## MSc in Network Centred Computing (NCC) For students entering in October 2009

Awarding Institution: Teaching Institution:

Programme length:

Date of specification: Programme Director: Board of Studies: Accreditation: The University of Reading The University of Reading, with contributions from other EU universities Faculty of Science 12 months full-time, 24 months parttime September 2009 Professor Vassil Alexandrov MSc in Network Centred Computing

### Summary of programme aims

The Advanced European MSc program in NCC aims to provide training for Honours graduates (or "equivalent") whose career aims include Network Centred Computing in a broad sense with focus through different specialisations on, High Performance Computing and Communication, Computational Sciences, Data Communications and Networking or E-Business. This is a two semester program consisting of six months taught component (part 1) and 6 months project placement (part 2).

The programme aims to develop and reinforce the net-centric approach to problem-solving; to develop the intellectual and practical skills of the students in recognising, formulating, defining important problems from multidisciplinary point of view; to devise efficient techniques to solve important scientific and industrial problems on systems ranging from the local cluster to the Grid.

**Transferable skills covered are** personal effectiveness, interpersonal skills, teamwork, technical communication (oral and written) and interview techniques, project management, self-management, risk assessment, efficient deployment of software tools, computer systems evaluation, marketing and business awareness for the streams with more business orientation as well as research and technical writing skills.

#### **Programme content**

The course content gives a broad and in-depth coverage of state-of-the-art parallel, scientific and network computing, including computer architectures; parallel algorithm design; modern scientific languages; tools and environments for advanced architectures; tools and environments for network-centred computing; tools and environments for scientific computation; collaborative computing and virtual reality, e-payments and security, scientific foundations of image processing and computer vision, knowledge discovery, data mining and web development, etc.

Graduates, depending on the stream they are selecting will be well equipped to pursue a career in the area of e-business and mobile computing, parallel scientific and network computing, or software engineering in industry and/or research respectively.

#### **Modular arrangements**

This is a modular program of one and two week long modules. Part 1 consists of a set of six CORE modules worth 60 credits and a further set of modules totalling 60 credits selected from a set of CROSS-CUTTING modules and a set of STREAM modules (two streams are provided; see below). A module consists usually of 30 contact hours of lectures/practicals (labs) and expects overall work from the student worth 10 credits. Part 2 consists of a 6 month project placement culminating in a written Dissertation worth 90 credits.

CORE MODULES	5	Credits	Level
SEMC1A	Advanced Programming on UNIX	10	7
SEMC02	Network Computing	10	7
SEMC03	Computer Architectures	10	7
SEMC04	Object Oriented Design	10	7
SEMC05	Internet Computing Environments	10	7
SEMC06	Transferable Skills	10	7
MAMB6	Industrial Mathematics (assessed as part of	non-	7
	SEMC06)	credited	
SEMC7A/7B	Dissertation Project	90/30	7

# **Cross-cutting modules:**

Cross-cutting modules focusing on advanced computing, programming techniques for advanced architectures, mathematical modelling and simulation, collaborative tools and mobile computing for academia and industry:

		Credits	Level
Select 3 out of	the following modules:		
SEMS04	Programming and Algorithmic Techniques for	10	7
	Advanced Architectures		
SEMS05	Algorithms for Data Mining and Information		7
	Retrieval		
SEMS07	Collaborative Virtual Environments	10	7
SEMS08	Security and E-payment	10	7
SEMS14	Databases & Advanced DBMS	10	7
SEMS25	Web Services	10	7
SEMS30	Mathematical Modelling	10	7
SEMS32	Scientific Visualisation	10	7
SEMS34	Applied Mobile Computing	10	7
SEMC10	Postgraduate Research Skills	10	7

Select 3 out of the following modules:

# Computational Science & High Performance Computing and Communication stream/specialisation

Level
7
7
7
7
7
7

# Or Select 3 out of the following modules

e-Business &	k data	communication	and
networking			

Credits	Level
10	7
10	7
10	7
10	7
10	7
10	7
10	7
10	7
10	7
	<i>Credits</i> 10 10 10 10 10 10 10 10 10

#### **Part-time arrangements**

Part-time option is available over 2 years. The taught component (Part 1- 12 modules with pass mark) is expected to be taken during the first 12/18 months and since the program has two intakes, October and February, these modules can be taken in flexible way.

#### **Progression Requirements**

Progression from Part 1 to Part 2 is determined by the Board of Examiners in accordance with the University Framework for Postgraduate Courses, and it requires achieving mark 50% or more in every taught module.

#### Summary of teaching and assessment

Teaching in Part 1 is organised in modules lasting one or two weeks. A week long module consists usually of 30 contact hours lectures/practicals (labs) and expects overall work from the student worth 10 credits (5ECTS). Each of these modules last one or two weeks. Assessment is by examination and/or coursework - details are given in the relevant module description.

The University's taught postgraduate marks classification is as follows:

Mark Interpretation 70 – 100% Distinction 60 – 69% Merit 50 – 59% Good standard (Pass)

<u>Failing categories</u>: 40 - 49% Work below threshold standard 0 - 39% Unsatisfactory Work

The final award is determined by the Board of Examiners in accordance with the University Framework for Postgraduate Courses where the requirements to qualify for an award of:

• **MSc Degree (210 credits)**, achieving 120 credits (mark 50% or more in every taught module) from the taught part (Part1) and 90 credits from the Dissertation (Part 2);

Students who gain an average mark of 70% or more overall including a mark of 60% or more for the dissertation and have no mark below 40% will be eligible for a Distinction. Those gaining an average mark of 60% or more overall including a mark of 50% or more for the dissertation and have no mark below 40% will be eligible for a Merit.

- **PG Diploma** (**120 credits**) achieving 50% and above in every module on modules worth 120 credits one of which can be a "Mini-dissertation" worth 30 credits as specified by the Board of Examiners.
- **PG Certificate (60 credits)** are the achievement of a mark 50% or more in every taught module;

Overall examination result	Usual recommendation
50% and above in every module on 12 modules (Part	MSc Degree
1) and MSc Dissertation (90 credits)	
50% and above in every module on modules worth	PG Diploma
120 credits	
50% and above in every module on 6 modules	PG Certificate
49% or less on more than 6 modules	Fail

#### **Admission requirements**

Entrants to this programme are normally required to have obtained:

**First Cycle Degree in Sciences, e.g. BSc, BEng or other:** A good honours degree with sufficient mathematical content and computing experience or equivalent qualification and background as approved by the University. Typically, graduates in Computer Science, Cybernetics, Engineering, Mathematics and Physics, or in joint Mathematics/Computer Science will be acceptable.

**First Cycle Degree with non-science background or** Graduates in other disciplines may be admitted to the programme if their level of computing experience as approved by the University are acceptable.

# Support for students and their learning

University support for students and their learning falls into two categories. Learning support includes IT Services, which has several hundred computers and the University Library, which across its three sites holds over a million volumes, subscribes to around 4,000 current periodicals, has a range of electronic sources of information and houses the Student Access to Independent Learning (S@IL) computer-based teaching and learning facilities. There are language laboratory facilities both for those students studying on a language degree and for those taking modules offered by the Institution-wide Language Programme.

Student guidance and welfare support is provided by Personal Tutors, School Senior Tutors, the Students' Union, the Medical Practice and the Student Services Centre. The Student Services Centre is housed in the Carrington Building and includes the Careers Advisory Service, the Disability Advisory Service, Accommodation Advisory Team, Student Financial Support, Counselling and Study Advisors. Student Services has a Helpdesk available for enquiries made in person or online (www.risisweb.reading.ac.uk), or by calling the central enquiry number on (0118) 378 5555. Students can get key information and guidance from the team of Helpdesk Advisers, or make an appointment with a specialist adviser; Student Services also offer drop-in sessions on everything from accommodation to finance. The Carrington Building is open between 8:30 and 17:30 Monday to Thursday (17:00 Friday and during vacation periods). Further

information can be found in the Student Diary (given to students at enrolment) or on the Student website (<u>www.reading.ac.uk/student</u>).

## **Career prospects**

The program is an example of the collaboration with industry in creating a model ICT curricula through the Career Space consortium (<u>www.career-space.com</u>). Different streams are focused on different job profiles:

- Computational Science and High Performance Computing and Communication is focused toward following job profiles: *in multidisciplinary research, design and development, in particular specialists in Mathematical Modelling, Data Visualisation, Algorithms Design and Implementation, Systems Specialist, Network Design and Grid Computing, Software Architecture and Design, DSP Applications Design, Integration/Implementation & Test Engineering.*
- Electronic Business and Data Communications and Networking is focused towards the following job profiles: Software Architecture and Design, Systems Specialist, Communications Network Design, Software & Applications Development, Multimedia Design, Data Communications Engineering, IT Business Consultancy, Product Design, DSP Applications Design, Communications Network Design, Integration/Implementation & Test Engineering.

# **Opportunities for study abroad or for placements**

Study abroad is through exchange with our EU partners through the EC ERASMUS program and/or on individual basis as far as student project placements are concerned.

#### **Educational aims of the programme**

The Advanced European MSc program in Network Centred Computing takes a net-centric approach and aims to teach the students of the new way to conduct multidisciplinary research based on advanced computing techniques, where the network is the computer and enabling "scientific discovery through advanced computing" and focusing on High Performance Computing and Communication, E-commerce, Software Engineering & HCI, and Cybernetics.

The main aims are:

- To prepare students for critical evaluation and testing of computer systems, to efficiently deploy theory, practices and tools for the specification, and implementation of complex computer systems.
- To Prepare students for teamwork
- To Prepare students for employment focusing the program to set of job profiles as described in Career Space consortium.
- To enable students to engage in life-long learning.

	Milowieuge	unu	Onderstanding
<b>A.</b>	Knowledge and understanding of:		Teaching/learning methods and strategies
	Understanding how to solve complex		
	scientific problems in a networked		Acquisition of knowledge is achieved
	environment		through lectures, practicals and seminars.
	Algorithmic thinking, advanced models		More advanced knowledge and concepts are
	of computation, analysis of algorithms		gained based on the above techniques and
	complexity, techniques for its estimation		through teamwork, team projects, and
	and measurement, existence of		individual projects and directed and self-
	intractable problems —	$\rightarrow$	paced study and learning.
	Knowledge of advanced programming		
	and communication techniques for		
	networked architectures		
	Knowledge of Web based systems and		Assessment
	building Web applications		Assessment methods are specified for each
	Multimedia data technologies		module. There are exams, project
	Network security		assignments, oral presentations and
	Wireless and mobile computing		Dissertation.
	Specific body of knowledge through		
	each stream such as: E-payments,		
	Computer Graphics Techniques,		
	Advanced Instrumentation etc.		

# Knowledge and Understanding

# Skills and other attributes

<b>B. Intellectual skills</b> – able to:	Teaching/learning methods and strategies
<ul> <li>Integration of Theory and practice</li> <li>Critical evaluation software environments, their limitations and suggest improvements</li> <li>Synthesise information from data for decision making</li> <li>Advanced decision making</li> <li>Analyse results of advanced computational experiments</li> <li>Demonstrate skill necessary to plan and conduct advanced research</li> <li>Demonstrate ability to understanding and explain advanced concepts, principles and theory related to Network Centered Computing and Computing Applications</li> </ul>	<ul> <li>Project work, tutorials, seminars and coursework assignments. Open-ended project work is permitting the students to demonstrate the achievements of all learning outcomes in this category.</li> <li>Assessment</li> <li>Through formal examination, coursework and practical and project work. Methods for assessment are: research reports, essays, oral presentations open and closed book examination.</li> </ul>

<b>C. Practical skills</b> – able to:	
	Teaching/learning methods and strategies
<ul> <li>Critically evaluate the problems and choose appropriate methods and algorithms for their efficient solution.</li> <li>Applying advanced methods and techniques for solving complex problems</li> <li>Use advanced theories and concepts to explain complex processes</li> <li>Manage practical projects efficiently</li> <li>Consider and analyse the problem to be solved from multidisciplinary point of view.</li> <li>Evaluate and analyse the outcomes of computational experiment.</li> <li>Write an efficient complex piece of code.</li> <li>Efficiently deploy appropriate theory, practices and tools for the design, evaluation and implementation of</li> </ul>	<ul> <li>Practical skills are developed through a practical project work, tutorials and course work assignments. Especially the open-ended project and practical work is designed to permit students to show achievements of all the learning outcomes in this category.</li> <li>The skills are taught embedded as integral part of various modules.</li> <li>Assessment The skills are assessed via the course work assessment as parts of the mark are awarded for achieving a level of skill appropriate for a postgraduate student (as recommended by the professional bodies in the field). </li> </ul>
computer systems	
<b>D. Transferable skills</b> – able to:	Teaching/learning methods and strategies
<ul> <li>Capacity to learn intensively</li> <li>Capacity to communicate efficiently by written and verbal means</li> <li>To write research reports and papers</li> <li>To do efficient search of information and select the relevant one.</li> <li>Problem solving skills</li> <li>Ability to work as part of a team</li> <li>Ability to work independently</li> <li>Project planning and time/task management through individual/team</li> </ul>	A separate module on Transferable Skills which includes lectures, practical exercises, formal oral presentations and written assignments. These skills are further developed throughout the programme through assignments, team projects and team work as well as tutorial and seminar work. Assessment Coursework assignments, Essays, Technical

*Please note* - This specification provides a concise summary of the main features of the programme and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. More detailed information on the learning outcomes, content and teaching, learning and assessment methods of each module can be found in the module description and in the programme handbook. The University reserves the right to modify this specification in unforeseen circumstances, or where the processes of academic development and feedback from students, quality assurance processes or external sources, such as professional bodies, requires a change to be made. In such circumstances, a revised specification will be issued.