UNIVERSITY OF LEICESTER

Programme Specification (Postgraduate)

For students entering in 2018/19

Date amended: Feb 2017

1. Programme Title(s):
MSc in Cloud Computing / Postgraduate Diploma in Cloud Computing
MSc in Cloud Computing with Industry

Note: the Postgraduate Certificate in Advanced Computer Science is an exit award

2. Awarding body or institution:
University of Leicester

3. a) Mode of study

Full-time [and Part-time depending on circumstances]

b) Type of study

Campus Based

4. Registration periods

a) MSc October Intake

The normal period of registration is 12 months

The maximum period of registration is 24 months

b) MSc January Intake

The normal period of registration is 16 months

The maximum period of registration is 28 months

c) MSc with Industry October Intake

The normal period of registration is 21 months

The maximum period of registration is 33 months

d) MSc with Industry January Intake

The normal period of registration is 24 months

The maximum period of registration is 36 months

5. Entry Requirements

The same entry requirements that apply to all MSc programmes in Computer Science apply. Specifically, candidates should have, or expect to gain, at least a good second class honours BSc degree or qualification of equivalent standard recognised by the University in a subject with a substantial element of Computing. Applicants for the "with Industry" variant should have or expect to gain at least a very good second class honours BSc degree or qualification of equivalent standard recognised by the University in a subject with a substantial element of Computing. Where a student holds an unrelated first degree at an acceptable level, they may be considered for admission on the basis of significant work experience in the field of study that they have applied for. In this case we would expect the experience to be significant (several years) and expect the candidate to provide details about this experience (e.g. details of the job they have been conducting in Industry) in addition to employer's statements for evaluation by the admissions team. Where English is not the first language of the candidate, the successful applicant must have IELTS 6.0.

6. Accreditation of Prior Learning:

n/a

7. Programme aims:

The general aims of the programme leading to a PG Diploma in Cloud Computing are to:

- Develop a deep understanding of the nature and impact of current challenges faced by the IT industry, so that students know what is expected from them as mature professionals.
- Develop an awareness of the methodologies and technologies that are available within computer science to address these challenges, so that students can evaluate and analyse specific situations and make informed choices.
- Foster confidence, convey knowledge and develop practical skills in the use of some of these technologies, including both fundamental concepts and state-of-the-art support tools.
- Encourage students to develop their interpersonal, communication, decision-making, and problem-solving skills, and to use these in an imaginative way.
- Train students in the design, analysis and engineering of systems for handling big data in a distributed environment based on dynamically scalable architectures such as cloud computing.
- Develop students' career management and development skills.

The programme leading to an MSc has the following additional aims:

- Provide experience of both team-based and individual project work.
- Secure knowledge and research skills so that students are able to take their studies further to do a PhD, in case they complete the full MSc.

In addition to the aims above, the "with Industry" variant of the programme aims to:

- Enable first-hand experience of the requirements, opportunities and modes of operation of the programme related software engineering and computer industry;
- Place students on challenging and relevant industrial placements;
- Enable students to use and develop the knowledge and skills gained during the taught part of the programme;
- Further enhance and enable students to apply their career management and development skills.

8. Reference points used to inform the programme specification:

- QAA Benchmark Computing (2011)
- QAA Frameworks for Higher Education Qualifications in England Wales and Northern Ireland
- QAA Master's Degree Characteristics
- PDR report (January 2010)
- University Learning Strategy
- University Employability Strategy
- Graduate Survey (2014)
- First Destination Survey
- External Examiner's Reports

9. Programme Outcomes:

MSc students are undertaking an individual project, which will require much deeper exploration and application of the learned skills than they would demonstrate in the PG Diploma. (MSc) in the table below will indicate the LOs, methods and demonstration for aspects specific to the MSc Programmes.

Learning Outcomes	Teaching Methods Subject and Professional Skills	How Demonstrated
Knowledge		
Demonstrate knowledge and mastery of a [wide (MSc)] range of advanced computer science subjects and the way they relate to IT practice. Integration of knowledge across subjects.	Independent research (MSc), lectures, and the seminar/discussion groups that are part of the Personal and Group Skills module.	Written examinations, oral presentations, participation in group discussions, essays/demos, project planning and dissertation (MSc).
Demonstrate understanding of the core elements of industrial practice and organisation ("with Industry").	Work placement.	Work placement report.
Concepts		
Demonstrate enhanced grasp of principles of computer science methodology and technology.	Independent research, lectures, seminars, group-discussions.	Written examinations, assessed coursework, group essays, oral presentations, dissertation (MSc) and reports.
Techniques		
Master advanced modelling and design techniques for the development of distributed, software intensive, and web-based systems.	Independent research, lectures, seminars, group-discussions, along with laboratory work and individual project (MSc).	Written examinations, assessed coursework, group essays, oral presentations, dissertation (MSc) and reports.
Engineer and follow software development processes, make use of model-based techniques, target service-oriented architectures.	As above.	As above.
Use problem-solving techniques, and select and apply suitable technologies in different application areas.	As above.	As above.
Apply current technologies in distributed systems engineering.	As above.	As above.
Master research methods and project planning techniques (MSc).	Personal and Group Skills module, and individual project (MSc).	Individual project components (MSc); group discussions and essays.
Techniques		
Work as a Computer Scientist and Computer Engineer in an industrial or commercial setting ("with Industry").	Work placement	Work placement report.

Learning Outcomes	Teaching Methods	How Demonstrated
Critical analysis		
Apply understanding of concepts and techniques with independence, rigour & self-reflexivity. Critically appraise problem solutions, and project work. Demonstrate consideration of professional issues.	Independent research, lectures, Personal and Group Skills module, and individual project (MSc). As above.	Oral presentations, participation in group discussions, essays/demos, project plan, dissertation (MSc), and work placement report. As above.
Presentation		
Organise research material and/or technology demonstration; distinguish between relevant and non-relevant material; write-up and deliver oral reports on findings to a professional standard; engage in scientific discussion with peers. These aspects are explored in more depth and with greater rigour by students studying for the MSc.	Lectures, seminars, group discussions. Personal and Group Skills module. Work placement.	Oral presentations, participation in group discussions, essays/demos, project plan, and dissertation (MSc).
Appraisal of evidence		
Analyse and assess a variety of requirements for system development and/or engineering. Assess the relevance and quality of proposed methods, techniques and technologies. Mount and sustain an independent level of inquiry at an advanced level (MSc).	Independent research, lectures, seminars, group-discussion, and the Personal and Group Skills module.	Oral presentations, participation in group discussions, essays/demos, project plan, and dissertation (MSc).
Transferable skills		
Communication skills		
Respond to scientific questions with accurate and concise answers. Demonstrate fluent and sustained scientific and technical communication. Write concise and accurate summaries of scientific knowledge, and solutions to problems, in a variety of different formats.	Lectures, seminars, moderated group discussions, and individual project supervision (MSc). Workshops delivered by the Student Learning Centre. Work placement. Lectures. Detailed solutions provided in problem classes. Workshops delivered by the Student Learning Centre. Individual project supervision (MSc).	Group discussions and individual project presentations, individual project oral examinations (MSc), work placement presentation. Written examinations, assessed coursework, group essay, intermediate individual project reports (MSc) and dissertation (MSc).

Learning Outcomes	Teaching Methods	How Demonstrated
Communication skills		
Produce properly structured, clear, advanced technical reports or dissertations (MSc).	As above.	Group essay. Intermediate individual project reports and dissertation (MSc).
Data presentation		
Organise and present information gathered through research clearly and effectively using appropriate IT resources.	Independent research. Lectures. Workshops delivered by the Student Learning Centre. Work placement.	Oral presentations, essays/demos, work placement report, and dissertation (MSc).
Working relationships		
Know how and when to draw on the knowledge & expertise of others; contribute and comment on ideas in syndicate groups	Lectures. Group discussions and collective essay. Work placement.	Oral presentations, participation in group discussions, work placement report.
Research skills		
Conduct [significant (MSc)] background research and literature surveys, organise and marshal evidence, report on findings, analyse complex ideas and construct [sophisticated (MSc)] critical arguments.	Project supervision (MSc). Seminars, group discussions, collective essay, and specific workshops delivered by the Student Learning Centre.	Collective essay, group discussions, and individual project reports and dissertation (MSc).
Managing learning		
Demonstrate independence and time management skills. Identifying a credible research project, drawing up a realistic research time-table, reflecting on and 'writing up' results. Design a long-term personal career plan (MSc).	Tutor system. Career development workshop delivered by the Student Learning Centre. Project supervision (MSc).	Meeting coursework deadlines. Collective essay. Individual project topic choice and plan, intermediate reports and dissertation (MSc).
Employability		
Plan personal professional development, understand how to prepare for job market and how to apply for employment.	Career development workshop.	Personal Tutor meetings. Obtaining placement ("with Industry")

10. Special features:

The courses share the compulsory Personal and Group Skills module which combines attendance of seminars especially commissioned from speakers selected for their presentation skills and state-of-the-art research, group discussions and collective essay writing on topics selected for the seminars, as well as a series of workshops on transferable skills and career planning run by the Student Learning Centre of the university. This module forms a highly praised (by previous

referees and the external examiners) component of the existing MSC offering in the department and is well liked by the students.

The department is research active in all areas covered by the programmes, which means that students will be able to benefit from the projects that are going on through special lectures, tutorials and discussions with national and international collaborators, as well as being able to conduct their projects in topics that are at the cutting edge of science and technology.

11. Indications of programme quality:

QAA subject review; external examiner's report.

12. Scheme of Assessment

This programme follows the rules and procedures set by the University for postgraduate programmes. See: Senate Regulation 6 governing taught postgraduate programmes http://www2.le.ac.uk/offices/sas2/regulations/general-regulations-for-taught-programmes

13. Progression Points

The programme will follow the standard University progression rules, as defined in the Scheme of Assessment. See: Senate Regulation 6 governing taught postgraduate programmes http://www2.le.ac.uk/offices/sas2/regulations/general-regulations-for-taught-programmes
In cases where a student has failed to meet a requirement to progress he or she will be required to withdraw from the course and a recommendation will be made to the Board of Examiners for an intermediate award where appropriate. Students who fail to fulfil the requirements of the named awards, but have completed 60 credits of level 7 modules will be considered for the award of a PG Certificate in Advanced Computer Science (subject to fulfilling the requirements in the Scheme of Assessment for award of PG Certificates).

Additionally, students on the "with Industry" programme are subject to the following two rules:

1. Students will normally revert to the degree without industry if they (a) fail exams in their first semester of study or (b) do not achieve an average of at least 60% taken across the 4 modules they studied in their first semester of study. The change of degree decision will be confirmed by the respective exam board.

2. If students fail to acquire a placement by the start of the exam period in their second semester of study, they will revert to the degree without industry.

14. Rules relating to re-sits or re-submissions:

Resit examinations for modules examined in January are scheduled in the Midsummer exam period, and resit examinations for modules examined in Midsummer are offered in September. Re-assessment rules for taught postgraduate programmes apply. See: Senate Regulation 6 governing taught postgraduate programmes: http://www2.le.ac.uk/offices/sas2/regulations/general-regulations-for-taught-programmes

15. Additional information [e.g. timetable for admissions]

Admissions are in September and January.
Students admitted in September undertake their individual project during the summer of the following year and submit their dissertation in September (12 months in total).

Students admitted in January start by following semester 2 modules and break during the summer; in September they follow semester 1 modules and start their project in the second half of February of the following year, submitting their dissertation at the end of May. Although this implies 16 months in total, only 12 are actually spent in the course.

Examinations are taken in January for first semester modules and in May/June for second semester ones.

Additionally, "With Industry" programmes will be longer as the placement, which can be either of 3, 6 or 8 months length depending on the interest of the student, and the placement that can be secured, is an integral part of the programme and hence adds the respective time to the programme length. Students will automatically be registered as if they were to take an 8 month placement and the length of study will be corrected when the placement is secured and the actual length of the placement is decided upon.

Students may transfer from this programme to other MSc programmes offered by the Department of Computer Science, with the permission of the programme director and under advice from their personal tutor until week 2 of their first semester. Transfers should normally only take place when a student wishes to study modules that are not compatible with the specialisation chosen at registration or when the student wishes to take an individual project outside their specialisation chosen at registration.

16. External Examiners

The details of the External Examiner(s) for this programme and the most recent External Examiners' reports can be found here.

Appendix 1: Programme structure (programme regulations)

In line with the other MSc offerings in the Department of Computer Science, there are three kinds of modules in the programmes. Details of the modules, including the semesters when they are delivered are shown in Table 1.

Personal and Group Skills (PGS) (15 credits)

This module is offered in both semesters and provides students with skills that are highly valued by any IT employer. Students attend a series of seminars given by researchers from universities or companies followed by group discussions moderated by a member of staff. Each group prepares a joint essay based on the seminar and the discussions. Students also attend workshops organised by the Student Learning Centre on topics like project planning, writing and presentation skills, as well as career management.

Taught Modules (105credits)

Taught modules are taken to a total of 105 credits. The programme requires 45 credits of core modules, as indicated in Table 1 (with **C**). The remaining 60 credits are filled by selecting four more options from the remaining modules shown below (with at most 30 credits selected from CO70xx modules).

Optional modules are chosen, with the approval of the personal tutor, before the end of the second teaching week of each semester. Some optional modules may have pre-requisites (e.g. experience in certain programming languages or mathematical maturity) and, therefore, unadvisable to certain students. Any such pre-requisite will be explicitly stated in the corresponding module form available in the student's handbook.

Individual Project (60 credits)

Candidates entitled to proceed to a full MSc degree undertake, after examinations, an individual project on an approved topic according to the profile of each course, leading to the submission of a 15,000 word dissertation. The project is expected to contain some element of original work, and may involve informal collaboration with other organisations, subject to the previous approval of the project supervisor.

Employability Programme (with industry only, compulsory but non-credit bearing)

Candidates on with Industry variants of the programmes will be required to undertake study of two additional modules that equip them with skills and knowledge about the labour market and preparing them for applying for and undertaking placements. CO7260 and CO7261 are compulsory for 'with industry' students.

Table 1

	Module Title	Semester offered	Credits	Level	Module Code
	Analysis and Design of Algorithms	2	15	M	CO7002
	Communication and Concurrency	1	15	M	CO7007
	Distributed Systems and Applications	2	15	M	CO7090
	Software Measurements and Quality Assurance	1	15	M	CO7095
	Compression Methods for Multimedia	2	15	M	CO7096
	Web Technologies	1	15	M	CO7098
	Cryptography and Internet Security	2	15	M	CO7099
	Advanced C++ Programming	1	15	M	CO7105
	Algorithms for Bioinformatics	2	15	M	CO7200
✓	Individual Project		60	M	CO7201
	Advanced System Design	1	15	M	CO7205
	System Re-engineering	1	15	M	CO7206
	Software Reliability	1	15	M	CO7209
✓	Personal and Group Skills	1 or 2	15	M	CO7210
	Discrete Event Systems	2	15	M	CO7211
	Game Theory in Computer Science	2	15	M	CO7212
C	Service-Oriented Architectures	2	15	M	CO7214
C	Advanced Web Technologies	1	15	M	CO7215
	Semantic Web	2	15	M	CO7216
	Agile Cloud Automation	1	15	M	CO7217
	Financial Services Information Systems	2	15	M	CO7218
C	Internet and Cloud Computing	1	15	M	CO7219
	Generative Development	2	15	M	CO7207

Programme Structure

MSc in Cloud Computing

September Entry

SEMESTER 1

Core Modules		**Credits**
CO7215	ADVANCED WEB TECHNOLOGIES	15
CO7219	INTERNET AND CLOUD COMPUTING	15

Optional Modules

30 credits selected from:

CO7210	PERSONAL AND GROUP SKILLS*	15
CO7007	COMMUNICATION AND CONCURRENCY	15
CO7095	SOFTWARE MEASUREMENT AND QUALITY ASSURANCE	15
CO7098	WEB TECHNOLOGIES	15
CO7105	ADVANCED C++ PROGRAMMING	15
CO7205	ADVANCED SYSTEM DESIGN	15
CO7206	SYSTEM RE-ENGINEERING	15
CO7209	SOFTWARE RELIABILITY	15
CO7217	AGILE CLOUD AUTOMATION	15
Semester total		**60**

SEMESTER 2

Core Modules		**Credits**
CO7214	SERVICE ORIENTED ARCHITECTURES	15

Optional Modules

45 credits selected from:

CO7210	PERSONAL AND GROUP SKILLS*	15
CO7002	ANALYSIS AND THE DESIGN OF ALGORITHMS	15
CO7090	DISTRIBUTED SYSTEMS AND APPLICATIONS	15
CO7096	COMPRESSION METHODS FOR MULTIMEDIA	15
CO7099	CRYPTOGRAPHY AND INTERNET SECURITY	15
CO7200	ALGORITHMS FOR BIOINFORMATICS	15
CO7211	DISCRETE EVENT SYSTEMS	15
CO7212	GAME THEORY IN COMPUTER SCIENCE	15
CO7216	SEMANTIC WEB	15
CO7218	FINANCIAL SERVICES INFORMATION SYSTEMS	15
CO7207	GENERATIVE DEVELOPMENT	15
Semester total		**60**

Core Modules		**Credits**
CO7201	INDIVIDUAL PROJECT	60
Total Credits		**180**

* All students are required to study CO7210, however may select to study it in either semester 1 or semester 2

January Entry

SEMESTER 2

Core Modules		**Credits**
CO7214	SERVICE ORIENTED ARCHITECTURES	15
Optional Modules		
45 credits selected from:		
CO7210	PERSONAL AND GROUP SKILLS*	15
CO7002	ANALYSIS AND THE DESIGN OF ALGORITHMS	15
CO7090	DISTRIBUTED SYSTEMS AND APPLICATIONS	15
CO7096	COMPRESSION METHODS FOR MULTIMEDIA	15
CO7099	CRYPTOGRAPHY AND INTERNET SECURITY	15
CO7200	ALGORITHMS FOR BIOINFORMATICS	15
CO7211	DISCRETE EVENT SYSTEMS	15
CO7212	GAME THEORY IN COMPUTER SCIENCE	15
CO7216	SEMANTIC WEB	15
CO7218	FINANCIAL SERVICES INFORMATION SYSTEMS	15
CO7207	GENERATIVE DEVELOPMENT	15
Semester total		**60**

SEMESTER 1

Core Modules		**Credits**
CO7215	ADVANCED WEB TECHNOLOGIES	15
CO7219	INTERNET AND CLOUD COMPUTING	15
Optional Modules		
CO7210	PERSONAL AND GROUP SKILLS*	15
CO7007	COMMUNICATION AND CONCURRENCY	15
CO7095	SOFTWARE MEASUREMENT AND QUALITY ASSURANCE	15
CO7098	WEB TECHNOLOGIES	15
CO7105	ADVANCED C++ PROGRAMMING	15
CO7205	ADVANCED SYSTEM DESIGN	15
CO7206	SYSTEM RE-ENGINEERING	15
CO7209	SOFTWARE RELIABILITY	15
CO7217	AGILE CLOUD AUTOMATION	15
Semester total		**60**

January to April

Core Modules		**Credits**
CO7201	INDIVIDUAL PROJECT	60
Total Credits		**180**

* All students are required to study CO7210, however may select to study it in either semester 1 or semester 2

MSc in Cloud Computing with Industry

The taught modules for the programme are as for those on the MSc in Advanced Distributed Systems degree programme with the addition of

October entry

Semester 1		
CO7260	Employability – Core Skills	0
Semester 2		
CO7261	Employability – Placement Preparations	0

January entry

Semester 2		
CO7260	Employability – Core Skills	0
Semester 1		
CO7261	Employability – Placement Preparations	0

All students on the 'with Industry' variant will undertake a 3, 6 or 8 month placement between completion of the taught element of the programme and commencement of the project. The placement will be assessed on a pass or fail basis according to the approved and published criteria. Students who are deemed to have passed the industrial placement and subsequently pass the individual project will be eligible to be considered for the award of an MSc in Cloud Computing with Industry. Students who fail to pass the industrial placement will revert to the non-industry variant of the programme.

Appendix 2: Module Specifications

See module specification database http://www.le.ac.uk/sas/courses/documentation