

**MSc in Advanced Computer Science (full-time)  
For students entering in 2013/4**

Awarding Institution:	University of Reading
Teaching Institution:	University of Reading
Relevant QAA subject Benchmarking group(s):	Computing
Faculty:	Science Faculty
Programme length:	12 months
Date of specification:	12/Aug/2013
Programme Director:	Dr Giuseppe Di Fatta
Programme Advisor:	Dr Hong Wei
Board of Studies:	Computer Science
Accreditation:	British Computer Society (BCS) (subject to approval)

**Summary of programme aims**

The programme is intended for students who have already studied Computer Science or a closely related subject as their first degree. It allows students to explore a variety of topics in advanced computing and programming paradigms, computer vision, visualisation and interactive technologies, computational intelligence, machine learning, data mining and knowledge discovery. The modules are designed to provide the students with a state-of-the-art knowledge on the current research and challenges in Computer Science.

The programme aims to provide students with:

- An in-depth understanding of modern computing and programming paradigms, such as Distributed Computing (e.g., Cloud Computing) and High Performance Computing (e.g., GPU programming).
- An in-depth understanding machine learning and data mining algorithms and practical experience with data analytics tools;
- A thorough grounding in, and hands-on experience of, advanced applications in computer vision and brain-computer interface;
- An appreciation of current interactive technologies, such as immersive visual environments (e.g., power-walls), haptic devices, virtual reality environments;
- An opportunity to carry out a multi-disciplinary research project. The proposed model will be co-supervision of two researchers, one from the School of Systems Engineering for the computing aspects and one from another School of the University for the application domain;
- A broad training in, and hands-on experience of, knowledge discovery process in multi-disciplinary domains;
- An easier choice for the next step in their career. Students can either continue onto a PhD programme, if they wish to, or join the IT industry immediately after graduation.

**Transferable skills**

As part of this programme students are expected to have gained experience and show competence in the following transferable skills: computing (parallel and distributed computing middleware, standard and mathematical software, visual programming, flow-based programming), scientific writing, oral presentation, team-working, problem-solving, digital literacy and time-management.

**Programme content**

The profile below states modules of this taught MSc course. The modules in Term 1 (Autumn) are worth 60 credits, those in Term 2 (Spring) 60 credits, and the project in Term 3 (Summer) another 60 credits, totalling 180 credits.

**Term 1 (or two terms part time)**

Code	Title	Credits	Level	Comp/ Opt
SEMBC13	Brain-Computer Interface	10	7	C
SEMDM13	Data Analytics and Mining	10	7	C
SEMRS11	Research Studies	10	7	C
SEMVR13	Interactive Virtual Reality	10	7	O
SEMIP12	Image Processing	10	7	O
SEMMA13	Engineering Mathematics and Statistics	10	7	C
MMM038	Practice of Entrepreneurship	20	7	O
SE3SL11	Social, Legal and Ethical Aspects in Engineering	10	6	O

### Term 2 (or two terms part time)

Code	Title	Credits	Level	Comp/Opt
SEMBD13	Big Data Analytics	10	7	C
SEMCC13	Cloud Computing	10	7	C
SEMGP13	GPU Computing	10	7	C
SEMSI11	Swarm Intelligence & Artificial Life	10	7	C
SEMVI11	Visual Intelligence	10	7	C
SEMMD12	Manipulator Dynamics & Haptics	10	7	O
SEMMI12	Medical Image and Signal Processing	10	7	O
SEMNN12	Advanced Neural Networks	10	7	O

### Term 3 (or two terms part time)

Code	Title	Credits	Level	Comp/Opti
SEMPR12	MSc Project (either an individual research project or an industry project)	60	7	C

### Part-time or modular arrangements

Part-time students will be able to take the taught elements of the MSc in the Autumn and Spring terms over two consecutive academic years.

The MSc project for part-time students will start in April of the first year of registration and will end in September of the second year of registration.

In addition to the full-time and two year part-time options, the programme is offered on a flexible modular basis, giving the opportunity to individuals who are in full-time employment to gain an MSc in Advanced Computer Science (180 credits, including a dissertation), a Postgraduate Diploma (120 credits without a dissertation) or a Certificate (60 credits), or to take the taught modules as free-standing CPD courses. Students in the flexible mode will have a maximum of five years to earn up to 180 credits.

The award of the Postgraduate Certificate and the Postgraduate Diploma will be dependent upon the successful completion of 60 credits and 120 credits, respectively, of the course at the same pass marks as for the Masters Degree. Because of the nature of the flexible modular option, students may be awarded the Postgraduate Certificate or Diploma at the termination of any appropriate module.

The maximum study period of five years will allow candidates considerable flexibility in achieving a postgraduate award while continuing to pursue a full-time career in industry. The flexible modular students will take their choice of modules together with the full-time students over the Autumn and Spring terms of each academic year. All the modules last for one term (i.e. 10 weeks). 10-credit modules involve two hours of lecture per week while 20-credit modules involve two hours of lecture as well as a hands-on session or a case study session of two hours per week.

It is also possible to take the taught modules as free-standing training courses and enrol on one of two different basis:

- Continuing Professional Development (CPD) undertaking no assessment;
- as a module with assessment which would then contribute towards a postgraduate qualification (MSc, Diploma, or Certificate).

### Summary of Teaching and Assessment

Teaching is organised in modules that typically involve lectures and tutorial and/or laboratory sessions. Most modules are assessed by a mixture of coursework and formal examination. Some modules are assessed only as coursework. Details are given in the relevant module description.

### Awards Classification

#### Mark Interpretation

70 - 100% Distinction

60 - 69% Merit

50 - 59% Good standard (Pass)

#### Failing categories:

40 - 49% Work below threshold standard

0 - 39% Unsatisfactory Work

### **For Masters Degrees**

To pass the MSc students must gain an average mark of 50 or more overall including a mark of 50 or more for the project. In addition the total credit value of all modules marked below 40 must not exceed 30 credits and for all modules marked below 50 must not exceed 55 credits.

Students who gain an average mark of 70 or more overall including a mark of 60 or more for the project 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 project and have no mark below 40 will be eligible for a Merit.

### **For PG Diplomas**

To pass the Postgraduate Diploma students must gain an average mark of 50 or more. In addition the total credit value of all modules marked below 40 must not exceed 30 credits and for all modules marked below 50 must not exceed 55 credits.

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

### **For PG Certificates**

To pass the Postgraduate Certificate students must gain an average mark of 50 or more. In addition the total credit value of all modules marked below 40 must not exceed 10 credits.

Awarding is made by the Examiners' exercising judgement of the category which best represents the candidate's achievement based on the overall level of performance (the weighted average of the marks), on the profile of marks overall, and on any specific restriction which may apply (for accreditation or other proper purposes), taking into account any relevant special circumstances. Further information on marking criteria, awarding classifications (including the Master's course, Postgraduate Diploma, the Postgraduate Certificate), resits, and resubmissions, is given at <http://www.reading.ac.uk/Exams/> (see the document PGclassification-post-2008.pdf).

### **Admission requirements**

#### **Undergraduate Degree**

At least a 2.1 Honours UK UG degree or overseas equivalent in Computing or in a related discipline with a significant Computing component.

#### **Degree Discipline**

Computer Science, Computer Engineering, or any other discipline with a significant computing component and adequate mathematical background (which should include introduction to Calculus and Linear Algebra).

Applications from graduates of Mathematics are also welcome but will be considered on a case-by-case basis.

#### **English**

For candidates whose native language is not English, proof of competency is required. The two approved tests are:

IELTS (British Council International English Language Test) - score of 6.5

TOEFL (Test of English as a Foreign Language) - score of 590 (computer based version 243)

**Admissions Tutor:** Dr. G. Di Fatta

### **Support for students and their learning**

University support for students and their learning falls into two categories. Learning support is provided by a wide array of services across the University, including: the University Library, the Careers, Placement and Experience Centre (CPEC), In-session English Support Programme, the Study Advice and Mathematics Support Centre teams, IT Services and 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 advisers in the Student Services Centre. The Student Services Centre is housed in the Carrington Building and offers advice on accommodation, careers, disability, finance, and wellbeing, academic issues (eg problems with module selection) and exam related queries. 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 and runs workshops and seminars on a range of topics. For more information see [www.reading.ac.uk/student](http://www.reading.ac.uk/student)

### **Career prospects**

Career prospects for the students of this course tend to be strong as the knowledge and skills acquired are very relevant to the current and future IT industry and digital society. Computing is now the Science underpinning most industry areas and even other traditional sciences with the advent of data-driven science as the new fourth scientific paradigm. Moreover, digital information has penetrated into almost every aspect of today's society. The graduates are expected to be employed in a large variety of sectors. Some graduates will join large multinational companies; others join smaller companies and consultancies; and some may well choose to further their research interests either in the School of Systems Engineering or at other Universities.

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

The Erasmus programme enables students to undertake project work at a number of European Universities.

### **Programme Outcomes**

The programme provides opportunities for students to develop and demonstrate knowledge and understanding, skills, qualities and other attributes in the following areas:

#### **Knowledge and Understanding**

##### **A. Knowledge and understanding of:**

1. Advanced computing and programming paradigms.
2. Science underlying computational intelligence methods and their applications (e.g., computer vision, brain-computer interface and machine learning).
3. The knowledge discovery process and its applications in multi-disciplinary domains.
4. Existing software tools and libraries
5. The state of the art, current problems and new insights in the fields of visualisation and interactive technologies.

##### **Teaching/learning methods and strategies**

- The knowledge required for the different topics is obtained via lectures, tutorials, laboratory sessions, assignments and project work.
- Appropriate software, middleware and libraries are used and introduced when necessary.
- Postgraduate demonstrators in laboratory and project supervisors advise students, and feedback is provided on all continually assessed work.
- By pursuing the course, students are expected to undertake independent research and improve their problem-solving skills.

##### *Assessment*

Most knowledge is tested through a combination of practical sessions, assignments and formal examinations: students write scientific reports on most assignments and oral presentations may also be assessed.

#### **Skills and other attributes**

##### **B. Intellectual skills - *able to:***

1. Select and critically apply scientific principles, mathematical-based methods for the design and implementation of algorithms.
2. Analyse and solve multi-disciplinary problems showing self-direction and originality.
3. Be innovative and creative.
4. Organise tasks into a structured form.
5. Understand the evolving state of knowledge in a rapidly developing area.
6. Transfer appropriate knowledge and methods from one topic to another.
7. Plan and conduct a research project and write a dissertation.
8. Prepare an oral presentation.
9. Develop business skills and commercial awareness.

##### **Teaching/learning methods and strategies**

Teaching and learning methods include lectures, seminars, assisted practical session in laboratories, group based and individual project assignments, self-directed research, student presentations, student-led conference organisation and participation. Appropriate scientific skills and tools are taught in lectures and problems to be solved are given as projects or assignments. The module Research Studies (SEMRS11) covers skills for literature search and for a state of the art review typically on the topic of the MSc Project (SEMPR12). The project can be either an individual research project or an industry project. An individual research project will usually be related to current research activities in the School or to a multidisciplinary

application. An industry project is carried out by one of the Industry partners of the School under the co-supervision of an academic staff member and an industry manager.

Project planning is part of the MSc project, and written and oral presentations are required for various assignments and for the MSc project. A scientific technical report on the state of the art of a specific topic, typically a Computer Science grand challenge not related to the MSc Project, is part of the optional module Advanced Research Studies (SEMAS13).

#### *Assessment*

1-6 are assessed partly by examination, though sometimes also by project or assignment work. 7 and 8 are assessed as part of project work.

### **C. Practical skills - able to:**

1. Use appropriate mathematical methods or IT tools.
2. Program a computer to solve problems especially real-time problems.
3. Use relevant laboratory equipment and analyse the results critically.
4. Research into DSP and wireless communications problems.
5. Manage projects.
6. Present work.

### **D. Transferable skills - able to:**

- Use software libraries, middleware and tools.
- Be digitally ready.
- Acquire, manipulate and process data.
- Present the results of a computing process in an appropriate, effective and interactive way.
- Use creativity and innovation.
- Solve problems.
- Communicate scientific ideas to a variety of audience.
- Give oral presentations.
- Work as part of a team.
- Use information resources.
- Manage time.

### **Teaching/learning methods and strategies**

Mathematics and IT tools are introduced in lectures and their use is assessed by examinations and assignments.

Programming assignments are set, and students may write programs as part of their MSc project.

Laboratory practical sessions and the MSc project are used to teach about 3, and the MSc project is used for 4, 5, and 6.

#### *Assessment*

1 is tested in coursework and in examinations.

2 is tested by assignments, the MSc project and occasionally by examination

3 is assessed in practical sessions and sometimes in the MSc project

4 and 5 are assessed through project work

6 is assessed in assignments and the MSc project.

### **Teaching/learning methods and strategies**

Some software libraries and tools are taught in lectures, but most through laboratory sessions and assignments.

Data skills are acquired in laboratory and projects. Creativity, innovation and problem solving are experienced through the MSc project, time management and presentations. Team working skills are acquired through laboratory work. Use of information resources, such as the library and digital media, is experienced through projects and assignments.

#### *Assessment*

Some skills, like the use of software middleware and tools and the ability to communicate orally and in written form are directly assessed, in assignments or through the MSc project, other skills are not directly assessed but their effective use will enhance the students' overall performance.

**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 process of academic development and feedback from students, quality assurance process or external sources, such as professional bodies, requires a change to be made. In such circumstances, a revised specification will be issued.**