



School of Computing and Information Engineering

PgDip / MSc Telecommunications and Internet Systems

Full-Time 2128/2129

Part-time 2252/2253

Programme Handbook

2010-11

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COURSE COMMITTEE MEMBERSHIP

Name	Post
Prof. David Bustard	Professor of Computing Science Head of the School
Mr Ray Hickey	Lecturer, School of Computing & Information Engineering Course Director
Dr Moira McAlister	Lecturer, School of Computing & Information Engineering Project Co-ordinator
Prof Sally McClean	Professor of Mathematics, School of Computing & Information Engineering
Mr Martin McKinney	Senior Lecturer, School of Computing & Information Engineering Faculty Co-ordinator for Teaching & Learning
Dr Michael McNeill	Senior Lecturer, School of Computing & Information Engineering
Dr Adrian Moore	Lecturer, School of Computing & Information Engineering
Dr Philip Morrow	Senior Lecturer, School of Computing & Information Engineering Head of Research School
Prof Gerard Parr	Professor of Telecommunications Engineering, School of Computing & Information Engineering
Prof Bryan Scotney	Professor of Informatics, School of Computing & Information Engineering Director of Computer Science Research Institute
Dr Marek Scularz	Lecturer, School of Computing & Information Engineering

SECTION A: INTRODUCTION

A1 SUBJECT OVERVIEW

The programme provides an opportunity for advanced study in the area of Telecommunications, particularly in relation to the creation, configuration and management of sophisticated network-based systems. In so doing, it caters for the evolving needs of the Telecommunications industry and the Distributed Applications market sector within Northern Ireland and further afield. Graduates of the programme will be well placed to contribute to the workforces of R&D projects and to embark on research study leading to a PhD.

Evidence of the continuing relevance of the programme is provided in the UK Ofcom Review of the Telecommunications Sector for 2005. Here are to be found details of growth in the converged ICT sectors that relate to digital communications and further plans for high levels of integration between the wireless-mobile and analogue-digital applications domain. This programme has responded to these market needs, some of which are being driven by legislation at the national and EU level as well as the development of Next Generation Networking, led globally by companies such as BT.

The programme receives considerable interest and support from local Telecommunications companies in Northern Ireland. Asidua, for example, sponsor annual prizes for the best Diploma examination result and best MSc project, and have employed several of our best students. They are also involved in defining and supervising MSc projects. CEO, Dr Steve Brankin commented:

“The syllabi look superb, I do wonder how you cover it all!”

Similarly, BT sponsor a prize for best overall performance on the MSc programme and support several projects each year. They comment:

"We are increasingly entering a world where telecoms and computing technologies and skills are merging, indeed we in BT are on the cusp of converting our entire core network infrastructure to an IP based platform, next generation networks (NGN) as it is commonly referred to across the globe.

Many of the challenges this presents us with are embedded and resolved in extensive R&D, however not everything can be tested in the lab and so we remain committed to supporting the opportunity to present and sponsor projects within the Telecoms and Internet Systems MSc. Not only does this provide much needed academic input to key operational issues at a local level but hopefully allows students to connect their study and syllabus to day to day issues and challenges. We look forward to developing further our association and sponsorship of this course."

Other collaborators include Ericsson Research, Ireland and Cisco Systems in San Jose, California and in Galway. Both sponsor research internships that are a good match for the knowledge and skills developed on our programme. Cisco is currently developing into a product the work of one student who completed an internship in 2006. Cisco (Ireland) commented:

“The PgDip/MSc Telecommunications and Internet Systems at UUC, with its stated (educational) objectives, covering the diverse yet totally necessary areas of... Multimedia Web Programming; Networking Systems and Concepts;; Distributed Systems; Research Methods; Internet Application Development; Network Design and Management Intelligent Systems; and also Project Work...seems to be relevant, sensible and useful to the needs of the ICT industry and the course structure would seem to be well designed to provide strong MSc telecom and internet candidates, aware of and trained in the newest, cutting edge technology areas, for the industry in general, and Cisco Voice Technology Group. Such a well developed course structure, depending on the talent of the students and professors involved, also lends itself suitably for closer alliances between the university and industry, such as joint research activities, etc.”

The programme operates as a standard linked Postgraduate Diploma (PgDip) and Masters (MSc). The Diploma comprises eight equally weighted compulsory modules. These cover Network Concepts and Management (3 modules), Distributed Systems, including web-based multimedia (3 modules), Research Methods (which supports the MSc project), and Intelligent Systems (including data mining).

All students take the Diploma initially and if successful may proceed to the project to complete an MSc. They may also exit with a Diploma.

There are no other comparable programmes within Northern Ireland and only a very small number elsewhere in the United Kingdom and Ireland.

Computing background for acceptance

Anyone joining the programme requires a background in computing and must be competent in programming. This includes students recruited from degrees in which computing is only a minor component. Such students generally complete the programme successfully, including two recent students from a *Business with Computing* degree who are currently studying for a PhD. The intention is to continue recruiting from this sector, offering bridging material, as necessary, to cover any gaps in skills or knowledge. This material will mostly be in the form of self-study tutorials.

BCS accreditation

Accredited by the British Computer Society as meeting the educational requirement for CITP Further Learning registration and partially meeting that for CEng and CSci registration.

SECTION B: PROVISION

B1 Programme Specification

- 1 **AWARD INSTITUTION/BODY:** University of Ulster
- 2 **TEACHING INSTITUTION:** University of Ulster
- 3 **LOCATION:** Coleraine
- 4 **ACCREDITED BY:** British Computer Society
- 5 **FINAL AWARD:** PgDip/MSc
- 6 **MODE OF ATTENDANCE:** Full-time or Part-time
- 7 **SPECIALISMS:** Computing Science
- 8 **COURSE/UCAS CODE:** 2128/2129 (Full-time); 2252/2253 (Part-time)
- 9 **DATE REVISED:** 2009/2010

10 EDUCATIONAL AIMS OF THE COURSE

The overall aim of this course is to provide an advanced education in Telecommunications and Internet Systems; to encourage the development of skills and knowledge levels in these technologies; and to make a significant contribution to the pool of professional and technological skills available to support associated industry, teaching and research in Northern Ireland and further afield.

The main objectives of the Diploma course are to:

- § Provide students with an advanced knowledge of Telecommunications and Distributed Systems technologies (including the Internet)
- § Ensure that students can evaluate and appraise the issues which must be addressed when designing and implementing a communications network
- § Investigate management issues and mechanisms that must be deployed in real-time to support relevant digital network topologies
- § Ensure that students can design and construct distributed systems and client-server architectures and can assess their advantages and disadvantages

In addition to these, the main objectives of the Masters course are to:

- § Equip students to plan, execute and report on a research project in a specialism within the field of Telecommunications and Internet Systems, to be presented as a dissertation
- § Allow students to develop sufficient knowledge and research skills within Telecommunications and Internet Systems to enable them to proceed either to an MPhil/PhD research degree or to a professional doctorate in Informatics.

11 MAIN LEARNING OUTCOMES

The following reference points were used to inform the development of the programme and its learning outcomes:

- § The University's Vision and core strategic aims, teaching and learning strategy and policies

- § Draft benchmarking standards for taught Masters in Computing (supported by QAA) at <http://www.comp.leeds.ac.uk/roger/cphc/Masters/BM.pdf>
- § Current research or other advanced scholarship carried out by academic staff
- § Requirements of the British Computer Society
- § National and University qualifications and credit frameworks.

The course provides opportunities for students to achieve and demonstrate the following learning. Successful students will be able to:

11K KNOWLEDGE AND UNDERSTANDING OF SUBJECT

Successful students will be able to:

- K1** Understand and critically assess advanced concepts, principles, practices and methods of evaluation used within the fields of Telecommunications and Distributed Systems (especially the Internet)
- K2** Explain the importance of telecommunications and computer networking as an infrastructural enabler for digital services
- K3** Understand the methodologies underlying the construction, development and deployment of distributed system architectures and applications
- K4** Understand how security in Networks and Distributed systems may be achieved.

Learning and Teaching Methods: Self-directed learning employing study packs and research based materials, on-line discussion boards and tutorials.

Assessment Methods: Written coursework (including project report), presentations, oral examination and written unseen examinations.

11I INTELLECTUAL QUALITIES

A student should be able to:

- I1** Analyze the issues that must be addressed when designing and implementing or modifying a communications network to achieve given requirements
- I2** Design experiments to evaluate and compare aspects of network configuration
- I3** Design distributed applications (including those involving multimedia) to satisfy given requirements
- I4** Research and critically analyse a particular area of Telecommunications or Distributed Systems.
- I5** (Masters only) Specify and execute a research project to investigate a substantial problem within Telecommunications or Distributed Systems.

Learning and Teaching Methods: Self-directed learning employing study packs and research based materials, on-line discussion boards and tutorials.

Assessment Methods: Written coursework (including project report), presentations, oral examination and written unseen examinations.

11P PROFESSIONAL/PRACTICAL SKILLS

A student should be able to:

- P1** Configure or modify a network
- P2** Gather, interpret and present information and statistics related to aspects of network performance
- P3** Carry out experiments and simulations to investigate network activity using an appropriate package
- P4** Implement a distributed system (including those involving multimedia)

Learning and Teaching Methods: Practical exercises involving software tools.

Assessment Methods: Programming-based assignments, use of simulation package, presentations.

11T TRANSFERABLE SKILLS

A student should be able to:

- T1** Organise and communicate ideas, descriptions of systems and experimental results orally and in writing
- T2** Manage time and work within given time scales
- T3** Work independently
- T4** Use ICT effectively.

Learning and Teaching Methods: Self-directed learning employing study packs and research based materials, practical exercises involving software tools, on-line discussion boards and tutorials.

Assessment Methods: Written coursework (including project report), presentations, oral examination and written unseen examinations.

11 PROGRAMME LEARNING OUTCOME MAP

Please note: The matrix displays only the measurable programme outcomes and where these are developed and assessed within the modules offered in the programme.

POSTGRADUATE DIPLOMA

TITLE	CODE	LEVEL	K1	K2	K3	K4	I1	I2	I3	I4	I5	P1	P2	P3	P4	T1	T2	T3	T4
Networking Concepts and Practice	COM880	7	√	√		√	√	√				√	√	√		√	√	√	√
Multimedia Web Development	COM851	7			√				√						√	√	√	√	√
Distributed Systems	COM863	7	√	√	√	√			√						√	√	√	√	√
Distributed Applications Development	COM881	7	√	√	√	√			√						√	√	√	√	√
Broadband Network Protocols and Architectures	COM862	7	√	√			√	√				√	√	√		√	√	√	√
Network Design and Management	COM883	7	√	√		√	√	√				√	√	√		√	√	√	√
Intelligent Systems	COM850	7	√		√	√			√	√			√		√	√	√	√	√
Research Methods	COM853	7								√						√	√	√	√

MASTERS (in addition to those for the DIPLOMA)

Project	COM884	7	√	√						√	√		√	√	√	√	√	√	√
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12 STRUCTURE AND REQUIREMENTS FOR THE AWARD

The Postgraduate Diploma programme consists of eight taught modules providing a total of 120 credits points. The Masters degree consists of the eight modules of the Postgraduate Diploma in addition to a project involving a substantial piece of independent research which utilises the knowledge and skills developed in the Diploma. Collaboration with industry in the course of this research will be encouraged. The project provides 60 credit points giving a total of 180 credit points for the Masters.. Successful completion of the Diploma is required for progression to the Masters. The language of instruction is English,

The modular organisation of the PgDip/MSc course means that it can be taken in either full or part-time mode of study. In full-time mode, study for the Masters is completed in one academic year. In part-time mode the order in which the modules are taken differs from the full-time structure, with the duration of study being relatively flexible to meet the various extraneous commitments of students.

Module Title	Credit Level	Credit Points	Module Status	Awards
Multimedia Web Development	7	15	Compulsory	PgDp (120 points)
Networking Concepts and Practice	7	15	Compulsory	
Broadband Network Protocols and Architectures	7	15	Compulsory	
Distributed Systems	7	15	Compulsory	
Research Methods	7	15	Compulsory	
Distributed Applications Development	7	15	Compulsory	
Network Design and Management	7	15	Compulsory	
Intelligent Systems	7	15	Compulsory	
Project	7	60	Compulsory	MSc (180 points)

13 SUPPORT FOR STUDENTS AND THEIR LEARNING

Students and their learning are supported in a number of ways:

- § Induction sessions to provide advice on the key aspects of the course provision.
- § A Faculty Student Handbook to provide a guide to life as a student within the School of Computing & Information Engineering.
- § A Course Student Handbook to provide all the necessary information about the course.
- § Module Handbooks (electronic or otherwise) to describe the content of each module delivered in a particular year.
- § A Course Director who has responsibility for ensuring the smooth day-to-day operation of the course.
- § An Adviser of Studies is allocated to each student. Advisers of Studies are

members of staff with the responsibility of assisting students in their personal and career development.

§ Personal Development Planning

§ A centralised Accommodation Service that helps new and existing students explore the range of accommodation options available.

§ A centralised Careers Service is available to help students determine their future career and support their applications for employment.

§ A centralised Information Services Department with responsibilities covering library, academic and administrative computing, digital communications, audio-visual services and reprographic services

§ A centralised Student Support Department is available to students who have problems with non-academic aspects of student life.

§ A Sport and Recreation Department

§ An International Office

§ A Students' Union

§ A Chaplaincy

14 CRITERIA FOR ADMISSION

Applicants must hold a degree or equivalent or demonstrate evidence of their ability to undertake the course through the accreditation of prior experiential learning.

Specific requirements for admission are detailed below:

Have gained a degree in Computing Science, or in a related discipline where the degree includes a significant component of Computing Science and be competent programmers in at least one high-level programming language, preferably Java.

15 EVALUATING AND IMPROVING THE QUALITY AND STANDARD OF LEARNING AND TEACHING

Mechanisms for review and evaluation of teaching, learning, assessment, the curriculum and outcome standards:

§ University processes for initial approval and periodic re-approval

§ External Examiner Reports

§ Views of employers

§ Module Reviews (Student Questionnaires and Module Report)

§ Annual Staff Reviews

§ Course Committee reviews

§ Annual Subject Monitoring (incorporating Annual Programme Commentary)

§ Peer Teaching Observations and Feedback

Committees with responsibility for monitoring and evaluating quality:

§ Staff Student Consultative Committee

§ Course Committee

- § Board of Examiners
- § School Board (includes elected student members)
- § Faculty Academic Affairs Committee (includes elected student members)
- § University Teaching & Learning Committee

Mechanisms for gaining student feedback on the quality of their learning experience:

- § Staff-Student Consultative Committee
- § Student representatives on School and Faculty boards
- § Module evaluation questionnaires / module forum / module freeform responses

Staff development includes:

- § Updating in the subject through research and scholarship
- § Membership of professional bodies
- § Consultancy
- § Research and Knowledge Transfer
 - Representation on external working groups and committees

16 REGULATION OF STANDARDS

Assessment rules

It should be noted that:

- § The pass mark for modules and individual assessments will be 50%.
- § In both the Diploma and the Masters degree the performance level for pass is 50% and for distinction is 70%.
- § A mark of 70% or above shall also be achieved in the project module in order for the degree to be awarded with Distinction.

External Examiners

There is one External Examiner for the course.

External examiners are academic subject or professional experts appointed from outside the University. Their key functions are to contribute to the assurance of the standards of the award and the fair treatment of students. They are involved in the moderation and approval of assessments and the moderation of the marking undertaken by internal examiners

17 INDICATORS OF QUALITY RELATING TO LEARNING AND TEACHING

Selected indicators of quality relating to Teaching and Learning include:

- § Computing was awarded a Grade 4 in the 2001 Research Assessment Exercise
- § Several members of the course team belong to the Research Institute in

Computing Science

§ A Discipline Audit Trail for Computing was examined as part of the 2005 QAA Institutional Audit with a number of positive comments. The following summary extract is appropriate:

“Computing programmes in the three Schools are defined appropriately and satisfy the requirements of professional accreditation where relevant. A review of assessed work confirmed that the standards achieved by students are appropriate to the titles of the awards and their location in FHEQ. The quality and extent of the DSED impressed the audit team, as did the articulation by staff of their commitment to the continual development and refinement of their courses and their attendance to issues such as student retention in very positive and supportive ways. Students felt that staff were very approachable and helpful, and this contributed significantly to a positive student learning experience. The quality of learning opportunities is suitable for the programmes of study leading to the named awards.”

Report at: <http://www.qaa.ac.uk/reviews/reports/instReports.asp?instID=H-0185>

B2 Regulations**1. TITLE**

Postgraduate Diploma/Master of Science in Telecommunications and Internet Systems

2. MODE OF ATTENDANCE**COURSE CODES**

FULL-TIME

2128/2129

PART-TIME

2252/2253

3. DURATION

FULL-TIME: Normally 2/3 semesters of study

PART-TIME: Normally 4/6 semesters of study

4. LOCATION

Coleraine

5. FACULTY

Computing and Engineering

6. ADMISSION REQUIREMENTS

Applicants must normally:

6.1 (a) have gained

- (i) an Honours or non-Honours degree from a University of the United Kingdom or the Republic of Ireland, from the Council for National Academic Awards, the National Council for Educational Awards, the Higher Education and Training Awards Council, or from an institution of another country which is recognised as being or an equivalent standard; or
- (ii) an equivalent standard in a Postgraduate Certificate, Graduate Diploma, Graduate Certificate or an approved professional or other qualification

and

have gained an Honours or non-Honours degree in Computing Science, or in a related discipline where the degree includes a significant component of Computing Science and be competent

programmers in at least one high-level programming language, preferably Java

and

- (b) provide evidence of competence in written and spoken English (GCSE grade C or equivalent); or

or as an alternative to (a) (i) or (a) (ii) and/or (b):

- (c) In exceptional circumstances, where an individual has substantial and significant experiential learning, a portfolio of written evidence demonstrating the meeting of graduate qualities (including subject-specific outcomes, as determined by the Course Committee) may be considered as an alternative entrance route. Evidence used to demonstrate graduate qualities may not be used for exemption against modules within the programme.

7. EXEMPTIONS

7.1 Studies pursued and examinations passed in respect of other qualifications awarded by the University or by another university or other educational institution, or evidence from the accreditation of prior experiential learning, may be accepted as exempting candidates from part of the programme provided that

- (a) they shall register as students of the University for modules amounting to at least the final third of the credit value of the award at the highest level in respect of a Master's award and at least 50% of the credit value of the award in respect of a Postgraduate Diploma award
- (b) no exemption shall be permitted from the dissertation

8. ATTENDANCE REQUIREMENTS

8.1 Students are expected to attend all classes and participate in all on-line activity associated with the course and be punctual and regular in attendance.

8.2 A student who has not been in attendance for more than three days through illness or other cause must notify immediately the Course Director. The student shall state the reasons for the absence and whether it is likely to be prolonged. Where the absence is for a period of more than five working days, and is caused by illness which may affect their studies, the student shall provide appropriate medical certification in accordance with the General Regulations for Students.

- 8.3 Students who are absent without good cause for a substantial proportion of classes may be required to discontinue studies, in accordance with the General Regulations for Students.

9. RULES GOVERNING STUDENT CHOICE

- 9.1 Modules are offered as indicated in the table at section 17. Revisions may be made in accordance with the University's quality assurance procedures. Module availability may vary.

10. EXAMINATION AND ASSESSMENT

- 10.1 The performance of candidates shall be assessed by the Board of Examiners in accordance with the Regulations Governing Examinations in Courses of Study.
- 10.2 Candidates shall be assessed in the modules for which they have enrolled in each year of study. At the discretion of the Board of Examiners candidates may be required to attend a viva voce examination.
- 10.3 Within each module candidates shall be assessed by a combination of examinations and /or coursework in accordance with the attached table.
- 10.4 The pass mark for the module shall be 50%. Where a module is assessed by a combination of coursework and examination a minimum mark of 45% shall be achieved in each element.

11. SUBMISSION OF COURSEWORK

- 11.1 Coursework must be submitted by the dates specified by the course committee.
- 11.2 Students may seek prior consent from the course committee to submit coursework after the official deadline; such requests must be accompanied by a satisfactory explanation, accompanied in the case of illness by a medical certificate. This application shall be made to the Course Director.
- 11.3 Coursework submitted without consent after the deadline shall not normally be accepted.
- 11.4 Candidates completing a dissertation shall submit a project outline for approval in accordance with the Guidelines for the Preparation of Dissertations for Master's Degree Programmes. Two copies of the dissertation shall be submitted, by a date specified by the course committee, for assessment. The dissertation shall be presented in

accordance with the Guidelines for the Presentation of Dissertations for Master's Degree programmes. An electronic version is also required.

- 11.5 Dissertations which achieve a final mark of 70% or above shall be made available for public access through the University Library. Access to such dissertations shall not normally be restricted. Access may be restricted, in exceptional circumstances, for a period of up to two years in the first instance, and for a total period of not more than five years. Such restriction shall be approved in accordance with the procedures described in the Guidelines for the Presentation of Dissertations for Master's Degree programmes. Access to the abstract of the work shall not be restricted. A statement regarding access shall be included in the introduction to dissertations deposited in the Library in accordance with the Guidelines.

12. PROGRESS

12.1 Progress from semester 1 to semester 2 is automatic.

12.2 FOR PART-TIME COURSES: Subject to 13, candidates are required to pass all modules in each year of study in order to proceed to the next.]

13. CONSEQUENCES OF FAILURE

13.1 Candidates who fail to satisfy the Board of Examiners in assessment may be permitted at the discretion of the Board to re-present themselves as specified in 13.2 for one or more supplementary examination and repeat such coursework or other assessment requirements as shall be prescribed by the Board. Such candidates may be exempted at the discretion of the Board from the normal attendance requirements. Where candidates are required to repeat coursework or to take a supplementary examination the original mark in the failed coursework component or examination shall be replaced by a mark of 50% or the repeat mark, whichever is the lower for the purpose of calculating the module result.

13.2 In each year, the consequences of failure shall normally be as follows:

<p>Failure in module(s) with an overall value up to and including 60 credit points</p>	<p>Repeat once only specified examination(s) and/or coursework in the failed module(s) (examinations August).</p>
<p>Failure in module(s) with an overall value of more than 60 and up to and including 90 credit points</p>	<p>Repeat once only specified examination(s) and/or coursework in the failed module(s) in the next academic year (examinations January/May) with or without attendance.</p>
<p>Failure in module(s) with an overall value of more than 90 credit points</p>	<p>Withdraw from the programme.</p>

13.3 Candidates who fail the dissertation may be permitted to resubmit the dissertation on one occasion only by a specified date in the following year (within a period not exceeding eight months from the date of the examination board's decision).

14. CLASSIFICATION OF FINAL RESULT

Classification of Final Result for Master's Degrees

14.1 The results of candidates who have successfully completed the Master's degree shall be graded by order of merit as Pass with Distinction and Pass.

14.2 The assessment results for the final level of the programme (Level 7) shall determine the overall grading. The weighting of each module's contribution to the final result shall be determined by the module's credit value.

14.3 The following shall be the minimum overall percentages used to determine the final gradings of candidates:

Pass with Distinction	70%
Pass	50%

14.4 A mark of 70% or above shall also be achieved in the project module in order for the degree to be awarded with Distinction.

14.5 Provided that they have not been exempted for modules amounting to more than 60 credit points, candidates who do not complete the dissertation and have passed the taught modules associated with the Postgraduate Diploma [and Certificate] may be assessed for the award of a Postgraduate Diploma [*and Certificate*] in accordance with 14.6.

Classification of Final Result for Postgraduate Diploma

14.6 The results of candidates who have successfully completed a programme of study leading to the award of Postgraduate Diploma shall be graded by order of merit as Pass with Distinction and Pass.

14.7 The assessment results for the final level of the programme (Level 7) shall determine the overall grading. The weighting of each module's contribution to the final result shall be determined by the module's credit value. (See table at section 17).

14.8 The following shall be the minimum overall percentages used to determine the final gradings of candidates:

Pass with Distinction	70%
Pass	50%

14.10 Candidates registered on linked postgraduate programmes shall receive only one award at the highest level during a period of continuous registration.

14.11 Candidates admitted with advanced standing shall be assessed in accordance with the programme regulations using the evidence from the accredited prior learning.

15. ILLNESS AND OTHER EXTENUATING CIRCUMSTANCES

15.1 The Board of Examiners may in the case of candidates who are prevented by illness or other sufficient cause from taking or completing the whole or part of the assessment or whose results are substantially affected by illness or other sufficient cause:

(a) permit the candidate to complete, take, or repeat the written examination or course work or both at an approved subsequent date
or

(b) deem the candidate to have passed and recommend the award of an Aegrotat Master's Degree.

15.2 Before an Aegrotat award is recommended a candidate must have signed that he or she is willing to accept the award.

16. REVISIONS TO REGULATIONS

These regulations may be revised during the student's period of registration in accordance with the procedures approved by Senate.

17 Table of Modules								
Year/Level	Semester (ft)	Module Title	Code	Credit Value	Status Compulsory (C) Optional (O)	Assessment Methods % S/E % C/W		Contribution to the overall mark of the Final Award
Postgraduate Diploma (Full-Time)								
1/7	1	Networking Concepts and Practice	COM880	15	C	50	50	12.5%
1/7	1	Multimedia Web Development	COM851	15	C	0	100	12.5%
1/7	1	Distributed Systems	COM863	15	C	50	50	12.5%
1/7	1	Broadband Network Protocols and Architectures	COM862	15	C	50	50	12.5%
1/7	2	Distributed Applications Development	COM881	15	C	0	100	12.5%
1/7	2	Network Design and Management	COM883	15	C	50	50	12.5%
1/7	2	Intelligent Systems	COM850	15	C	50	50	12.5%
1/7	2	Research Methods	COM853	15	C	0	100	12.5%
Masters Degree (Full-Time) * Indicates module which must be passed at 70% for award of Distinction								
1/7	1	Networking Concepts and Practice	COM880	15	C	50	50	8.3%
1/7	1	Multimedia Web Development	COM851	15	C	0	100	8.3%
1/7	1	Distributed Systems	COM863	15	C	50	50	8.3%
1/7	1	Broadband Network Protocols and Architectures	COM862	15	C	50	50	8.3%
1/7	2	Distributed Applications Development	COM881	15	C	0	100	8.3%
1/7	2	Network Design and Management	COM883	15	C	50	50	8.3%
1/7	2	Intelligent Systems	COM850	15	C	50	50	8.3%
1/7	2	Research Methods	COM853	15	C	0	100	8.3%
1/7	3	Project *	COM884	60	C	0	100	33.3%

Postgraduate Diploma (Part-Time)								
1/7	1	Networking Concepts and Practice	COM880	15	C	50	50	12.5%
1/7	1	Multimedia Web Development	COM851	15	C	0	100	12.5%
1/7	2	Distributed Applications Development	COM881	15	C	0	100	12.5%
1/7	2	Intelligent Systems	COM850	15	C	50	50	12.5%
2/7	1	Broadband Network Protocols and Architectures	COM862	15	C	50	50	12.5%
2/7	1	Distributed Systems	COM863	15	C	50	50	12.5%
2/7	2	Network Design and Management	COM883	15	C	50	50	12.5%
2/7	2	Research Methods	COM853	15	C	0	100	12.5%
Masters Degree (Part-Time) * Indicates module which must be passed at 70% for award of Distinction								
1/7	1	Networking Concepts and Practice	COM880	15	C	50	50	8.3%
1/7	1	Multimedia Web Development	COM851	15	C	0	100	8.3%
1/7	2	Distributed Applications Development	COM881	15	C	0	100	8.3%
1/7	2	Intelligent Systems	COM850	15	C	50	50	8.3%
2/7	1	Broadband Network Protocols and Architectures	COM862	15	C	50	50	8.3%
2/7	1	Distributed Systems	COM863	15	C	50	50	8.3%
2/7	2	Network Design and Management	COM883	15	C	50	50	8.3%
2/7	2	Research Methods	COM853	15	C	0	100	8.3%
3/7	3	Project *	COM884	60	C	0	100	33.3%

B3 Structure Diagram

Year	Semester 1			Semester 2			June- September		
	Module	Credit/ Level	Status	Module	Credit/ Level	Status	Module	Credit/ Level	Status
1	Networking Concepts and Practice	15/7	compulsory	Broadband Network Protocols and Architectures	15/7	compulsory	Project	60/7	compulsory
	Multimedia Web Development	15/7	compulsory	Distributed Systems	15/7	compulsory			
	Distributed Applications Development	15/7	compulsory	Network Design and Management	15/7	compulsory			
	Intelligent Systems	15/7	compulsory	Research Methods	15/7	compulsory			

All modules are revised.

B4 Module Descriptions

MODULE TITLE:	Networking Concepts and Practice		
MODULE CODE:	COM880		
DATE OF REVISION:	2007-08		
MODULE LEVEL:	7		
CREDIT POINTS:	15		
MODULE STATUS:	Compulsory		
SEMESTER:	1		
LOCATION:	Coleraine		
E-LEARNING:	Web Dependent		
PREREQUISITE(S):	None		
CO-REQUISITE(S):	None		
MODULE CO-ORDINATOR(S):	McAlister MJ, Dr		
TEACHING STAFF RESPONSIBLE FOR MODULE DELIVERY:	McAlister MJ, Dr		
HOURS:	Lectures (on-line)	20	hours
	Seminars (Face-to-face/on-line)	40	hours
	Tutorials (face-to-face)	6	hours
	Practicals (on-line)	20	hours
	Independent study (including assessment)	64	hours
TOTAL EFFORT HOURS:	150 hours		
ACADEMIC SUBJECT:	COM		

RATIONALE

Telecommunications and Computer Networking are vital underpinning technologies for digital services. This module will provide students with the fundamental key concepts in these areas and allow them to gain experience of a range of communication and networking systems.

AIMS

The aims of this module are to provide students with a thorough and in-depth understanding of the core concepts in Telecommunications and Computer Networking by considering the fundamental areas. The module will focus on:

1. The concept of a network
2. Communication strategies
3. Network construction
4. Network standards
5. Future developments

LEARNING OUTCOMES

A successful student will be able to show that he/she can:

KNOWLEDGE AND UNDERSTANDING

- K1 Develop an understanding of the importance of telecommunications.
- K2 Understand how computer networking acts as an infrastructural enabler for digital services.
- K3 Explain the basic principles of wired and wireless communication networks.
- K4 Understand fundamental concepts of transmission, error detection, compression and modulation.
- K5 Apply the appropriate IEEE standards.
- K6 Recognize network security problems and solutions.
- K7 Demonstrate an awareness of how future developments impact on communications technologies.

INTELLECTUAL QUALITIES

- I1 Synthesise and evaluate information relevant to network communication technologies.
- I2 Assess the level to which current communications networks incorporate communication technology and standards.
- I3 Identify and analyze new network technologies which directly affect communication and influence the development of standards.

PROFESSIONAL/PRACTICAL SKILLS

- P1 Strengthen previous academic/industrial experience by use of real-world examples of the deployment and utilisation of digital networking services
- P2 Contrast, evaluate and apply differing learning styles, requirements and processes relevant to the study and analysis of network communication technologies.

TRANSFERABLE SKILLS

- T1 Demonstrate communication skills, including the ability to present technical issues in an appropriate form
- T2 Investigate, assess and report on current research activity within computer network technology

CONTENT

The following six aspects encapsulate the teaching on the module:

1. The physical aspects of telecommunication (10%)
 - a) Types of communication services
 - b) Types of physical media
 - c) Limitations of physical media and the effects of noise
2. Data transfer & communication control (20%)
 - a) Data transfer strategies
 - b) Error control and data link flow control
 - c) Compression techniques
3. Building networks (20%)
 - a) Structure of the PSTN and introduction of ISDN
 - b) The need for networks
 - c) The 7-layer OSI model
4. Network perspectives (20%)
 - a) Data link protocols
 - b) Network topologies
 - c) Network types
5. Network standards (20%)
 - a) IEEE 802.3 & IEEE 802.5
 - b) Internetworking
 - c) Extending LANs
6. Developing Technologies (10%)
 - a) Wireless technology
 - b) Security fundamentals

TEACHING AND LEARNING METHODS

Lectures will consist of on-line lecture notes (divided into weekly reading blocks) which provide an exposition of the principles of AI and learning and mining. These will be illustrated through case studies and other worked examples

Tutorials will be given face-to-face at the beginning, middle and end of the semester. This will provide: orientation for the module, including advice on how to study; introductions to software for practical work (installation, user guides and demonstrations); briefings on coursework; opportunities to raise issues.

Practical exercises will be provided online as a programme of weekly practical blocks, linked to the reading blocks for students to carry out in their own time. Support will be offered using on-line discussion boards.

Seminars, given face-to face and through on-line discussion boards will provide an opportunity for students to discuss, with each other and staff, problems and issues arising from lecture and practical materials and independent reading.

Students will be directed to read from a variety of texts and web-sites. The latter will include general portal sites offering additional reading on topics introduced in lecture

notes; sites of prominent research groups providing research project overviews and papers including case studies; commercial sites offering white papers on software developments

Students will be expected to: follow the weekly programme of study; access and contribute regularly to discussion boards on-line.

The module is web dependent.

ASSESSMENT

The practical assessment will involve students working on two pieces of coursework which will focus on underpinning the fundamental aspects and illustrating programming knowledge via the development of a software application that solves a network communication problem. A typical assessment load is as follows:

Coursework 1: (15%)

Students will be asked to address a set of technical questions weekly which will be based on material from the lectures and the course text. These questions will form a digital log-book which will be submitted as a second component of course work for this module.

This will measure the student's achievement of learning outcomes K1, K2, K3, K4, K5, K7, I1, I2, I3, P1 and T2.

Coursework 2: (35%)

This will take the form of a software development project. The project will ensure that students are able to grasp an understanding of the operational constraints of basic network communication. This activity will be supported by tutorial tasks. The work is presented in a report which is subject to a written and oral examination.

This will measure the student's achievement of learning outcomes K2, K3, K4, K6, I1, I2, P1, P2, T1 and T2.

Examination: (50%)

The final examination will be 2 hours long. Candidates will be presented with 5 questions from which they should choose 3.

The examination will measure the student's achievement of learning outcomes K1, K2, K3, K4, K5, K6, K7, I1, I2, I3 and T1.

50 % Coursework

50 % Examination

READING LIST

Required

Stallings, W 2007, *Data & Computer Communications*, 8th edn, Prentice Hall, London.

Recommended

Horak, R 2002, *Communications Systems & Networks*, 3rd edn, John Wiley & Sons, London.

Fourzan, BA 2003, *Local Area Networks*, McGraw-Hill, London.

Sloan, JD 2001, *Network Troubleshooting Tools*, O'Reilly, London.

Nicopolitidis, P, Obaidat, MS, Papadimitriou, GI, Pomportsis, AS 2003, *Wireless Networks*, John Wiley & Sons, London.

Gollmann, D 2006, *Computer Security*, John Wiley & Sons, London.

SUMMARY DESCRIPTION

This module will provide all students with a detailed overview of the core concepts in Telecommunications and Computer Networking. Issues such as data transfer, network construction and standards will be examined and the students will be given an understanding of the QoS metrics associated with efficient transmission in both LAN and WAN environments. Consideration will be given to developing technologies such as wireless and security fundamentals which will influence future implementation.

MODULE TITLE:	Distributed Systems	
MODULE CODE:	COM863	
DATE OF REVISION:	2007-08	
MODULE LEVEL:	7	
CREDIT POINTS:	15 credit points	
MODULE STATUS:	Compulsory	
SEMESTER:	1	
LOCATION:	Coleraine	
E-LEARNING:	Web Dependent	
PREREQUISITE(S):	None	
CO-REQUISITE(S):	None	
MODULE CO-ORDINATOR(S):	Morrow PJ, Dr	
TEACHING STAFF RESPONSIBLE FOR MODULE DELIVERY:	Morrow PJ, Dr	
HOURS:	Lectures (on-line)	20 hours
	Tutorials (face-to-face)	6 hours
	Practicals (on-line)	20 hours
	Independent study (including assessment)	104 hours
TOTAL EFFORT HOURS:	150 hours	
ACADEMIC SUBJECT:	COM	

RATIONALE

Networks of computers are now everywhere (e.g. the internet, mobile phone networks, corporate networks, campus networks). They all share essential characteristics that can be studied under the heading of *distributed systems*. With the widespread use of networks there is a need for students to be aware of these essential characteristics.

AIMS

The aims of this module are:

1. To provide students with an understanding of the underpinning principles on which distributed systems are based, and
2. To provide students with practical skills in developing distributed systems software.

LEARNING OUTCOMES

A successful student will be able to show that he/she can:

KNOWLEDGE AND UNDERSTANDING

- K1 Demonstrate a knowledge and understanding of various distributed system architectures, models and algorithms
- K2 Explain the necessity of middleware software within distributed systems
- K3 Explain the use of system infrastructures (e.g. OS support, distributed file systems, shared memory) within the context of distributed systems

INTELLECTUAL QUALITIES

- I1 Analyse and evaluate complex problems requiring a distributed systems solution.
- I2 Assess and analyse design issues within distributed systems

PROFESSIONAL/PRACTICAL SKILLS

- P1 Develop client-server and/or peer-to-peer systems (using UDP/TCP communications protocols)
- P2 Develop distributed systems applications based on middleware software

TRANSFERABLE SKILLS

- T1 Communicate technical ideas in writing
- T2 Effectively find and select appropriate information using on-line information sources
- T3 Develop a logical approach to problem solving

CONTENT

Introduction (20%):

- Example systems; models and architectures; inter-process communication; challenges and key characteristics of distributed systems; distributed algorithms.

Middleware (20%):

- Definitions; distributed objects; RMI; security; name services.

System Infrastructure (20%):

- Concurrency; processes and threads; synchronization; OS support; distributed file systems; shared memory.

Shared data (20%):

- Transactions; distributed transactions; replication.

Paradigms (20%):

- Peer-to-peer systems; mobile and ubiquitous computing.

TEACHING AND LEARNING METHODS

Lectures will consist of on-line lecture notes (divided into weekly reading blocks) which provide an exposition of the principles of distributed systems. Students may also be directed to further reading (either from the recommended textbook or web-based material).

Tutorials will be given face-to-face at the beginning, middle and end of the semester. This will provide: orientation for the module, including advice on how to study; introductions to software for practical work (installation, user guides and demonstrations); briefings on coursework; opportunities to raise issues.

Practicals will be based on the lecture and reading material and will provide an opportunity to gain practical experience in the development of distributed systems software. (This will use Java as the programming language which is freely available). Support will be offered using on-line discussion boards.

Students will be directed to read from a variety of texts and web-sites. The latter can include general portal sites offering additional reading on topics introduced in lecture notes; sites of prominent research groups providing research project overviews and papers including case studies; commercial sites offering white papers on software developments.

Students will be expected to: follow the weekly programme of study; access and contribute regularly to discussion boards on-line.

ASSESSMENT

Coursework 1: (15%)

Either: textbook exercises - a number of exercises selected from the course text would be set every other week to be completed by the following week; or: a technical report / essay: a range of topics within the area of distributed systems are provided; students are required to select and research one of the topics and write a technical report / essay relating the issues considered during the lectures to the application area chosen.

This will measure the student's achievement of learning outcomes K1-3, I1-2 and T1-2.

Coursework 2: (35%)

Application programming: distributed system programs must be designed and implemented utilising techniques developed during the module.

This will measure the student's achievement of learning outcomes P1-2 and T1, T3.

Examination: (50%)

A 2 hour examination; choice of 3 questions from 5. The examination will potentially measure the student's achievement in learning outcomes K1-3; I1-2 and P1-2.

50% Coursework

50% Examination

READING LIST

Required

Coulouris, G, Dollimore, J & Kindberg, T 2005, *Distributed Systems: Concepts and Design*, 4th ed., Addison-Wesley, London.

Recommended

Graba, J 2006, *An Introduction to Network Programming with Java*, Springer, New York.

Harold, ER 2004, *Java Network Programming*, 3rd ed., O'Reilly, London.

Selected documents from websites as directed.

SUMMARY DESCRIPTION

The aim of this module is to provide students with an understanding of the underpinning principles and characteristics of distributed computing systems. The main topics addressed in this module are: an introduction to distributed systems; middleware software; distributed system infrastructure; dealing with shared data; and recent distributed system paradigms. Practical experience of programming within a distributed computing environment will also be gained.

MODULE TITLE:	Broadband Network Protocols and Architectures	
MODULE CODE:	COM862	
DATE OF REVISION:	2007-8	
MODULE LEVEL:	7	
CREDIT POINTS:	15	
MODULE STATUS:	Compulsory	
SEMESTER:	1	
LOCATION:	Coleraine	
E-LEARNING:	Web Dependent	
PREREQUISITE(S):	None	
CO-REQUISITE(S):	None	
MODULE CO-ORDINATOR(S):	Szularz, M. Dr	
TEACHING STAFF RESPONSIBLE FOR MODULE DELIVERY:	Szularz, M. Dr	
HOURS:	Lectures (on-line)	20 hours
	Seminars(face-to-face/on-line discussion)	40 hours
	Tutorials (face-to-face)	6 hours
	Practicals (on-line)	20 hours
	Independent study (including assessment)	64 hours
TOTAL EFFORT HOURS:	150	
ACADEMIC SUBJECT:	COM	

RATIONALE

Telecommunications and Computer Networking are vital underpinning technologies for the digital economy and the services it requires. This module will provide students with the fundamental advanced key concepts in high speed communication and networking systems and associated areas and allow them to gain insight into the functional and technical requirements of these technologies.

AIMS

The aim of this module are to:

1. Provide a thorough and in-depth understanding of the core concepts in Telecommunications and Computer Networking. Most notably, this includes infrastructure, ATM Transport, MAC Layer Protocols, Flow Control coupling with Routing.
2. Provide an understanding of the main issues concerned with achieving real-time Quality of Service in a Broadband Networks.

LEARNING OUTCOMES

A successful student will be able to show that he/she can:

KNOWLEDGE AND UNDERSTANDING

- K1 Understand the importance of telecommunications and computer networking as an infrastructural enabler for converged broadband digital services
- K2 Explain the different LAN and WAN/MAN protocol stacks and underpinning PDU transport formats for fixed and wireless communications
- K3 Understand the issues concerned with traffic engineering and QoS performance metrics associated with ATM/ISDN/xDSL/IP/MPLS and Wireless communications
- K4 Have knowledge of the economic pressures being placed on Telecommunications Service Providers in the global context

INTELLECTUAL QUALITIES

- I1 Evaluate the resource needs of a particular application within a converged communications network and to associate such needs within the context of available transport protocols such as IEEE 802, ATM, ISDN, IP/MPLS, xDSL and GSM/GPRS; this will also include WiFi and WiMAX

PROFESSIONAL/PRACTICAL SKILLS

- P1 Achieve practical skills in the use of OPNET Modeler as an exemplar internationally renowned network simulation tool and adopted network simulation and modelling environment

TRANSFERABLE SKILLS

- T1 Source research materials from IETF, ACM/IEEE relevant to the course and to prepare written technical reports and presentations for discussion in class and tutorials. Research materials will also be sourced from regulatory bodies such as Ofcom UK and ComReg (Ireland)
- T2 Discuss and understand the key business drivers behind decisions on infrastructure/service deployments

CONTENT

Networking and Telecommunications (20%)

Introducing services in SOAs

The relationship between LAN and high speed interconnect WANs

Integrated Networks

Structure of PSTN: core SONET/SDH networks

Metro Ethernet

IEEE MAC-Layer Protocols (10%)

The structure of the Internet, routers, transmission links, internet services Local access and ISPs, IXPs

ATM, GPRS, GSM and DECT (10%)

Integrated Services Transport (10%)

Narrowband ISDN and its interfaces

Benefits of digital network, Extension of digital working to customer

Network Interface and CPE

Control & Signaling

Addressing & Routing (10%)

ATM Numbering and routing

ATM LANE

ISDN

Congestion Control Algorithms

Internetworking- xDSL (10%)

Quality of Service in IP/MPLS Networks (10%)

The Network layer in Internet (10%)

Mobile Communications Systems and Services (10%)

WiFi/ WiMAX

Bluetooth

MANETs

LEARNING AND TEACHING METHODS

Lectures will consist of on-line lecture notes (divided into weekly reading blocks) which provide an exposition of the principles of AI and learning and mining. These will be illustrated through case studies and other worked examples.

Tutorials will be given face-to-face at the beginning, middle and end of the semester. This will provide: orientation for the module, including advice on how to study; introductions to software for practical work (installation, user guides and demonstrations); briefings on coursework; opportunities to raise issues. This time will also be used for guest lectures on state-of-the-art topics ranging from enterprise-SOA through converged network architectures. These lectures will be organised in conjunction with Ericsson, Asidua, BT, Cisco Systems and SAP as appropriate.

Practical exercises concerned with network protocol simulation and modelling using OPNET will be provided online as a programme of weekly practical blocks, linked to the reading blocks for students to carry out in their own time. Support will be offered using on-line discussion boards.

Seminars, given face-to face and through on-line discussion boards will provide an opportunity for students to discuss, with each other and staff, problems and issues arising from lecture and practical materials and independent reading.

Students will be directed to read from a variety of texts and web-sites. The latter will

include general portal sites offering additional reading on topics introduced in lecture notes; sites of prominent research groups providing research project overviews and papers including case studies; commercial sites offering white papers on software developments; business and academic web blogs which discuss issues of the day.

Students will be expected to: follow the weekly programme of study; access and contribute regularly to discussion boards on-line.

The module is web dependent.

ASSESSMENT

Coursework 1: (35%)

This will take the form of software development projects in the laboratory. It will ensure that students are able to grasp an understanding of the operational constraints of basic computer communication protocols. OPNET will be deployed to provide the test-beds for these experiments.

This activity will assess learning outcomes K2, K3, P1, T1 and T2.

Coursework 2: (15%)

Students will be given a Class Test comprising of 10 short questions relating to the material covered in lectures up to that point. The purpose of the Class Test is to encourage students to review their lecture notes and additional materials, together with any tutorial tasks they may have completed.

This will assess learning outcomes K1-K4 and I1.

Examination: (50%)

The final examination will be 2 hours long. Candidates will be presented with 5 questions from which they should choose 3. The examination will measure the student's achievement of all learning outcomes for the module.

Learning outcomes K1-K4 and I1 will be assessed.

50 % Coursework

50 % Examination

READING LIST

Recommended

Stallings, W 2007, *Data & Computer Communications*, 8th edn, Prentice Hall, London.

Kurose, J & Ross, K 2004, *Computer Networking; A top-down approach featuring the Internet*, 3rd edn, Pearson Education, London.

Olifer, N & Olifer, V 2006, *Computer Networks – Principles, Technologies and Protocols for Network Design*, John Wiley, Chichester.

SUMMARY DESCRIPTION

This module will provide all students with a detailed overview of the core concepts and systems, which are involved with the assembly and distribution of digitally encoded signals in guided and freespace media. Issues such as access and resource allocation will be examined and the students will be given an understanding of the QoS metrics associated with efficient transmission in LAN, WAN, MAN and PAN environments. Consideration will be given to the associated infrastructural components and related fault tolerance/management issues for various fixed-freespace signalling and protocol standards operation in narrowband and broadband converged communications.

MODULE TITLE:	Multimedia Web Development	
MODULE CODE:	COM851	
DATE OF REVISION:	2009/10	
MODULE LEVEL:	7	
CREDIT POINTS:	15	
MODULE STATUS:	Compulsory	
SEMESTER:	1	
LOCATION:	Coleraine	
E-LEARNING:	Web Dependent	
PREREQUISITE(S):	None	
CO-REQUISITE(S):	None	
MODULE CO-ORDINATOR(S):	Moore AA, Dr.	
TEACHING STAFF RESPONSIBLE FOR MODULE DELIVERY:	Moore AA, Dr	
HOURS:	Tutorials	6 hours
	Independent study (including assessment)	144 hours
TOTAL EFFORT HOURS:	150 hours	
ACADEMIC SUBJECT:	COM	
MODULAR SUBJECT:		

RATIONALE

The World Wide Web has become a global tool for information presentation in all fields of business and research. As client processing power and available bandwidth have shown significant improvement in recent years, so it has become possible to enhance Web applications with multimedia elements. This module provides the student with practical experience in developing interactive, client-server multimedia applications in a Web environment.

AIMS

The specific aims of the module are:

1. to promote an awareness of recent developments and trends in the areas of Internet and multimedia development to provide experience in developing e-business solutions for the web, incorporating back-end database applications and content management systems
2. to provide an understanding of techniques for generating and structuring content for web pages
3. to develop student experience in client and server side programming in a selection of current languages
4. to provide practice in advanced multimedia interaction techniques

LEARNING OUTCOMES

A successful student will be able to show that he/she can:

KNOWLEDGE AND UNDERSTANDING

- K1 Demonstrate awareness of the range of development and delivery options for interactive multimedia
- K2 Understand recent developments in native Web standards for multimedia specification

INTELLECTUAL QUALITIES

- I1 Critically evaluate the quality of an interface with respect to appropriateness of information presentation and ease of use
- I2 Exercise appropriate judgement in the planning, selection and presentation of information

PROFESSIONAL/PRACTICAL SKILLS

- P1 Demonstrate the design and implementation of interactive multimedia, using a selection of suitable tools and environments
- P2 Use a range of appropriate client and server programming technologies

TRANSFERABLE SKILLS

- T1 Develop programming ability in a range of modern languages and notations
- T2 Demonstrate the ability to communicate information effectively via the Web
- T3 Apply a range of general IT skills, including the use of internet search facilities, graphics packages and word processing packages

CONTENT

The following 5 aspects encapsulate the teaching on the module:

7. Design and implementation of Web pages **(10%)**
 - (a) Formatting of content
 - (b) Embedded multimedia objects
 - (c) Accessibility and usability guidelines

- | | |
|--|--------------|
| 8. Client-side interaction | (20%) |
| (a) DHTML and the Document Object Model | |
| (b) Event-driven applications; client-side scripting | |
| 9. Server-side interaction | (20%) |
| (a) Dynamic generation of multimedia content | |
| 10. Specifying Web multimedia | (25%) |
| (a) Native and proprietary standards | |
| (b) Interactive web graphics and animation | |
| (c) Synchronised and Interactive delivery | |
| 11. Emerging topics | (25%) |
| (a) Mobile and handheld devices | |
| (b) XML and Web 2.0 applications | |
| (c) APIs and Mashups | |

TEACHING AND LEARNING METHODS

This module is delivered primarily via e-learning, with the majority of class interaction performed through a managed learning environment. This environment facilitates access to study materials, as well as various supporting information about the module. Students are also able to engage in on-line discussion, both with teaching staff and with their peers. Tutorials will be given face-to-face at the beginning, middle and end of the semester. This will provide: orientation for the module, including advice on how to study; introductions to software for practical work (installation, user guides and demonstrations); briefings on coursework; opportunities to raise issues.

This module is Web Dependent.

ASSESSMENT

This module is assessed via 100% coursework with two pieces of coursework being used to assess the module as follows:

Coursework 1: Continuous Assessment (45%)

A number of development exercises, testing the student's understanding of the module content elements, with feedback offered on an ongoing basis over the course of the module

This assignment will measure the student's achievement of all module learning outcomes

Coursework 2: Individual Development Exercise (55%)

An individual development exercise, demonstrating and applying the techniques introduced during the module.

This coursework will measure the student's achievement of all module learning outcomes.

100 % Coursework

0 % Examination

READING LIST

Recommended:

Pilgrim M, (2010), *HTML 5 Up and Running*, O'Reilly Media

Powers S, (2008), *Painting the Web*, O'Reilly Media

Deitel PJ, Deitel HM, (2009), *Ajax, Rich Internet Applications and Web Development for Programmers*, Prentice-Hall, Harlow

Moore AA, (2005), *Multimedia Web Programming*, Palgrave Macmillan, Basingstoke

Selected Web sites as directed

SUMMARY DESCRIPTION

The World Wide Web has become a global tool for information presentation in all fields of business and research. As client processing power and available bandwidth have shown significant improvement in recent years, so it has become possible to enhance Web applications with multimedia elements. This module provides the student with practical experience in developing interactive, client-server multimedia applications in a Web environment

MODULE TITLE:	Distributed Applications Development	
MODULE CODE:	COM881C1	
DATE OF REVISION:	2007-08	
MODULE LEVEL:	7	
CREDIT POINTS:	15 credit points	
MODULE STATUS:	Compulsory	
SEMESTER:	2	
LOCATION:	Coleraine	
E-LEARNING:	Web Dependent	
PREREQUISITE(S):	None	
CO-REQUISITE(S):	None	
MODULE CO-ORDINATOR(S):	McNeill MDJ, Dr.	
TEACHING STAFF RESPONSIBLE FOR MODULE DELIVERY:	McNeill MDJ, Dr.	
HOURS:	Lectures (online)	20 hours
	Seminars(face-to-face/on-line discussion)	20 hours
	Tutorials (face-to-face)	6 hours
	Practicals (online)	30 hours
	Independent study (including assessment)	74 hours
TOTAL EFFORT HOURS:	150 hours	
ACADEMIC SUBJECT:	COM	

RATIONALE

Distributed applications have become increasingly important for a range of industry sectors, including science (grid), communications (mobile) and Internet (business-to-consumer (B2C) and business-to-business (B2B)). This module exposes students to a range of technologies for building distributed applications and gives them practical experience in using those technologies.

AIMS

This module aims to provide students with

1. an understanding of the context of developing distributed applications and associated implications for application design
2. knowledge of a range of technologies used in distributed applications and practical experience in a number of those technologies
3. the ability to critically evaluate distributed applications with regard to their scalability, performance, reliability and security.

LEARNING OUTCOMES

A successful student will be able to show that he/she can:

KNOWLEDGE AND UNDERSTANDING

- K1 Understand the challenges facing developers of distributed applications and how these differ from other applications
- K2 Demonstrate an awareness of recent developments in technologies for distributed applications

INTELLECTUAL QUALITIES

- I1 Critically evaluate distributed applications with regard to their scalability, performance, reliability and security
- I2 Exercise a degree of creativity and imagination in the technical design of distributed applications

PROFESSIONAL/PRACTICAL SKILLS

- P1 Implement a number of distributed applications using appropriate technologies
- P2 Analyse, debug and comment on/improve the performance, reliability, scalability and security of distributed applications

TRANSFERABLE SKILLS

- T1 Communicate technical ideas in writing
- T2 Develop a logical approach to problem solving

CONTENT

Introduction (20%):

Characteristics of distributed applications; Programming models (message-passing, RPC, distributed object systems and Web Services).

Distributed Applications – fundamentals (40%):

Marshall by reference and value; Serialisability; Proxies; stateless and stateful services. Performance (caching, multi-threading, asynchronous calling). Scalability and deployment. Security (authentication, encryption), integrity. Reliability (transactions-based programming).

Web Services (20%):

Web Services technologies: HTTP, SOAP, WSDL and Discovery; Designing, building, deploying and testing a Web Service. Profiling and debugging. Clients and proxies.

Development tools, middleware (20%):

Case Studies (e.g., .NET Remoting, XML Web Services, Google Web Services)

TEACHING AND LEARNING METHODS

Lectures will consist of on-line lecture notes (divided into weekly reading blocks) which provide a guide to the issues of developing applications for distributed systems. These will be illustrated through case studies and other examples.

Tutorials will be given face-to-face at the beginning, middle and end of the semester. This will provide: orientation for the module, including advice on how to study; introductions to software for practical work (installation, user guides and demonstrations); briefings on coursework; opportunities to raise issues.

Practical exercises will be provided online as a programme of weekly practical blocks, linked to the lecture and reading blocks (students will be encouraged to carry out additional reading in their own time). Support will be offered using on-line discussion boards.

Seminars, given face-to face and through on-line discussion boards will provide an opportunity for students to discuss, with each other and staff, problems and issues arising from lecture and practical materials and independent reading.

Students will be directed to read from a variety of texts and websites. The latter will include general portal sites offering additional reading on topics introduced in lecture notes; sites of prominent research groups providing research project overviews and papers including case studies; commercial sites offering white papers on technology developments; business and academic web blogs which discuss issues of the day, on current research, deployment of applications, security and new and emerging technologies.

Students will be expected to: follow the weekly programme of study; access and contribute regularly to discussion boards on-line.

The module is web dependent.

ASSESSMENT

Coursework 1: (45%)

A number of development exercises, testing the student's understanding of the module content, with feedback offered on an ongoing basis over the course of the module.

Short written reports (~2-3 pages) will accompany each submission. There will typically be 5 submissions contributing to CA1.

This assignment will measure in part the student's achievement of all module learning outcomes.

Coursework 2: (55%)

A larger individual development project, applying a number of techniques introduced during the module to one integrated system. A longer written report (~10-15 pages) will accompany the submission.

This assignment will measure in part the student's achievement of all module learning outcomes.

100 % Coursework

0 % Examination

READING LIST*Required*

Rammer, I, Szpuszta, M 2003, *Advanced .NET Remoting*, 2 edn, Apress, Berkeley, CA.

MacDonald, M, Szpuszta, M 2005, *Pro ASP.NET 2.0 in C#*, Apress, Berkeley, CA.

Recommended

Coulouris, G, Dollimore, J & Kindberg, T 2005, *Distributed Systems: Concepts and Design*, 4th edn, Addison-Wesley, Boston, MA.

Hasan, J, Duran, M 2005, *Expert Service-Oriented Architecture in C# 2005*, 2nd edn, Apress, Berkeley, CA.

Ferrara, A and MacDonald, M 2002, *Programming .NET Web Services*, O'Reilly, Sebastopol, CA.

Grosso W 2002, *Java RMI*, O'Reilly, Sebastopol, CA.

Harold, E R 2000, *Java network programming*, 2nd edn., O'Reilly & Associates, Sebastopol, CA.

Ballinger, K 2003, *.NET Web Services: Architecture and Implementation*, Addison-Wesley, Boston, MA.

Mahmoud, Q 2000, *Distributed Programming with Java*, Manning, Greenwich, CT.

Newcomer, E 2002, *Understanding Web Services: XML, WSDL, SOAP, and UDDI*, Addison-Wesley, Boston, MA.

Web Links

Google Code: <http://code.google.com/>

Amazon Web Services: Amazon E-commerce Service:

<http://docs.amazonwebservices.com/AWSEcommerceService/2005-03-23/index.html>

ASP.NET Web Services or .NET Remoting: How to Choose:

<http://msdn2.microsoft.com/en-us/library/ms978420.aspx>

An Introduction to the .NET Remoting Framework: <http://msdn2.microsoft.com/en-us/library/ms978420.aspx>

CodeProject: .NET Remoting: design decisions and best practices:

<http://www.codeproject.com/KB/IP/remotingdesignndecisions.aspx>

Web Services and Other Distributed Technologies: <http://msdn2.microsoft.com/en-gb/webservices/default.aspx>

Thinktecture: Resources: <http://www.thinktecture.com/resourcearchive/>

Journals

IEEE Distributed Systems online:

<http://dsonline.computer.org/portal/site/dsonline/index.jsp>

IEEE Transactions on Parallel and Distributed Systems:

<http://www.computer.org/portal/site/transactions/menuitem.a66ec5ba52117764cfe79>

d108bcd45f3/index.jsp?&pName=tpds_home/&jsessionId=LT9rYIYvZTr68LJxQv4rY1qWC1yHnQthhTT2hvssL955ThzmCnBb!-2112008742

Annual ACM Symposium on Principles of Distributed Computing: www.acm.org/dl

SUMMARY DESCRIPTION

Students will gain an appreciation of fundamentals of designing, building and deploying distributed applications. A range of enabling technologies will be studied, with an emphasis on industry standard solutions. Students will gain practical experience in developing secure, reliable, scalable and efficient distributed applications, suitable for deployment over the Internet.

MODULE TITLE:	Network Design and Management	
MODULE CODE:	COM883C2	
DATE OF REVISION:	2007-8	
MODULE LEVEL:	7	
CREDIT POINTS:	15	
MODULE STATUS:	Compulsory	
SEMESTER:	2	
LOCATION:	Coleraine	
E-LEARNING:	Web Dependent	
PREREQUISITE(S):	None	
CO-REQUISITE(S):	None	
MODULE CO-ORDINATOR(S):	Parr GP, Professor	
TEACHING STAFF RESPONSIBLE FOR MODULE DELIVERY:	Parr GP, Professor	
	Lectures (on-line)	20 hours
	Seminars(face-to-face/on-line discussion)	40 hours
	Tutorials (face-to-face)	6 hours
	Practicals (on-line)	20 hours
	Independent study (including assessment)	64 hours
TOTAL EFFORT HOURS:	150	
ACADEMIC SUBJECT:	COM	

RATIONALE

This module will provide a comprehensive understanding of the issues involved in the design, deployment and management of narrow and broadband communication networks. It is a necessary requirement for such networks to be constructed in an efficient and industrially relevant manner. This module will therefore build on the fundamental concepts covered in COM862C2 to provide students with the necessary knowledge for this to take place.

AIMS

The specific aims of the module are:

1. To provide students with a firm understanding of both design and management issues for different types of network systems and underlying enabling technologies.
2. To underpin this activity with topics such as Network Management Standards, Communications & Functional Models, SNMP, MITs, Agent Management Systems, FCAPS and MIB constructs.

LEARNING OUTCOMES

A successful student will be able to show that he/she can:

KNOWLEDGE AND UNDERSTANDING

- K1 Understand the importance of telecommunications and computer networking as an infrastructural enabler for broadband digital services
- K2 Understand the management issues which must be addressed when designing and implementing a communications network including SNMP control of elements, managed objects and agents
- K3 Explain the operational constraints under which the various physical components must exist in different environments
- K4 Comprehend the different QoS requirements that particular application domains dictate and how they are mapped onto the physical plant

INTELLECTUAL QUALITIES

- I1 Evaluate the need for self-healing and fault tolerant protocols in support of various QoS parameters in a communications network.
- I2 Analyse and evaluate the main industry protocols for the provision of network management functions in LAN/WAN freespace and guided media environments with different bandwidth and protocol stacks
- I3 Evaluate the resource needs of a particular network management application within the FCAPS framework and to associate such needs within the context of example SNMP scenarios.

PROFESSIONAL/PRACTICAL SKILLS

- P1 Acquire the practical skills necessary to use MS-SOFT SNMP MIB Builder, Compiler, Browser in a real-world Network

TRANSFERABLE SKILLS

- T1 Source research materials from IETF, ACM and IEEE and RFCs relevant to the course and to prepare written technical reports and presentations for discussion in class and tutorials

CONTENT

Network Management in narrow and converged broadband communications (10%)

Enabling Technologies (LANs, WANs, MANs) (10%)

- OSI Management Models and Standards
- Supporting Services for Management
- Systems Management Function Standards
- Systems Management Communications (CMIP)

OSI Structure of Network Management Information (10%)

- Managed Objects, Elements, and Agents
- Management Information Base

Simple Network Management Protocol (SNMP) (10%)

- TCP/IP Network Management
- SNMP Security
- Message Formats, Privacy, Authentication, Access Control

The Telecommunications Management Network (TMN) (10%)

(objectives, activities, applications, functional architecture, TMN Management Information)

FCAPS (10%)

Broadband Network Management: SONET-SDH- IP/MPLS ATM Networks (10%)

Network Planning (10%)

- Managing and Implementing Large Network Projects

Fundamental Problems and Performance Evaluation (10%)

- NGOSS
- Real-time Management for Enterprise-wide SOA
- Real-Time Data Analytics and MIB Engineering

WBMN (10%)

LEARNING AND TEACHING METHODS

Lectures will consist of on-line lecture notes (divided into weekly reading blocks) which provide an exposition of the principles of AI and learning and mining. These will be illustrated through case studies and other worked examples.

Tutorials will be given face-to-face at the beginning, middle and end of the semester. This will provide: orientation for the module, including advice on how to study; introductions to software for practical work (installation, user guides and demonstrations); briefings on coursework; opportunities to raise issues. Half-day group sessions provide an element of face-to-face contact, physical group interaction and guest lectures. The latter will involve state-of-the-art topics ranging from NGOSS for

enterprise-wide management through converged network SLA Programming and PBNM. These lectures will be organised in conjunction with Ericsson, Asidua, BT, and Cisco Systems appropriate.

Practical exercises to assess the learning outcomes concerned with network simulation and modelling using MG-Soft SNMP MIB environments will be provided online as a programme of weekly practical blocks, linked to the reading blocks for students to carry out in their own time. Support will be offered using on-line discussion boards.

Seminars, given face-to face and through on-line discussion boards will provide an opportunity for students to discuss, with each other and staff, problems and issues arising from lecture and practical materials and independent reading.

Students will be directed to read from a variety of texts and web-sites. The latter will include general portal sites offering additional reading on topics introduced in lecture notes; sites of prominent research groups providing research project overviews and papers including case studies; commercial sites offering white papers on software developments; business and academic web blogs which discuss issues of the day.

Students will be expected to: follow the weekly programme of study; access and contribute regularly to discussion boards on-line.

The module is web dependent.

ASSESSMENT**Coursework 1: (25%)**

This will involve software development projects in the laboratory. It will ensure that students are able to grasp an understanding of the operational constraints of SNMP, MIBs and Abstract Syntax Notation for managed objects within a network. Environments such as Observer and or MG-SOFT Visual MIB Builder and Visual MIB Compiler will be deployed to provide the test beds for these experiments. This activity will be supported by tutorial tasks, class and final tests.

This assignment will measure the student's achievement of learning outcomes K1-K4, I1-I3 and P1.

**Coursework 2:
(10%)**

Students will be asked to address a set of technical questions weekly which will be based on material from the lectures and the course text. These questions will form a digital log-book which will be used to support the revision for a Class Test.

This component of the assignment will measure the student's achievement of learning outcomes for this module, K1-K4.

**Coursework 3:
(15%)**

Students will be asked to develop a Network Management Strategy by assessing the functional and technical requirements for Web-based Network management System within the context of a large-scale multi-site environment such as the University of Ulster.

This assignment will assess learning outcomes I1-I3 and T1.

**Examination:
(50%)**

The final examination will be 2 hours long. Candidates will be presented with 5 questions from which they should choose 3. The examination will measure the student's achievement of all learning outcomes for the module

The examination will measure the student's achievement of learning outcomes K1-K4 and I1-I3.

50 % Coursework

50 % Examination

READING LIST

Recommended

Subramanian, M 2000, *Network Management, Principles and Practice*, Addison Wesley , Reading, Mass.

Note- a new version is under development during 2007 and Professor Parr has been asked to contribute as co-author and co-editor.

Clemm, A 2006, *Network Management Fundamentals*, Pearson Education, Cisco Press, Indianapolis, Indiana.

Comer, D 2007, *Automated Network Management Systems*, Prentice Hall, London.

SUMMARY DESCRIPTION

This module will serve to give students a detailed view of the logistical and management problems associated with the design and deployment of a digital communications network in a variety of operational settings. The Network Management function will be examined and the industry standard protocols that exist will be analysed in regard to their performance and efficiency. Industry case studies will be used to provide practical evidence as to the methods used to implement high-speed management frameworks which are built by leading vendors to support the LAN-WAN and Internet environments across fixed and converged freespace boundaries.

MODULE TITLE:	Intelligent Systems	
MODULE CODE:	COM850C1	
DATE OF REVISION:	2007-8	
MODULE LEVEL:	7	
CREDIT POINTS:	15	
MODULE STATUS:	Compulsory	
SEMESTER:	2	
LOCATION:	Coleraine	
E-LEARNING:	web-dependent	
PREREQUISITE(S):	<i>None</i>	
CO-REQUISITE(S):	<i>None</i>	
MODULE CO-ORDINATOR(S):	Hickey, RJ Mr	
TEACHING STAFF RESPONSIBLE FOR MODULE DELIVERY:	Hickey RJ, Mr	
HOURS:	Lectures (on-line)	20 hours
	Seminars(face-to- face/on-line discussion)	40 hours
	Tutorials (face-to-face)	6 hours
	Practicals (on-line)	20 hours
	Independent study (including assessment)	64 hours
TOTAL EFFORT HOURS:	150	
ACADEMIC SUBJECT:	COM	

RATIONALE

Computer systems that provide enhanced functionality through the use of Artificial Intelligence (AI) are increasingly employed in a variety of application areas within scientific research, industry and commerce. It is therefore appropriate that there be an advanced module that surveys the field and provides students with experience in the use of the some of the major techniques. This module presents an account of several approaches with a major focus on the use of Machine Learning (ML) for knowledge discovery from databases (KDD) through data mining. The deployment of AI through expert systems and agents is considered in various settings, including the Web.

AIMS

The specific aims of the module are:

1. To provide an understanding of the purposes, capabilities and range of applications of systems that deploy Artificial Intelligence (AI) techniques including Knowledge Discovery through Data Mining.
2. To develop the ability to identify an appropriate AI solution to a problem.
3. To develop skill in using an AI programming environment and a Data Mining package.

LEARNING OUTCOMES

A successful student will be able to show that he/she can:

KNOWLEDGE AND UNDERSTANDING

- K1 Understand how knowledge can be acquired, represented and reasoned within a computer system including expert systems
- K2 Understand search techniques and how they contribute to the implementation of intelligence in computer systems
- K3 Explain the motivation for, the architecture, and the roles of intelligent agents within an overall system
- K4 Explain the basic principles of the symbolic and neural learning and discovery paradigms and describe several ML/data mining algorithms

INTELLECTUAL QUALITIES

- I1 Identify the tasks within a variety of application areas, which are likely to benefit from an AI approach and design an appropriate AI solution
- I2 Assess the level of intelligence in currently deployed systems including expert systems and agents
- I3 Select, with justification, learning/mining algorithm(s) to solve particular knowledge acquisition tasks

PROFESSIONAL/PRACTICAL SKILLS

- P1 Develop programs in an AI language
- P2 Carry out a data mining exercise using a data mining package

TRANSFERABLE SKILLS

- T1 Demonstrate communication skills, including the ability to present technical issues in an appropriate form
- T2 Investigate, assess and report on current research activity within AI and knowledge discovery

CONTENT*Systems that think (40%):*

Definitions of Artificial Intelligence (AI); tasks for which an AI approach is suitable.; main sub-areas; relationship to Computing Science.

First Order (Predicate) Logic; the thinking machine; the Prolog language and Inference engine.

Reasoning under uncertainty; Bayesian belief networks, fuzzy logic.

Search in AI; state space representation of problems; blind and heuristic search.

Systems that learn and discover (35%):

Definitions of Machine Learning (ML); examples of tasks suitable for learning. Knowledge Discovery from Databases (KDD); the CRISP-DM process model.

Concept learning; evaluation of learning; decision tree learning; artificial neural network learning; overfitting.

Discovery; clustering; association; recommender systems.

The Clementine environment; tools for data understanding, data preparation, model building and evaluation.

Deploying AI (25%)

Expert Systems; agents; agent communication; learning in agents.

Autonomous systems.

Data Mining for Computer security.

LEARNING AND TEACHING METHODS

Lectures will consist of on-line lecture notes (divided into weekly reading blocks) which provide an exposition of the principles of AI and learning and mining. These will be illustrated through case studies and other worked examples.

Tutorials will be given face-to-face at the beginning, middle and end of the semester. This will provide: orientation for the module, including advice on how to study; introductions to software for practical work (installation, user guides and demonstrations); briefings on coursework; opportunities to raise issues.

Practical exercises will be provided online as a programme of weekly practical blocks, linked to the reading blocks for students to carry out in their own time. Support will be offered using on-line discussion boards.

Seminars, given face-to face and through on-line discussion boards will provide an opportunity for students to discuss, with each other and staff, problems and issues arising from lecture and practical materials and independent reading.

Students will be directed to read from a variety of texts and web-sites. The latter will include general portal sites offering additional reading on topics introduced in lecture notes; sites of prominent research groups providing research project overviews and papers including case studies; commercial sites offering white papers on software developments; business and academic web blogs which discuss issues of the day, on current research, deployment of AI, social/moral/political implications of AI usage.

Students will be expected to: follow the weekly programme of study; access and contribute regularly to discussion boards on-line.

The module is web dependent.

ASSESSMENT**Coursework 1: (20%)**

Design and implementation of a network-based intelligent system using Prolog.

This will measure the student's achievement of learning outcomes K1, I1, P1 and T1.

Coursework 2: (10%)

An essay of about 1500 words on a given research topic.

This will measure the student's achievement of learning outcomes I2, T1 and T2.

Coursework 3: (20%)

Data Mining mini-project using Clementine.

This will measure the student's achievement of learning outcomes I3, P2, T1.

Examination: (50%)

Students will attempt three questions from five equally weighted questions in a two hour examination. There are no compulsory questions.

The examination will measure the student's achievement of learning outcomes K1, K2, K3, K4, I1, I2, I3 and T1.

50 % Coursework

50 % Examination

READING LIST*Required*

Merritt, D 2007, *Adventures in Prolog*. Retrieved 1 February, 2007 from www.amzi.com/AdventureInProlog/advfrtop.htm.

CRISP-DM V1 Process Model and User Guide. Retrieved 1 February, 2007 from www.crisp-dm.org/Process/index.htm.

Recommended

Russell, SJ & Norvig, P 2002, *Artificial Intelligence: A Modern Approach*, 2nd edn, Pearson US Imports & PHIPES, London.

Witten, IH & Frank, E 2005, *Data Mining: Practical Machine Learning Tools and Techniques with Java Implementations*, 2nd edn, Morgan Kaufmann, San Mateo, CA.

Larose, DT 2005, *Discovering Knowledge in Data: An Introduction to Data Mining*, Wiley, Chichester.

Maloof, M (ed.) 2005, *Machine Learning and Data Mining for Computer Security*. Springer, Berlin.

Black, MMB & Hickey RJ 2006, *Rationalization of data used in model of time varying event behaviour*, U.S. Patent 7024426.

Danyluk, A & Provost, F 2001, 'Telecommunications Network Diagnosis'. Retrieved 5 December, 2007 from <http://pages.stern.nyu.edu/~fprovost/>.

Lawrence, RD, Almasi, GS, Kotlyar, V, Viveros, MS, Duri, SS 2001, 'Personalization of Supermarket Product Recommendations', *Data Mining and Knowledge Discovery*, vol 5, pp 11-32.

Jochem, T & Pomerleau, D 1996, 'Life in the Fast Lane: The Evolution of an Adaptive Vehicle Control System', *AI Magazine*, vol 17, pp 11-50. Retrieved 1 February, 2007 from www.aaai.org/Library/Magazine/vol17.php#Summer.

AITopics, www.aaai.org/aitopics/html/welcome.html .

UMBC Agents, agents.umbc.edu/ .

Carnegie Mellon Intelligent Software Agents lab , www-2.cs.cmu.edu/~softagents/ .

KDNuggets, www.kdnuggets.com .

SUMMARY DESCRIPTION

The notion of an artificially intelligent system is introduced. The roles of Machine Learning and of the discovery of knowledge from databases are highlighted. A variety of application areas for such systems are discussed in several environments including the Web. Deployment through agents is described. Students will experiment using an Artificial Intelligence development environment and a data mining package.

MODULE TITLE:	Research Methods	
MODULE CODE:	COM853C2	
DATE OF REVISION:	2007-8	
MODULE LEVEL:	7	
CREDIT POINTS:	15	
MODULE STATUS:	Compulsory	
SEMESTER:	2	
LOCATION:	Coleraine	
E-LEARNING:	Web-dependent	
PREREQUISITE(S)	None	
CO-REQUISITE(S)	None	
MODULE CO-ORDINATOR(S):	Scotney B, Professor	
TEACHING STAFF	Scotney B, Professor	
RESPONSIBLE FOR MODULE	McClellan S, Professor	
DELIVERY	Bustard D, Professor	
	(Other lecturers as appropriate)	
HOURS:	Lectures (on-line)	20 hours
	Seminars(face-to-face/on-line discussion)	40 hours
	Tutorials (face-to-face)	6 hours
	Practicals (on-line)	20 hours
	Independent study (including assessment)	64 hours
TOTAL EFFORT HOURS:	150	
ACADEMIC SUBJECT:	Computing	

RATIONALE

Most undergraduate courses provide little grounding in research methods and techniques. There is therefore a need to provide students with the necessary skills required to undertake a research project. The purpose of this module is to introduce students to a range of techniques and skills needed for the organisation, management and implementation of a successful research project.

AIMS

The specific aims of the module are:

1. To introduce students to research techniques and resources commonly employed in Computing Science
2. To prepare students for undertaking a research project and to encourage the development of organisational and management skills
3. To develop generic research skills
4. To foster and develop the ability to critically assess and reflect on current literature in a chosen topic
5. To develop and enhance communication skills, including the writing of a literature review

LEARNING OUTCOMES

A successful student will be able to show that he/she can:

KNOWLEDGE AND UNDERSTANDING

- K1 Understand current research publications and the nature of research in general
- K2 Understand the process and development of a research project
- K3 Understand techniques for effective time management and decision making
- K4 Understand strategies for problem solving and the importance of creativity
- K5 Understand descriptive statistics, concepts of hypothesis testing, and effective presentation of research results
- K6 Understand key concepts for technical writing and the importance of presentation skills

INTELLECTUAL QUALITIES

- I1 Critically assess research papers and identify research objectives in a specific research area
- I2 Investigate a range of techniques / technologies to be used in a research project and justify any choices made

PROFESSIONAL/PRACTICAL SKILLS

- P1 Develop a plan for a research project
- P2 Construct and present a literature review on a topic within Computing Science in a coherent and convincing manner
- P3 Identify and formulate a research project proposal of an appropriate standard

TRANSFERABLE SKILLS

- T1 Effectively communicate research findings, both orally and in writing
- T2 Effectively find and select appropriate information using on-line research databases and search tools

CONTENT*Research planning and time management (20%):*

1. project management and organisation
2. monitoring and controlling a project
3. managing your time
4. ethical issues

Problem solving and creative thinking (20%):

1. what is a 'problem'?
2. problem-solving approaches
3. problem-solving techniques
4. taking a decision

Information gathering (20%):

1. evaluation of the quality of information
2. on-line electronic services
3. organization of research materials
4. bibliographic tools

Presentation skills (20%):

1. evaluation and presentation of information (e.g. simulation data)
2. verbal and written communications skills; style in writing
3. structure and organization of a presentation; delivering an effective presentation

Technical writing (20%):

1. structure of a research paper / dissertation
2. the submission and review process
3. reviewing research papers
4. literature reviews
5. Plagiarism detection and avoidance

LEARNING AND TEACHING METHODS

The module will be delivered through blended learning, substantially via e-learning and supported by face-to-face tutorials at the beginning, middle and end of semester.

Lectures will consist of on-line notes (divided into weekly reading blocks) which provide an exposition of the principles and practice of conducting research. These notes will be illustrated through case studies and other examples, and students will be directed to further reading (via specified references and web-based materials).

Tutorial sessions will provide students the opportunity to refine the skills they are developing during the course of the module through the presentation and discussion of results.

Practical exercises will be used to assess student performance in the areas of presentation skills, critical analysis of research papers, development of a literature review and identification of research objectives.

Students will be expected to undertake associated independent learning activities (e.g., information gathering, and the reading of supplementary research papers).

They will be directed to read selected research papers in an agreed research area. They will be provided with the necessary knowledge and information required to successfully investigate, define, organise, manage and present a research project.

ASSESSMENT

Coursework 1: (20%)

This coursework will consist of selecting a number of papers relevant to the student's research project topic and subsequently undertaking a review of the paper(s). The students will have to undertake a typical review process and assess the paper(s) using an example review template. They may also present their results to a group of their peers.

This assignment will measure the student's achievement of module learning outcomes K1, K4, K5, I1, T1 and T2.

Coursework 2: (60%)

The major part of the assessment of the module consists of a project proposal / literature review which will be undertaken in a chosen research topic. The student will present the results of this investigation in a document, of approximately 5000 words to include a review of current research, a set of project objectives and a project plan (for a duration of approximately 12-15 weeks).

This assignment will measure the student's achievement of module learning outcomes K1, K2, K3, K6, I1, I2, P1, P2, P3, T1 and T2

Coursework 3: (20%)

A presentation of the proposed project will be given by each student outlining background information, objectives, project plan, etc.

This assignment will measure the student's achievement of module learning outcomes K6, I2, P1, P3 and T1.

100 % Coursework

0 % Examination

READING LIST

Much of the reading material will be based around selected papers relevant to each student's research topic. This material will be recommended by the lecturers / supervisors once project topics have been chosen.

Required

Dawson, CW 2005, *Projects on computing and information systems: a student's guide*, Addison-Wesley, Harlow.

Dawson, CW 2000, *The essence of computing projects: a student's guide*, Prentice Hall, London.

Recommended

Ayres, R 1999, *The essence of professional issues in computing*, Prentice Hall, London.

Bell, J 2005, *Doing your research project*, Open University Press, Milton Keynes.

O'Connell, F 2001. *How to run successful projects III : the silver bullet*, Addison Wesley, Harlow.

Sharp, JA, Peters, J & Howard, K 2002, *The management of a student research project*, Gower, Aldershot.

Adair, J 1996, *Effective decision-making: a guide to thinking for management success*, Pan, London.

Adair, J 1988, *Effective time management: how to save time and spend it wisely*, Pan, London.

Lewis, H 1999, *Time management for academics*, Peter Francis, Dereham.

De Bono, E 1990, *Lateral thinking for management*, Penguin, Harmondsworth.

Polya, G 1990, *How to solve it*, Penguin Books, Harmondsworth.

SUMMARY DESCRIPTION

The purpose of this module is to introduce students to a range of techniques and skills which can be applied to the organisation, management and implementation of a successful research project. The module will cover topics in research planning and time management; ethical conduct; problem solving and creative thinking; information gathering; presentation skills; technical writing and literature review. The module is assessed via a combination of reports and presentation(s).

MODULE TITLE:	Project	
MODULE CODE:	COM884C4	
DATE OF REVISION:	2007-08	
MODULE LEVEL:	7	
CREDIT POINTS:	60	
MODULE STATUS:	Compulsory	
SEMESTER:	3	
LOCATION:	Coleraine	
E-LEARNING:	Web Dependent	
PREREQUISITE(S):	None	
CO-REQUISITE(S):	None	
MODULE CO-ORDINATOR(S):	McAlister MJ, Dr	
TEACHING STAFF RESPONSIBLE FOR MODULE DELIVERY:	McAlister MJ, Dr	
HOURS:	Lectures	0 hours
	Seminars	0 hours
	Scheduled Meetings (face-to-face)	20 hours
	Online Discussions	40 hours
	Independent study (including assessment)	540 hours
TOTAL EFFORT HOURS:	600 hours	
ACADEMIC SUBJECT:	COM	

RATIONALE

This module enables students to bring together the knowledge and skills attained in earlier modules to investigate a selected research topic, review the relevant literature, prepare a technical report, present and prepare material in the form of a dissertation and attend a viva. The project is undertaken individually and can be industrially related.

AIMS

The aims of this module are to provide students with a thorough and in-depth understanding of the core concepts in Telecommunications and Computer Networking by considering the fundamental areas. The module will focus on:

1. Develop and synthesize knowledge and skills gained on the taught element of the programme, allowing the student to see their relevance and application.
2. Develop further research and project management skills.
3. Develop and enhance interpersonal and management skills.
4. Develop and transferable and intellectual skills that will enhance their potential.
5. Communicate findings both orally and in writing..

LEARNING OUTCOMES

A successful student will be able to show that he/she can:

KNOWLEDGE AND UNDERSTANDING

- K1 Identify and define a research topic, outline its investigation and present/interpret findings
- K2 Demonstrate an awareness of the processes involved in managing people and information in complex IT problems.
- K3 Recognize the need for a multi-disciplinary perspective when developing solutions to problems encountered during the dissertation process.
- K4 Understand the ethical, corporate and social responsibilities of organizations.
- K5 Recognize the need for a multi-disciplinary perspective when developing solutions to problems encountered during the dissertation process.
- K6 Explore and analyze an advanced problem.
- K7 Demonstrate and apply research methods to solve problems relevant to the dissertation.

INTELLECTUAL QUALITIES

- I1 Synthesize and evaluate arguments and evidence relevant to the dissertation.
- I2 Locate and extract data from multiple sources relevant to the dissertation.
- I3 Discriminate in the planning, selection and presentation of information, methods and resources used to complete the dissertation.
- I4 Develop issues relevant to the dissertation.
- I5 Identify, analyze and draw reasoned conclusions from data relevant to the dissertation.

PROFESSIONAL/PRACTICAL SKILLS

- P1 Develop written and oral communication skills and be able to convey ideas to a third party
- P2 Contrast, evaluate and apply differing learning styles and processes relevant to project completion.
- P3 Diagnose the fundamental problem encountered and decide the most efficient solution.
- P4 Develop effective listening, negotiating and conflict solving skills relevant to the dissertation.
- P5 Develop an ability for independent, self-motivated action action.

TRANSFERABLE SKILLS

- T1 Develop project management skills
- T2 Demonstrate an ability to work independently and show enterprise, initiative, originality and independence of thought
- T3 Demonstrate sufficient knowledge and research skills within their specialism to enable them to proceed either to an MPhil/DPhil research degree or to a PhD
- T4 Demonstrate communication skills.
- T5 Manage and develop personal and interpersonal skills relevant to the dissertation.

CONTENT

The student will select a research proposal. Each student will have an academic supervisor, allocated from within the School of Computing & Information Engineering. The student, in consultation with the academic supervisor, will determine the nature and structure of the dissertation. The academic supervisor will provide guidance on defining the research question, collecting data and structuring the dissertation.

For those students who have an industry-based project they will also have an industrial supervisor. The student will agree with their supervisors on the process to be followed for the project. The industrial supervisor will ensure that the work has relevance to company initiatives and the academic supervisor will ensure that the academic requirements of the project are met.

The following aspects encapsulate the teaching on the module:

Preparation & Planning (10%)

- Select a project

- Preparation of a work plan to identify the appropriate techniques and the project structure

Literature review (20%)

- Undertake a literature review.

System development (40%)

- Develop a system which defines the results of the investigation

- Prepare a technical report which summarized technical development and implementation

Dissertation preparation (30%)

- Write up the dissertation

- Deliver a viva

TEACHING AND LEARNING METHODS

Three methods will be used:

1. Directed reading.
2. On-going consultation with a supervisor and other staff working in the area.
3. Independent investigation and analysis.

Delivery mechanisms will use a combination of on-line discussion/study aids/CBT/Internet.

Meetings between student and supervisor(s) will vary according to requirements but can be up to 2 hours a week face-to-face for the duration of the project in the summer months. Additional online discussions will take place on a regular basis.

ASSESSMENT

Coursework 1: (10%)

Develop a technical paper. The paper will take the form of a six page technical document in ACM/IEEE format. The document will define the problem statement, a description of design work undertaken and approach to problem, an outline of the implementation and the proposed evaluation. The document should include all of the evidence that readers need to have in order to understand the subject including details, data, results of any tests and conclusions. Exactly what you include in the body and how it is organized will be determined by the context in which you are writing. The format of the report is defined in the Technical Report Guidelines and should be followed exactly.

This assessment will measure learning outcomes K1-K3, I1-I5, P2-P5 and T1-T3.

Coursework 2: (60%)

A written dissertation of 15000-20000 words which will be examined by two internal examiners, one of whom will be the project supervisor.

Viva: (20%)

An oral examination which will normally be examined by the supervisor, second marker and project co-ordinator. The developed software will be demonstrated at this time.

Supervisor's assessment of the candidate (10%)

This assessment will measure learning outcomes K1-K7, I1-I5, P1-P5 and T1-T5.

100 % Coursework

0 % Examination

READING LIST

Required

De Marco, T 1997, *The Deadline*, Dorset House Publishing, London.

SUMMARY DESCRIPTION

The dissertation module integrates and further develops the knowledge and skills acquired within the taught element of the programme. The module specifically allows the student to apply the knowledge and skills acquired to undertake a dissertation.

SECTION C: COURSE MANAGEMENT

C1 Equality of Opportunity; Admissions Policy; SENDO

The University is committed to ensuring equality of opportunity. No student will be excluded on grounds of religious belief, political opinion, racial group, age, gender, marital status or sexual orientation. The Faculty of Computing and Engineering follows the University's equal opportunities and admissions policy for all its courses. Applications for home students will be considered by the Course Director who may seek further clarification through contact with applicant as to whether admission criteria are met. Applications from international students are considered by the International Office who may seek advice from the Course Director.

The Special Educational Needs and Disability (NI) Order 2005 (SENDO) applies to all aspects of teaching and learning and assessment and student support. Staff are obliged to anticipate the requirements of disabled students so that they are not placed at a disadvantage and to make reasonable adjustments.

The University's Admissions Policy to which all courses within the Faculty of Engineering are governed, states that, with regard to disability: "applications from disabled students should be assessed according to normal academic criteria. In addition, account should be taken of the nature of the disability and its likely effect on entrance qualifications, on the students' ability to undertake the programme of study and on the University's ability to provide for the candidates' personal needs in relation to the particular disability and programme of study".

Individuals with disabilities are encouraged to apply for places, and are provided with unobtrusive and personalised support so that they can realise their full potential. Arrangements are made for successful applicants to contact staff well in advance of the commencement of arrival so that mutually satisfactory preparation can take place.

The programme does not have a separate curriculum provision for students with disabilities but seeks to ensure total inclusion through removal of barriers to accessibility. This is achieved through flexible teaching methods and the provision of a raft of University-wide facilities and services that meet individual student needs.

C2 Student Support & Guidance

Students and their learning are supported in a number of ways:

- A phased face-to-face *Induction Programme* that introduces all aspects of the course, including tutorials on software packages, advice on time management, introduction to faculty and university services.
- Provision of a *Faculty Student Handbook* (CD) that contains essential information for students studying within the Faculty. This handbook provides details of all of the key issues in relation to the faculty including academic

structures, student support, study requirements, career and further study options etc.

- Provision of a *Course Student Handbook* that contains the essential information for the programme. This provides details of all of the key issues in relation including learning outcomes, assessment strategy, rules and regulations etc.
- Each Module is supported by the provision of a *Module Handout* which provides an outline of key issues relevant to a module such as schedule for study, an outline of the assessment, class times and staff contact details The *Module Description* provides greater detail including learning outcomes, syllabus (including practical work) and references for study.
- Each student is allocated a personal *Studies Advisor* who has the responsibility of assisting them in their personal and career development. Studies Advisors are charged with assisting their students in adapting to the requirements of a University environment and are required to meet with their students on a regular basis so that any problems can be identified at an early stage and corrective action taken. Duties of Studies Advisers can be found at Appendix 30 of the Programme Approval, Management and Review Handbook (July 2007). Where problems are of a more serious nature or require more specialist advice, students may be directed to other teaching staff, the Course Director, University Counselling Service or Medical Services.
- The University's centralised *Department of Student Support* is available to help students achieve the maximum benefit from their University life. Students encounter personal challenges in learning and in living within the university environment. Their purpose of the Department of Student Support is to assist students, not only in relation to academic achievement, but also in their social and personal development, and to help them plan their future careers. There are a number of key areas of that are of particular use to students and these include Accommodation Services, Health Services, Nursery Care, Students Union and Student Development (which includes Counselling & Guidance and Careers).
- Face-to-face attendance and on-line activity are carefully monitored; the latter is effected using on-line tracking mechanisms and participation in discussion forums. Students are governed by regulation 9.1.

C3 Arrangements for Personal Development Planning (PDP)

Students will receive formal face-to-face PDP induction and training in the use of the associated software system, PDS. PDP is monitored by staff involved in the Research Methods module and by Masters project supervisors. These staff will encourage usage of the PDS system; in particular, throughout their project work, students will be asked to submit draft documents for discussion as well as minutes of meetings.

C4 Staff Student Consultative Committee

While not strictly management, the Staff-Student Consultative Committee (SSCC) assists in informing the Course Committee. Class representatives are elected for each year of the course. The SSCC meets at least once per semester and class representatives are elected for each year of the Programme. The latter are expected to bring forward any issues raised by the student group they represent. Minutes from the SSCC are considered at Course Committee level. In addition, consultation with students is required for any proposal to amend a course during its period of approval.

C5 Work-based learning

The main opportunity for work-base learning arises from a project undertaken for a local Telecommunications company. Currently British Telecom and Asidua specify several such projects each year. Typically, these involve an investigation into a real problem of substance and importance to the company. A recent example was the contribution made by a student to the drive by British Telecom to achieve 100% Broadband coverage on Northern Ireland.

Further opportunities come from summer Internships, such as those provided by CISCO, California and Ericsson Research, Ireland. Here students will work for the company typically over a four month period in the summer following completion of their Diploma examinations. As part of this activity, a project will be specified and supervised by a member of the company in addition to the usual appointed University supervisor. In one recent case, a student working for CISCO produced a solution to a problem which is currently being turned into a product by the company.