MSc Advanced Computer Science (full-time)
For students entering in 2017/8

Awarding Institution:	University of Reading
Teaching Institution:	University of Reading
Relevant QAA subject Benchmarking group(s):	Computing
Programme length:	12 months
Date of specification:	16/Aug/2017
Programme Director:	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 computer science graduates and computer professionals who wish to broaden and deepen their understanding of computer science and in particular, of Data Science and Big Data Analytics. A prior programming experience is required. This programme offers a challenging, flexible scheme of study invigorated by the research interests and expertise of our academics and the unique location of Reading at the heart of the 'Silicon Valley of Europe'.

The programme provides a unique opportunity to develop leading-edge in-depth knowledge of specific computer science disciplines for the analysis of data and covers topics such as modern programming paradigms (e.g., Cloud computing), data-driven knowledge discovery (Big Data, Data Mining and Predictive Analytics) and interdisciplinary applicative domains (Computer Vision, Virtual Reality , etc.).

The programme aims to provide students with:

- An in-depth understanding of modern computing and programming paradigms, such as Distributed Computing (Cloud Computing, MapReduce/Apache Hadoop) and High Performance Computing.
- An in-depth understanding machine learning and data mining algorithms and practical experience with data analytics tools;
- A broad training in, and hands-on experience of, knowledge discovery process, machine learning, advanced predictive analytics, Big Data, applications in computer vision and in interdisciplinary domains such as digital marketing;
- An opportunity to carry out an interdisciplinary research project. The proposed model will be co-supervision of two researchers, one from the Department of Computer Science for the computing aspects and one from another School/Department of the University for a specific application domain;
- 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, and flow-based programming), scientific writing, oral presentation, team-working, problem-solving, digital literacy and time-management.

Programme content

The profile below states the modules of this taught MSc course. The taught modules in Term 1 (Autumn) and in Term 2 (Spring) account for 100 credits, and the project mainly in Term 3 (Summer) another 80 credits, totalling 180 credits.

Term 1 (or two terms part time)

Code	Title	Credits	Level	Compulsory/ Optional
CSMMA16	Mathematics and Statistics	10	7	C
CSMRS16	Research Studies	10	7	C
CSMDM16	Data Analytics and Mining	10	7	C
CSMML16	Machine Learning	10	7	C
CSMCC16	Cloud Computing	10	7	C
CSMBD16	Big Data Analytics	10	7	C
CSMIP16	Image Processing	10	7	O
CS3SL16	Social, Legal and Ethical Aspects in Engineering	10	6	O

Term 2 (or two terms part time)

Code	Title	Credits	Level	Compulsory/ Optional
CSMVR16	Virtual Reality	10	7	O
CSMVI16	Visual Intelligence	10	7	O
MMM077	Digital Marketing	20	7	O
MMM038	Practice of Entrepreneurship	20	7	O
CS3CS16	Concurrent Systems	10	6	O

Term 3 (or two terms part time)

Code	Title	Credits	Level	Compulsory/ Optional
CSMPR16	MSc Project	80	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. Taught modules involves lectures as well as a hands-on sessions or a case study sessions.

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

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

Progression requirements

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):

- http://www.reading.ac.uk/web/FILES/exams/PGclassification-post-2008.pdf

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

Admission requirements
Undergraduate Degree
At least a 2.1 Honours UK UG degree or overseas equivalent (60%) 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 other disciplines are also welcome but will be considered on a case-by-case basis and a prior programming experience is required.
English
For candidates whose native language is not English, proof of competency is required. If your English ability is not at the required standard you may be asked to attend our pre-sessional English programme. (For further details see http://www.reading.ac.uk/ready-to-study/international-and-eu/english-language-requirements.aspx)

Admissions Tutor: Dr. Frederic Stahl

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, In-sessional English Support Programme, the Study Advice and Mathematics Support teams and IT Services. 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 Support Centres. If a student has a general enquiry and is unsure where to seek help, they should visit their Support Centre. There are five Support Centres across the University, including one based at the London Road Campus. The Support Centre will be able to advise on matters such as extenuating circumstances, module selection, suspensions, withdrawals, timetable queries and transferring programme. The Support Centre will also be able to signpost students to Carrington building where other University services related to disability, financial support, counselling and wellbeing, accommodation and careers can be found. More information on what student services are available can be found here: http://student.reading.ac.uk/essentials.

Career prospects
Career prospects for the students of this course tend 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 industrial and academic areas with the advent of data-intensive discovery as the 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. Reading is in the Royal County of Berkshire and lies at the centre of the Thames Valley on the M4 corridor, a major high-technology hub often referred to as the 'Silicon Valley of Europe'.

Opportunities for study abroad or for placements
The University of Reading offers opportunities for multi-disciplinary research projects, industrial internships (http://www.reading.ac.uk/careers/RIS/), and 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:	**Teaching/learning methods and strategies**
1. Advanced computing and programming paradigms. 2. The science underlying computational intelligence methods and their applications (e.g., computer vision and machine learning). 3. The process of Knowledge Discovery and Data Mining, as an interdisciplinary area focusing upon methodologies for extracting useful knowledge from data. 4. The state of the art, current problems and new opportunities and insights in Data Science, Big Data and Predictive Analytics. 5. Existing software tools and libraries.	• 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:*	**Teaching/learning methods and strategies**
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 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 covers skills for literature search and for a state of the art review typically on the topic of the MSc Project. 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 in collaboration with 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.

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 data-intensive problems.
3. Use relevant laboratory equipment and analyse the results critically.
4. Manage projects.
5. Present work.

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 and 5.

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 is assessed through project work
5 is assessed in assignments and the MSc project.

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

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.