1. Summary

<table>
<thead>
<tr>
<th>Award</th>
<th>Programme Title</th>
<th>Duration</th>
<th>Mode of study</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSc</td>
<td>Advanced Computer Science &lt;with specialisation in pathway&gt;</td>
<td>1 year</td>
<td>Full-time</td>
</tr>
<tr>
<td>MSc</td>
<td>Advanced Computer Science &lt;with specialisation in pathway&gt;</td>
<td>2-4 years</td>
<td>Part-time</td>
</tr>
<tr>
<td>MSc</td>
<td>Advanced Computer Science &lt;with specialisation in pathway&gt;</td>
<td>3-4 years</td>
<td>Modular</td>
</tr>
<tr>
<td>PG Diploma</td>
<td>Advanced Computer Science</td>
<td>1 year</td>
<td>Full-time (exit award only)</td>
</tr>
<tr>
<td>PG Diploma</td>
<td>Advanced Computer Science</td>
<td>2-3 years</td>
<td>Part-time (exit award only)</td>
</tr>
<tr>
<td>PG Diploma</td>
<td>Advanced Computer Science</td>
<td>2-3 years</td>
<td>Modular</td>
</tr>
<tr>
<td>PG Certificate</td>
<td>Advanced Computer Science</td>
<td>1 year</td>
<td>Full-time</td>
</tr>
<tr>
<td>PG Certificate</td>
<td>Advanced Computer Science</td>
<td>2 years</td>
<td>Part-time (exit award only)</td>
</tr>
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<td>Advanced Computer Science</td>
<td>2 years</td>
<td>Modular</td>
</tr>
</tbody>
</table>


Role of this Programme Specification: to outline the intended knowledge, understanding, skills and attributes of a student completing that course. It also gives details of teaching and assessment methods as well as linking the course to the framework for HE qualifications and any subsequent professional qualification and career path.

Date of Completion: June 2017

Further Links: Programme web site at http://studentnet.cs.manchester.ac.uk/pgt/

2. Aims and Intended Learning Outcomes

The aim of this programme is to provide students with a state-of-the-art collection of knowledge, understanding, and skills in the area of Advanced Computer Science. This collection aims to be, on the one hand, of sufficient breadth so as to reflect the discipline's breadth of techniques and areas and, on the other hand, of sufficient depth so as to provide the student with the relevant knowledge, understanding, and skills at an advanced level. It is designed for students with a good first degree in Computer Science or related areas who wish to broaden and deepen their understanding, knowledge, and skills, and aim at a career in either Industry or Academia.
## Postgraduate Programme Specification: 
### MSc in Advanced Computer Science <with pathway> 

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>At PG Certificate level: Produce computing professionals with specialised knowledge of selected advanced topics in Computer Science</td>
</tr>
<tr>
<td>2</td>
<td>At PG Diploma level: Produce high quality computing professionals and researchers across a broad range of Computer Science</td>
</tr>
<tr>
<td>3</td>
<td>Provide a vehicle for dissemination of leading-edge knowledge and skills, focusing on the research strengths of a large School covering most major topics in Advanced Computer Science and its applications</td>
</tr>
<tr>
<td>4</td>
<td>Continue to attract the highest-quality students from the UK and overseas</td>
</tr>
<tr>
<td>5</td>
<td>Provide an opportunity to engage in a small research project in Advanced Computer Science</td>
</tr>
<tr>
<td>6</td>
<td>At MSc level: As above 2 – 5 together with 6 and 7: Offer the opportunity to focus on one of a range of specialisations</td>
</tr>
<tr>
<td>7</td>
<td>At MSc level: Provide high quality training and experience in research in Advanced Computer Science</td>
</tr>
</tbody>
</table>

### A. Knowledge & Understanding

Students will be able to:

A1. **(At all levels)** Acquire a knowledge of a range of advanced topics in Computer Science beyond undergraduate level and at the forefront of research

A2. **(At all levels)** Understand, apply and develop leading-edge technologies by following three themes from those listed in Figure 1

A3. **(MSc & PG Diploma)** Have a knowledge & understanding of research methodology & practice

### B. Intellectual Skills

Students will be able to:

B1. **(MSc and PG Diploma levels only)** Develop and evaluate original ideas in a research context

B2. **(All)** Use methodologies for development of computational systems at an advanced level

B3. **(All)** Perform problem-solving in academic and industrial environments

### C. Practical Skills

Students will be able to:

C1. **(MSc, PG Diploma & PG Certificate levels)** Develop applications to satisfy given requirements

C2. **(MSc and PG Diploma only)** Organise & pursue a scientific or industrial research project

C3. **(All)** Use, manipulate and develop large computational systems

C4. **(All)** Perform independent information acquisition and management

### D. Transferable Skills and Personal Qualities

Students will be able to:
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<table>
<thead>
<tr>
<th>D1.</th>
<th>Work and communicate effectively as a team member</th>
</tr>
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<tbody>
<tr>
<td>D2.</td>
<td>Understand ethical issues related to professional activities</td>
</tr>
<tr>
<td>D3.</td>
<td>Write theses and reports to a professional standard (MSc and PG Diploma)</td>
</tr>
<tr>
<td>D4.</td>
<td>Perform independent and efficient time-management</td>
</tr>
</tbody>
</table>

These Aims and Intended Learning Outcomes are informed by the QAA subject benchmark for computing, and relate as following to those mentioned there: A1-A3 are covered in 5.1 and 5.2; B1 is covered in 5.5; B2-3 are covered in 5.2; C1-C3 are covered in 5.2 and 5.4; C4 is covered in 5.5; D1, D2, D4, and D5 are covered in 5.3 and 5.4; D3 is covered in 5.2 and 5.5.

3. Teaching, Learning, and Assessment Methods

The programme’s teaching and learning forms and assessment methods are informed by the QAA subject benchmark for computing, and are designed to ensure that any student graduating with an MSc in Advanced Computer Science and IT Management have demonstrated the understanding, awareness, and skills at threshold level as described in Section 7 of the benchmark.

We use a variety of teaching forms, from face-to-face lectures via supervised and unsupervised labs, to self-study elements and supervised projects. Where appropriate, we use blended learning and enquiry-based learning. In general, knowledge-intensive parts of a course-unit are taught through lectures (either face-to-face or via alternative delivery), with aspects of self-study and enquiry-based learning. Other parts of our course units that are aimed at the students’ acquisition of skills (either intellectual or practical) are mostly taught through (supervised or unsupervised) labs and workshops. These are also often used to enhance the students’ communication and teamwork skills.

Our course units combine knowledge and understanding learning outcomes with suitable skills learning outcomes. Moreover, in Computer Science, applying a certain technology, formalism, or method is a key requirement for understanding it fully. As a consequence, all our taught course units use coursework as a part of assessment, to deepen (and assess) both knowledge and understand and to teach (and assess) relevant skills.

The defining regulations and procedures for the MSc programme are laid down in the University’s Ordinances and Regulations.

<table>
<thead>
<tr>
<th>Learning &amp; Teaching Processes for A (to allow students to achieve intended learning outcomes)</th>
<th>Assessment (of intended learning outcomes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALL</td>
<td>A1 – A3 are assessed by a mixture of written examinations, computer-based practical work, and a range of coursework assessments including assessed miniprojects, group projects, reports, essays, etc.</td>
</tr>
<tr>
<td>ALL</td>
<td>A1- A3 is also assessed via the research project.</td>
</tr>
</tbody>
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Learning & Teaching Processes for B

Assessment

PG Programme Specification template, April 2010
### Learning & Teaching Processes for C

| C1. and C3. | C1. and C3. are demonstrated in practical lab exercises and mini-projects, as well as during the research project. |
| C2. and C4. | C2. and C4. are demonstrated during the research project. C4. is also present in many course units. |
| | The practical skill C4. is demonstrated in the preliminary preparation for each course unit |

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<thead>
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</tr>
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<tbody>
<tr>
<td>C1. and C3. are assessed through laboratory exercises, either marked on-line or by written report.</td>
</tr>
<tr>
<td>C2. and C4. are developed and assessed during the Research Skills and Professional Issues training that is part of the project, as reflected in the initial report and dissertation.</td>
</tr>
<tr>
<td>C4. is assessed by the Research Project and by a report or marked presentation in some course units.</td>
</tr>
</tbody>
</table>

### Learning & Teaching Processes for D

| D1. | D1. is evident in team practical projects used in a number of course units. |
| D2. | D2. is demonstrated in the research project. |
| D3. | D3. is demonstrated through lab practical and mini-project reports and the research project dissertation. |
| D4. | D4. is demonstrated by the ability to meet a number of deadlines throughout the year, and to effectively carry out a research project on time |

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<thead>
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<tbody>
<tr>
<td>D1. is assessed through reports and marked presentations.</td>
</tr>
<tr>
<td>D2 and D3. are assessed by the research project dissertation, and the project initial report.</td>
</tr>
<tr>
<td>D4. is assessed by course unit teachers &amp; the exams office, who must ensure coursework and dissertations are submitted on time.</td>
</tr>
</tbody>
</table>

### Support for student learning and development:

In addition to the Director of PGT, we have Programme Directors for full and part time students, whose main responsibility is the pastoral care for the MSc in ACS students and, as members of the school PG Committee, to monitor students’ attendance and progress, and to oversee the general running of the MSc in ACS. Students are encouraged to contact the Directors when problems arise and are informed of this during the introductory period. During the period of the second Semester and the research project, an individual assigned supervisor is also available. The relationship with the supervisor is outlined in the taught Research Skills and Professional Issues material that is included as part of the Project.

We also have an effective Student Support Office, with several staff who work principally with postgraduate students, whose members provide support for students in all aspects of their learning and development, and work closely with the directors and the PG committee through formal meetings and other means.

We implement a project model where the students submit, at the end of Semester 2, an Initial Report. In this way, students are encouraged to develop early a clear vision and plan for their project, including for its
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evaluation, and to communicate it to their supervisors in writing, so that potential issues regarding technical misunderstandings or writing problems can be detected early and appropriate actions be taken.

The project process is overseen by a Project Coordinator, whose role is to ensure that projects are allocated and supervised in an effective way, that feedback is provided in a timely and constructive manner, and that the training provided to students is appropriate.

All students are directed to the Faculty’s Personal Development Plan web site and encouraged to participate, and the site is also linked from the MSc Handbook http://www.cs.manchester.ac.uk/postgraduate/prospectus/.

4. Programme Structure

A student following this programme chooses three themes, each consisting of a conceptually coherent set of two course units of 15 credits each. This makes up the 90 credits taught part of the programme. In addition, they take a 90 Credit project.

A student who chooses three themes that belong to a given pathway, e.g., Software Engineering 1 and 2, and whose project is in an area suitable for this pathway (which is determined by the examiners) can choose to graduate with an

MSc in Advanced Computer Science with specialisation in Software Engineering.

A full list of pathways and related themes can be found in Figure 1.

Course units in general:

Course units are taught in an intensive mode over a period of 6 weeks: 1 day a week for the first 5 weeks are ‘taught’ days consisting of lectures, supervised labs etc., which are complemented with 1.5 days a week for the first 5 weeks of practical exercises and 2.5 days of a coursework completion week (the 6th week) are also practical exercises. Some of the practical exercises are assessed work.

Chronology of the programme:

The (full time version of the) programme lasts 1 year, and starts in September with a welcome week, during which
• introductory talks for each course unit are offered
• the structure of the programme, expectations, rules & regulations, pathways and themes are explained (the allocation of course units to themes and themes to pathways is shown in the Handbook)
• students choose themes and course units
• students take part in an on-line course about plagiarism

Semester 1: September – January
Students usually take 60 credits-worth of course units in the 1st semester, i.e. four of the course units identified in Figure 1 below, two from each Semester 1 theme. In particular, they follow 2 course units in Period 1 (one course unit per Semester 1 theme chosen) and 2 course units in Period 2 (one course unit per Semester 1 theme chosen).

Semester 2: January - May
Students usually take 30 credits-worth of course units in the 2nd semester, i.e. two of the course units from one Semester 2 theme, identified in Figure 1 below, and they work half-time on their projects, leading to the production of an initial report.

Core Project Work: May – September
The student continues to work on his/her project, and writes up a dissertation (or Group and Individual Reports for group projects).

Summary of the exit qualifications:
A student with 60 credits from the taught part can exit with a PG Certificate.
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A student who has passed all 90 credits of the taught part, and a 30 Credit Diploma Project can exit with a PG Certificate.
Neither PG Certificate nor the PG Diploma can carry a pathway specialisation.

5. Mechanisms for Programme Revision

There is an annual Programme Review, which reflects on the year that is coming to an end, and which informs an annual PGT Action Plan that is reviewed by faculty. This action plan regularly includes items relating to programme revision. Progress against the Action Plan is a standing item on PG Committee Meetings.
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Figure 1: Course Units and themes they belong to (the numbers in brackets are the semester)

1. (1) Data on the Web:
   (a) COMP60411 Modelling Data on the Web
   (b) COMP62421 Querying Data on the Web
2. (1) Data Engineering and Systems Governance:
   (a) COMP60711 Data Engineering
   (b) COMP60721 IT Governance
3. (1) Learning from Data:
   (a) COMP61011 Foundations of Machine Learning
   (b) COMP61021 Modelling & Visualization of high-dimensional data
4. (1) Parallel Computing in the Multi-Core Era:
   (a) COMP60611 Parallel Programs and their Performance
   (b) COMP60621 Designing for Parallelism and Future Multi-core Computing
5. (1) Security:
   (a) COMP61411 Cryptography
   (b) COMP61421 Cyber Security
6. (1) Software Engineering 1:
   (a) COMP61511 Software Engineering Concepts in Practice
   (b) COMP62521 Agile Software Development
7. (2) Software Engineering 2:
   (a) COMP61532 Component-based Software Development
   (b) COMP62542 Pattern-based Software Development
8. (2) Biohealth Informatics:
   (a) COMP60532 Principles of Digital Biology
   (b) COMP60542 Introduction to Health Informatics
9. (2) Ontology Engineering and Automated Reasoning:
   (a) COMP60332 Automated Reasoning and Verification
   (b) COMP62342 Ontology Engineering for the Semantic Web
10. (2) Making Sense of Complex Data (students taking this theme must have taken Learning from Data):
    (a) COMP61332 Text Mining
    (b) COMP61342 Computer Vision
11. (2) Mobile Computing:
    (a) COMP61232 Mobile and Energy Efficient Systems
    (b) COMP61242 Mobile Communications
1. Advanced Computer Science: though not a pathway, for your MSc in Advanced Computer Science, you choose any three themes.

2. Advanced Web Technologies: for this pathway, you choose the Data on the Web theme, and two other themes.

3. Artificial Intelligence: for this pathway, you choose at least two themes from Data on the Web, Learning from Data, Making Sense of Complex Data, and Ontology Engineering and Automated Reasoning plus a third theme.


5. Computer Systems Engineering: for this pathway, you choose the Mobile Computing theme and the Parallel Computing in the Multi-core Era theme, plus one other theme.

6. Data and Knowledge Management: for this pathway, you choose any two themes from Data on the Web, Learning from Data, Making Sense of Complex Data, and Ontology Engineering and Automated Reasoning, plus one other theme.

7. Digital Biology: for this pathway, you choose the Biohealth Informatics theme and any two other themes.

8. Multi-core Computing: for this pathway, you choose the Parallel Computing in the Multi-core Era theme and any two other themes.

9. Semantic Technologies: for this pathway, you choose the Data on the Web theme, the Ontology Engineering and Automated Reasoning theme, and one other theme.

10. Software Engineering: for this pathway, you choose the Software Engineering 1 and 2 themes, and any other theme.