from an idea to a fully formed business.

- We have established a forensics laboratory to support our new developments in that area. The department has purchased a number of NIST certified Write Blockers as well as several Mobile Phone forensics toolkits. In addition, we have licensed industry standard software such as ENCASE and FTK.

Research & Consultancy Activity underpinning programme

The Digital Innovation Beacon has four strands of research, each of these draws from a number of areas both within and beyond dCET(as illustrated in the diagrams below).Drawing our research together under these strands allows us to clearly identify the ways in which clusters of researchers bring their different subject expertise together to tackle a range of interesting research problems in the digital economy. Moreover, it is also a risk mitigation strategy since it enables subject specific expertise to develop (and fade away) while still leaving robust strands of research.

The strands are:

- Big Data - which focuses on novel techniques for managing and discovering knowledge in enormous data sets.
- Technology-Enhanced Living – which focuses on effectively incorporating technology into all aspects of everyday-life and evaluating the impact of digital technologies at a personal level.
- Informatics for Business and Manufacturing –which focuses on digital technology use within organisations to support business and manufacturing innovation and enable new business models.
- Energy Efficient and Safe Vehicles - which focuses on the complementary areas of energy efficient vehicles and vehicle safety (including vehicle-human interactions and vehicle crashworthiness).

Big Data is predominantly focused on research within the computing domain whilst Energy Efficient and Safe Vehicles is within the engineering domain. Technology-Enhanced Living and Informatics for Business and Manufacturing are clearly multi-disciplinary (drawing from subject expertise in computing, psychology and engineering).

Research activity has received considerable support from the University in recent years and the department was returned in the 2008 RAE under UoA23. Our submission was judged to contain extensive evidence of outstanding research impact in terms of academic recognition and collaboration, wealth creation, quality of life, knowledge transfer, industrial collaboration, and public awareness and understanding.

The Faculty of Applied Science in general and the Department in particular is committed to the close coupling of research and teaching activities so that our research underpins the teaching we deliver. Some exemplars from recent years include:

Industrial Engagement: Reach-out work with Sage has led directly to the production of teaching materials and case studies for our level 3 students. Engagement with a local SME has resulted in students contributing to the design and development of an M-Commerce platform. Our collaborative research involves over 150 industrial collaborators and informs the design and development of our curriculum.

Student Engagement: We have a proud history of direct involvement from our students within our research activities. Stage 3 projects are actively sourced from our four research areas and recent publications have featured project work undertaken by stage 2 and 3 students who have been included as named authors.

Research in Teaching: Research active staff are involved in the delivery of teaching across the complete range of our programmes. We actively map teaching teams to modules based on the relevance of their current activities and previous experience. The resulting cross-fertilisation of research and teaching means that our modules remain current in a rapidly developing field.

Appendix 1



QUICK REFERENCE

Panel: External Internal

Programme: New Review Title Change

SITS SUMMARY PROGRAMME/SHORT COURSE DETAILS

(Form to be completed electronically by the Faculty and forwarded to the QAE Quality Officer supporting the Approval event, or sent to MISD for faculty devolved processes before sending to QAE)

PROGRAMME/SUBJECT/SHORT COURSE DETAILS	
Exit Award: Title of programme/award	MSc Network Systems
<i>If replacement for existing, specify title of old</i>	
Faculty(ies):	Applied Sciences
Department:	Computing, Engineering and Technology
SITS Programme/Short Course code ¹	
Programme Studies Board ²	Postgraduate Computing
UCAS code ³ (if applicable). If other please state method.	N/A
JACS code ⁴	N/A
Qualification Level / Qualification Aim	MSc

¹ To be allocated in consultation with MISD team in Planning and Finance

² Programme Studies/Assessment Board that will have management responsibilities for the programme.

³ Please contact Admissions Manager for code

⁴ JACS code = e.g. (V1) History, (G5) Computing Science, etc. for information contact relevant Faculty Associate Dean (See QAA Website http://www.qaa.ac.uk/WorkWithUs/Documents/jacs_codes.pdf)

Modes of delivery and duration:	(delete yes/no as necessary) Full time Yes 14 months Sandwich No Part time Work Based Learning No On-campus Yes Off-campus No
CSP Only. Other subject combinations not allowed with this subject:	
Programme/Subject/Short Course Leader:	David Evans
Date of Approval /Modification/Review	June 2013
Date of next review (QAE to complete)	
Start date of programme/Short Course	October
Number of intakes per annum and likely month(s) intake(s) starts.	Two October and February

FUNDING DETAILS	
Confirm funding arrangements for programme e.g. HEFCE/TDA/NHS/Other ⁵	HEFCE, Band B
If it is TDA, is it primary/secondary/F.E./Other (please state)	
Is the programme Open or Closed ⁶ :	Open

ACCREDITING BODY	None
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PROGRAMME SPECIFIC REGULATIONS	No
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⁵ Please confer with Amanda Watson for funding status for programme

⁶ An Open programme constitutes an open admissions policy. A Closed programme is normally specific to one client only. If in doubt please consult Academic Services or Planning and Finance.

COLLABORATIVE: Please complete details	UK No
	Overseas Yes

Institution	Collaborative model ⁷	Funding arrangements ⁸
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INTERIM AWARD SCHEDULE

Interim award title	Credits required	Interim structure
Postgraduate Certificate in Computing	60	Any 60 M level Credits from CETM11, CITM15, CITM16, CITM17,CITM18, CITM13, CITM14
Postgraduate Diploma of Higher Education in Network Systems	120	Any 120 M level Credits from CETM11, CITM15, CITM16, CITM17,CITM18, CITM13, CITM14

DETAILS SUPPLIED BY: **DATE:**

For QAE use only: Circulation list: Quality Assurance & Enhancement (files), MISD (J Ruffell, L Warner), Admissions (E Wilson), Recruitment (Les Brown, Catryn Davies), Student Office (L Dixon), Planning (Laura Anderson), Learning Development Services (Malcolm Creen) Central Timetabling (Alison McMahan) + **for collaborative programmes:** Partnership Office Carole Green, Marketing and Recruitment (Judith Green)

⁷ As per QAE guidelines

⁸ Please contact Amanda Watson for confirmation of funding details

Module List

Award, Route (if applicable) and Level	(N/E/MM)	Module Title	Module Code	Module Credit Value	Whether core or option	Must choose (ie designated option):	Assessment weighting – give % weight for <i>each assessment item</i>	Pre-/co-requisites	Module leader	Other comment (if required)	Date of Entry on SITS.	JACS Code
PG Cert	E	Research Skills and Academic Literacy	CETM11	15	Core		100% Coursework	None	L. Humphries			
	N	Network Infrastructure	CITM15	30	Core		Coursework 1 (50%) Coursework 2 (50%)	None	D. Evans			
	N	Client/Server Networking	CITM17	15	Core		Coursework (50%) Practical TCT (50%)	None	R. Warrender			
PG Dip	N	Virtualisation and Cloud Computing	CITM18	15	Core		Coursework (50%) Exam (50%)	None	M. Lawrence			
	N	Network Design	CITM16	15	Core		Coursework 1 (50%) Coursework 2 (50%)	CITM15	D. Evans			
	E	Digital Telephony	CITM13	15	Core		Coursework 1 (50%) Coursework 2 (50%)	None	P. Irving			
	E	Network Security	CITM14	15	Core		Coursework 1 (50%) Coursework 2 (50%)	None	S. Swales			
MSc	E	Project	PROM01	60	Core		Dissertation (20%) Research (30%) Success & Evaluation (30%) Planning 10% Viva (10%)	None	D. Nelson			

PROGRAMME REGULATIONS

Name of programme: *Network Systems*

Title of final award: *MSc Network Systems*

Interim awards⁹: *Postgraduate Certificate in Computing; Postgraduate Diploma in Network Systems*

Accreditation: *None*

University Regulation: 4.2.1 - The overall pass mark for each module is 40%. To pass a module a student must also have submitted work for each element of assessment.

Stage 1 - PG Certificate**Core modules:**

Code	Title	Credits
CETM11	Research Skills and Academic Literacy	15
CITM15	Network Infrastructure	30
CITM17	Client/Server Networking	15

Optional Modules:

None

Progression Regulations

There are no programme-specific progression regulations

Stage 2 – PG Diploma**Core modules:**

Code	Title	Credits
CITM13	Digital Telephony	15
CITM14	Network Security	15
CITM18	Virtualisation & Cloud Computing	15
CITM16	Network Design	15

⁹ Same as main award unless agreed otherwise at validation – eg to meet PSRB requirements
MSc Network Systems Programme Specification March 2013.docx, V5

Optional Modules:

None

Progression Regulations

There are no programme-specific progression regulations

Stage 3 - MSc**Core modules**

Code	Title	Credits
PROM01	Project	60

Optional Modules:

None

Progression Regulations

There are no programme-specific progression regulations

PG Certificate / Diploma Stage – Teaching & Learning and Assessment

Module Title	Code	Core/ Option	Modes of T&L	Modes of Assessment
Research Skills and Academic Literacy	CETM11	Core	Lecture / Tutorial, Case Studies, Group Work, Presentation, Directed Reading	Individual Coursework
Network Infrastructure	CITM15	Core	Lecture, Group Work, Practical / Tutorial, Directed Reading	Individual Coursework & Practical Assessment
Client/Server Networking	CITM17	Core	Lecture, Practical / Tutorial, Directed Reading	Individual Coursework
Virtualisation and Cloud Computing	CITM18	Core	Lecture, Practical / Tutorial, Directed Reading	Individual Coursework & Exam
Network Design	CITM16	Core	Lecture, Group Work, Practical / Tutorial, Directed Reading	Individual Coursework
Digital Telephony	CITM13	Core	Lecture, Group Work, Practical / Tutorial, Directed Reading	Individual Coursework & Practical Assessment
Network Security	CITM14	Core	Lecture, Group Work, Practical / Tutorial, Directed Reading	Individual Coursework & Practical Assessment

MSc Stage – Teaching & Learning and Assessment

Module Title	Code	Core/ Option	Modes of T&L	Modes of Assessment
Project	PROM01	Core	Lecture Directed Reading	Dissertation Reviews

Modules - Learning Outcomes Knowledge

Module Title	Code	K1	K2	K3	K4	K5	K6	K7	K8	K9	K10
Research Skills and Academic Literacy	CETM11		TA	TA							
Network Infrastructure	CITM15	TA	TA		TA	D					
Client/Server Networking	CITM17	TA	TA		D	TA	TA	D	D		
Virtualisation and Cloud Computing	CITM18	TA	TA	DA	TA	DA	TA	TA	DA		
Network Design	CITM16	TA	TA		D		TA	D	TA		
Digital Telephony	CITM13	TA	TA		TA		TA	D			
Network Security	CITM14	TA	TA		TA		TA				
Project	PROM01						A			TA	TA

T = Taught, A = Assessed, D = Developed

Modules - Learning Outcomes Skills

Module Title	Code	S1	S2	S3	S4	S5	S6	S7	S8	S9
Research Skills and Academic Literacy	CETM11	TA	TA							
Network Infrastructure	CITM15	TA	TA	D		D				
Client/Server Networking	CITM17	TA	TA	D	D	D	D			
Virtualisation and Cloud Computing	CITM18	TA	TA	TA	TA	D	D			
Network Design	CITM16	TA	TA	D	TA	D	D			
Digital Telephony	CITM13	TA	TA	TA	TA	TA				
Network Security	CITM14	TA	TA	TA	DA	TA	TA			
Project	PROM01	A						TA	TA	TA

T = Taught, A = Assessed, D = Developed

Postgraduate Assessment Criteria

Appendix 4

		Categories						
Grade	Relevance	Knowledge	Analysis	Argument and Structure	Critical Evaluation	Presentation	Reference to Literature	
Pass	86 – 100%	The work examined is exemplary and provides clear evidence of a complete grasp of the knowledge, understanding and skills appropriate to the Level of the qualification. There is also ample excellent evidence showing that all the learning outcomes and responsibilities appropriate to that Level are fully satisfied. At this level it is expected that the work will be exemplary in all the categories cited above. It will demonstrate a particularly compelling evaluation, originality, and elegance of argument, interpretation or discourse.						
	76-85%	The work examined is outstanding and demonstrates comprehensive knowledge, understanding and skills appropriate to the Level of the qualification. There is also excellent evidence showing that all the learning outcomes and responsibilities appropriate to that level are fully satisfied. At this level it is expected that the work will be outstanding in the majority of the categories cited above or by demonstrating particularly compelling evaluation and elegance of argument, interpretation or discourse.						
	70 – 75%	The work examined is excellent and is evidence of comprehensive knowledge, understanding and skills appropriate to the Level of the qualification. There is also excellent evidence showing that all the learning outcomes and responsibilities appropriate to that level are satisfied. At this level it is expected that the work will be excellent in the majority of the categories cited above or by demonstrating particularly compelling evaluation and elegance of argument, interpretation or discourse.						
	60 – 69%	Directly relevant to the requirements of the assessment	A substantial knowledge of relevant material, showing a clear grasp of themes, questions and issues therein	Comprehensive analysis - clear and orderly presentation	Well supported, focussed argument which is clear and logically structured.	Contains distinctive or independent thinking; and begins to formulate an independent position in relation to theory and/or practice.	Well written, with standard spelling and grammar, in a readable style with acceptable format	Critical appraisal of up-to-date and/or appropriate literature. Recognition of different perspectives. Very good use of a wide range of sophisticated source material.
	50 – 59%	Some attempt to address the requirements of the assessment: may drift away from this in less focused passages	Adequate knowledge of a fair range of relevant material, with intermittent evidence of an appreciation of its significance	Significant analytical treatment which has a clear purpose	Generally coherent and logically structured, using an appropriate mode of argument and/or theoretical mode(s)	May contain some distinctive or independent thinking; may begin to formulate an independent position in relation to theory and/or practice.	Competently written, with only minor lapses from standard grammar, with acceptable format	Uses a good variety of literature which includes recent texts and/or appropriate literature, including a substantive amount beyond library texts. Competent use of source material.
Fail	40 – 49%	Some correlation with the requirements of the assessment but there is a significant degree of irrelevance	Basic understanding of the subject but addressing a limited range of material	Some analytical treatment, but may be prone to description, or to narrative, which lacks clear analytical purpose	Some attempt to construct a coherent argument, but may suffer loss of focus/consistency, with issues stated only vaguely, or theoretical mode(s) couched in simplistic terms	Sound work which expresses a coherent position only in broad terms and in uncritical conformity to one or more standard views of the topic	A simple basic style but with significant deficiencies in expression or format that may pose obstacles for the reader	Evidence of use of appropriate literature which goes beyond that referred to by the tutor. Frequently only uses a single source to support a point. Weak use of quotation
	35 – 39%	Relevance to the requirements of the assessment may be very intermittent, and may be reduced to its vaguest and least challenging terms	A limited understanding of a narrow range of material	Largely descriptive or narrative, with little evidence of analysis	A basic argument is evident, but mainly supported by assertion and there may be a lack of clarity and coherence	Some evidence of a view starting to be formed but mainly derivative.	Numerous deficiencies in expression and presentation; the writer may achieve clarity (if at all) only by using a simplistic or repetitious style	Barely adequate use of literature. Over reliance on material provided by the tutor.
	30 – 34%	The evidence provided shows that the majority of the learning outcomes and responsibilities appropriate to that Level are satisfied – for compensation consideration.						
	15-29%	The work examined provides insufficient evidence of the knowledge, understanding and skills appropriate to the Level of the qualification. The evidence provided shows that some of the learning outcomes and responsibilities appropriate to that Level are satisfied. The work will be weak in some of the indicators.						
Fail	0-14%	The work examined is unacceptable and provides almost no evidence of the knowledge, understanding and skills appropriate to the Level of the qualification. The evidence fails to show that any of the learning outcomes and responsibilities appropriate to that Level are satisfied. The work will be weak in the majority or all of the indicators.						

