Imperial College
London

Programme Specification for the MSc in Computing Science

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. This specification provides a source of information for students and prospective students seeking an understanding of the nature of the programme and may be used by the College for review purposes and sent to external examiners. More detailed information on the learning outcomes, content and teaching, learning and assessment methods of each module can be found in the course handbook or on-line at http://www3.imperial.ac.uk/computing/. The accuracy of the information contained in this document is reviewed by the College and may be checked by the Quality Assurance Agency.

1. **Awarding Institution:**   Imperial College London

2. **Teaching Institution:**   Imperial College London

3. **External Accreditation by Professional / Statutory Body:** N/A

4. **Name of Final Award** (BEng / BSc / MEng etc):   MSc

5. **Programme Title** (e.g. Biochemistry with Management):   Computing Science

6. **Name of Department / Division:**   Department of Computing

7. **Name of Faculty:**   Engineering Faculty

8. **UCAS Code** (or other coding system if relevant):   N/A

9. Relevant QAA Subject Benchmarking Group(s) and/or other external/internal reference points

http://www.qaa.ac.uk/Publications/InformationAndGuidance/Pages/SBS-Masters-degree-computing.aspx

http://www.qaa.ac.uk/academicinfrastructure/fheq/EWNI/default.asp

10. Level(s) of programme within the Framework for Higher Education Qualifications (FHEQ):

Master's (MSc, MRes)   M (Levels 6 & 7)

11. Mode of Study

Full-time

12. Language of Study: English

13. Date of production / revision of this programme specification (month/year):

May 2014

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14. Educational aims/objectives of the programme

The programme aims/objectives are to:

- Give graduates of disciplines other than computing preparation for a career in the computer industry.
- Extend students' previous experience of programming and update it to include the major programming paradigms including object-oriented programming methods and design.
- Give students access to, and experience of, the current ideas and trends in the basics of Object Oriented Program Design, Computer Architecture, Operating Systems and Logic.
- Give students access to specialized subjects and trends in Computer Science, such as Software Engineering, Communications, Distributed Computing, Artificial Intelligence and Databases.
- Enable students to experience large software project development.
- Give students an opportunity to link their subject interest and expertise with newly acquired expertise in computing.
- Attract highly motivated students.
- Give students opportunity to prepare for PhD studies.

15. Programme Learning Outcomes

1. **Knowledge and Understanding**

Knowledge and Understanding of:

1. Major paradigms of programming - declarative, imperative and object oriented.

2. Basic Computer Science, including Object Oriented Design, Databases, Communication and Networks, Architecture, Operating Systems and Logic.

3. Practical programming skills.

4. The detail and essential topics relevant to the students' chosen option and project areas.

5. Communication skills, including project design, teamwork, written and oral reports and presentations and literature search, both web-based and hard copy.

6. A broad awareness of the subject of computer science.

How achieved:

Acquisition of 1 to 4 is through a combination of lectures, tutorials and practical work in core courses (October to December) including an initial intensive course in C++ programming and specialist optional courses (January to March).

Acquisition of 5 is through group project work with reports and presentations (January to March) and through the full-time, individual, supervised project work (May to September).

Acquisition of 6 is through tutorials, independent study and reading and background reading for project. Students are encouraged to undertake independent reading to supplement and consolidate what is being learned and to broaden their individual knowledge and understanding of Computer Science.

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Assessment of the knowledge base is through a combination of unseen written examinations (1,2,4), unseen practical examinations (3), assessed coursework and laboratory work (1,2,3 and 4), team programming project documentation and presentations (1,2,3and 5), individual project dissertation and presentation (1,2,3,4,5 and 6).

2. Skills and other Attributes

Intellectual Skills:

1. Analyse and formally specify computing and programming problems of varying types.

2. Match problems to tools and techniques most suitable for solving them.

3. Have an understanding of the style of a number of major programming languages and paradigms.

4. Develop an understanding of a basic computer model and the basic theory required for computer science.

5. Develop an understanding and practice of more advanced computing topics, including databases, concurrent programming, artificial intelligence and distributed systems.

6. Plan, conduct and write-up a programme of software development conducted in a team.

7. Plan, conduct and write-up a programme of original research and software development.

How achieved:

Skills 1 and 2 are taught and developed through the taught courses, the laboratory work, courseworks and group and individual project work.

Skill 3 is taught and developed through the laboratory programme, the program design and programming courses, the assessed laboratory work and courseworks, the group and individual projects.

Skill 4 is taught and developed through core courses in term 1.

Skill 5 is taught and developed through the specialized optional courses in term 2.

Skill 6 and 7 are taught and developed through the group and individual projects. All taught courses are assessed by written examinations, and have continuous assessment in the form of laboratory work or coursework associated with them.

Practical Skills:

1. Design and develop programs of varying levels of complexity using a number of different programming languages and paradigms, including logic and functional programming, imperative and object oriented programming.

2. Use computing tools and techniques, such as database, web-based and graphic tools and techniques.

3. Analyze computing and computing related problems and devise solutions to them.

4. Give technical presentations.

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5. Prepare technical reports.

6. Conduct detailed literature searches.

7. Conduct in-depth research on tools and languages available on line.

How achieved:

Practical skill 1 is taught and developed through the laboratory programme, the program design and programming courses, the assessed laboratory work and coursework and the group project and individual projects. They are also developed by some of the optional courses in term 2 that involve practical work.

Practical skill 2 is taught and developed through the specialized optional courses in term 2, and through the group and individual project work.

Practical skill 3 is taught and developed throughout the year through the taught courses, laboratory and coursework and group and individual project work. Practical skills 4-7 are taught and developed through the group and individual projects. Assessment of the group project is by a technical presentation, a product demonstration and a technical report, including a detailed log. Assessment of the individual project is by a detailed dissertation and a demonstration.

Other Practical skills are assessed through laboratory work and coursework. The continuous assessment (laboratory work and coursework) in terms 1 and 2, and the programming tests in term 2 provide valuable feedback for the staff and students.

Transferable Skills:

1. Communicate effectively through oral presentations, computer presentations and written reports.

2. Program in the major computer programming paradigms.

3. Use the World Wide Web effectively.

4. Integrate and evaluate information from multiple and diverse sources.

5. Work within and contribute to a team, apply management skills such as coordination, project design and evaluation and decision processes as applied in software engineering.

6. Manage resources and time.

7. Transfer techniques and solutions from one area to another.

8. Learn independently with open mindedness and critical enquiry.

9. Learn effectively for the purpose of continuing professional development.

How achieved:

Skill 1 is developed through feedback on coursework, reports and presentations. In particular, the group project requires a product demonstration, an oral presentation and a report comprising design and implementation documentation, end-user documentation and a comprehensive project logbook.

Skill 2 is taught through lectures and practical coursework. It is further developed, as appropriate, in the individual project.

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Skills 3, 4 and 7 are developed through the individual and group project work.

Skill 5 is developed through group project work.

Skill 6 is developed throughout the course within a series of staged deadlines.

Skills 8 and 9 are not explicitly taught but are encouraged and developed throughout the course.

Skill 1 is assessed through coursework, project presentations and reports and written examinations.

Skill 2 is assessed through coursework and a laboratory based examination.

Skill 5 is assessed in the group project project.

The other skills are not assessed formally, but are implicitly assessed through coursework and the group and individual project reports.

16. The following reference points were used in creating this programme specification.

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http://www3.imperial.ac.uk/computing/teaching/pg/mcs (Course web pages)

http://www.qaa.ac.uk/Publications/InformationAndGuidance/Pages/SBS-Masters-degree-computing.aspx

http://www.qaa.ac.uk/AssuringStandardsAndQuality/quality-code/Pages/default.aspx

17. Programme structure and features, curriculum units (modules), ECTS assignment and award requirements:

For programme structure please see: http://www3.imperial.ac.uk/computing/teaching/pg/mcs/structure

For curriculum units (modules) please see:
http://www3.imperial.ac.uk/computing/teaching/pg/mcs

For ECTS assignment and award requirements please see:
http://www3.imperial.ac.uk/computing/teaching/pg/mcs/regulations
http://www.doc.ic.ac.uk/internal/teachingsupport/ects/ects-mcs.htm

18. Support provided to students to assist learning (including collaborative students, where appropriate).

•One week orientation at the beginning of the Autumn Term, introduction to the Department, to the library, to personal tutors and to the degree programme.
•Extensive library facilities.
•State-of-the-art Computing facilities, with about 200 workstations available. The stock is regularly upgraded and the scheduled lab sessions have lab staff to assist with technical queries.
•Students are each allocated a personal tutor. The tutor's role is to assist their tutees with personal problems and to advise students on academic issues that may arise during the course of the year. In addition to this an academic member of the Department facilitates the administration and co-ordination of the degree.

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•Students have email and open personal access to their tutorial support, including the Course Director.
•Students have access to the Internet and the MSc web-page gives details of courses available, their syllabuses and a guide to completing project work, as well as a FAQ page. Students also have access to the Departmental web pages which include examination and lecture timetables, an in house "Continuous Assessment Tracking Engine" (CATE) used for the electronic administration of coursework via the web and an online computing dictionary, links to careers and the main College web site.
• Access through CATE to teaching material, lecture notes, tutorial exercises, as well as the schedule of assessed work.
•Access to student counsellors on-site.
•Elected student MSc Computing Representatives meet regularly with the MSc Computing Science Director. They also meet at staff-student Committee three times a year to discuss issues relating to their study.
•A large community of postgraduate research students and postdoctoral research workers located on-site who interact with MSc Computer Science students in the course of their learning.
•Access to Teaching and Learning Support Services, which provide assistance and guidance e.g. on careers.
•Students are given the opportunity to carry out their research project at external institutions, during which time an academic member of the Department is responsible for overseeing the student's welfare and monitoring progress.
•Employer needs and opinions feed into the programme through frequent guest lectures from industry, industry based group and individual projects and collaboration between staff and industry in research and consultancy. The Department's student society (DOC SOC) regularly invites guest speakers from industry to discuss career and technical issues.
•An Industrial Liaison Board consisting of influential guests from Industry act in a non-executive capacity to advise on our programmes.

19. Criteria for admission:

The minimum qualification for admission is normally at least an Upper Second Class Honors degree from a UK academic institution or an equivalent overseas qualification, together with some computing experience. Where an applicant has a lesser degree qualification but has several years of relevant experience, the MSc Admissions Tutor may submit a special case for admission to the College.

20. Processes used to select students:

All UK applicants, where it is considered possible to make them an offer, are invited for interview with the MSc Admissions Tutor. Other applicants may be contacted by telephone or email.

21. Methods for evaluating and improving the quality and standards of teaching and learning.

a) Methods for review and evaluation of teaching, learning, assessment, the curriculum and outcome standards:

The external examiner system and Boards of Examiners are central to the process by which the College monitors the reliability and validity of its assessment procedures and academic standards. Boards of Examiners comment on the assessment procedures within the College and may suggest improvements for action by relevant departmental teaching Committees.

The Faculty Studies Committees and the Graduate Schools' Postgraduate Quality Committees review and consider the reports of external examiners and accrediting bodies and conduct periodic (normally quinquennial) and internal reviews of teaching provision. Regular reviews ensure that there is opportunity to highlight examples of good practice and ensure that recommendations for improvement can be made.

At programme level, the Head of Department/Division has overall responsibility for academic standards and the quality of the educational experience delivered within the department or division.

Most of the College's undergraduate programmes are accredited by professional engineering and science bodies or by the General Medical Council. Accreditation provides the College with additional assurance that its programmes are of an appropriate standard and relevant to the requirement of industry and the professions. Some postgraduate taught courses are also accredited.

b) **Committees with responsibility for monitoring and evaluating quality and standards:**

The **Senate** oversees the quality assurance and regulation of degrees offered by the College. It is charged with promoting the academic work of the College, both in teaching and research, and with regulating and supervising the education and discipline of the students of the College. It has responsibility for approval of changes to the Academic Regulations, major changes to degree programmes and approval of new programmes.

The **Quality Assurance Advisory Committee** (QAAC) is the main forum for discussion of QA policy and the regulation of degree programmes at College level. QAAC develops and advises the Senate on the implementation of codes of practice and procedures relating to quality assurance and audit of quality and arrangements necessary to ensure compliance with national and international standards. QAAC also considers amendments to the Academic Regulations before making recommendations for change to the Senate. It also maintains an overview of the statistics on completion rates, withdrawals, examination irregularities (including cases of plagiarism), student appeals and disciplinaries.

The **Faculty Studies Committees** and **Graduate School Postgraduate Quality Committees** are the major vehicle for the quality assurance of undergraduate/postgraduate courses respectively. Their remit includes: setting the standards and framework, and overseeing the processes of quality assurance, for the areas within their remit; monitoring the provision and quality of e-learning; undertaking reviews of new and existing courses; noting minor changes in existing programme curricula approved by Departments; approving new modules, changes in module titles, major changes in examination structure and programme specifications for existing programmes; and reviewing proposals for new programmes, and the discontinuation of existing programmes, and making recommendations to Senate as appropriate.

The **Faculty Teaching Committees** maintain and develop teaching strategies and promote inter-departmental and inter-faculty teaching activities to enhance the efficiency of teaching within Faculties. They also identify and disseminate examples of good practice in teaching.

The **Academic Committee** meets monthly and deals with both the strategic and the regular day to day decisions about the Departments teaching. Subcommittees are formed and look at problem areas. Year and Course Coordinators discuss problems of their constituencies. Topics for discussion can come from any member of the teaching staff and sometimes come from the Departments Operations Committee. Decisions requiring regulations to be changed go to the Engineering Studies Committee and then to College Senate.

c) **Mechanisms for providing prompt feedback to students on their performance in course work and examinations and processes for monitoring that these named processes are effective:**

Marking and the dissemination of marks are required to be completed within three weeks of being handed in. This is monitored by our online tracking engine called CATE.

CATE requires students to submit their work either electronically or manually via this system. The Senior Tutor is informed of late submissions. Once submitted the system will then track the progress of the work being marked and will publish the marks when complete. Failure to publish the marked work within the set time will result in CATE emailing the relevant lecturers of the lateness.

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Methods for checking effectiveness include:

•Feedback from lecturer evaluation questionnaires.
•Staff-Student Committee held each term; feedback from this is passed on to the Academic
Committee.
•Meetings with personal tutees.
•Regular meetings between student representatives and Course Director.

d) **Mechanisms for gaining student feedback on the quality of teaching and their learning experience and how students are provided with feedback as to actions taken as a result of their comments:**

•Feedback from lecturer evaluation questionnaires;
•Staff-Student Committee held each term; feedback from this is passed on to the Academic
Committee·
•Meetings with personal tutees.
•Regular meetings between student representatives and Course Director.

e) **Mechanisms for monitoring the effectiveness of the personal tutoring system:**

•Feedback from PG SOLE (Student On-Line Evaluation)
•Staff-Student Committee held each term (twice in the Autumn and the Spring terms and once in the Summer Term); feedback from this is passed on to the Academic
Committee·
•Regular meetings between student representatives and Course Director.

f) **Mechanisms for recognising and rewarding excellence in teaching and in pastoral care:**

Staff are encouraged to reflect on their teaching, in order to introduce enhancements and develop innovative teaching methods. Each year College awards are presented to academic staff for outstanding contributions to teaching, pastoral care or research supervision. A special award for Teaching Innovation, available each year, is presented to a member of staff who has demonstrated an original and innovative approach to teaching. Nominations for these awards come from across the College and students are invited both to nominate staff and to sit on the deciding panels.

g) **Staff development priorities for this programme include:**

- Active research programme in multiple fields of Computing.
- Staff appraisal schemes and staff development programmes (e.g. CASLAT).
- Updating professional developments.

22. Regulation of Assessment.

a) **Marking Schemes for undergraduate and postgraduate taught programmes:**

In order to pass the MSc students have to satisfy all of the following requirements:

1. An aggregated mark of at least 50% on the following 9 components:
   a) Two written papers on core computing courses (term 1 material) - Counts as 3 components
   b) The Laboratory (term 1) - Counts as 1 component
   c) Four written papers on the option courses (term 2 material) - Counts as 4 components
   d) Software Engineering Group Project counts as 1 component.

2. A mark of at least 40% on each of the components in b, c, d and in each of the two papers in a.

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3. A mark of at least 51% on the individual project.

Notes:

Coursework associated with a course normally contributes 10% to the assessment of the course. Any exceptions are indicated in the individual course syllabus. Each paper in (a) examines two core computing courses of term 1. The courseworks of those courses contribute 10% to the paper.
The Laboratory test contributes 80% of the Laboratory mark.

In order to be considered for the MSc with DISTINCTION students have to satisfy all of the following requirements:

1. Pass the MSc
2. An aggregated mark of at least 70% on the 9 components
3. A mark of at least 71% on the individual project.

In order to be considered for the MSc with MERIT students have to satisfy all of the following requirements:

1. Pass the MSc, but without DISTINCTION
2. An aggregated mark of at least 60% on the 9 components
3. A mark of at least 61% on the individual project.

If a candidate who has been examined in all the components fails to satisfy the Board of Examiners, the Board will determine which components (including which examination papers) he/she will have to retake on re-entry. These elements are normally selected from those in which the candidate has a mark less than 50%. All failed components, including the practical components (e.g. Laboratory or the group project), will have to be retaken the following year, and the team project may, at the discretion of the Board of Examiners, be substituted by practical tests. Only one retake is possible for each component.

http://www3.imperial.ac.uk/computing/teaching/pg/mcs/regulations

b) **Processes for dealing with mitigating circumstances:**

A candidate for a Master's degree who is prevented owing to illness or the death of a near relative or other cause judged sufficient by the Graduate Schools from completing at the normal time the examination or part of the examination for which he/she has entered may, at the discretion of the Examiners,

(a) Enter the examination in those elements in which he/she was not able to be examined on the next occasion when the examination is held in order to complete the examination.

Or

(b) Be set a special examination in those elements of the examination missed as soon as possible and/or be permitted to submit any work prescribed (e.g. report) at a date specified by the Board of Examiners concerned. The special examination shall be in the same format as specified in the course regulations for the element(s) missed.

Applications, which must be accompanied by a medical certificate or other statement of the grounds on which the application is made, shall be submitted to the Academic Registrar who will submit them to the Board of Examiners.

c) **Processes for determining degree classification for borderline candidates:**

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Candidates should only be considered for promotion to pass, merit or distinction if their aggregate mark is within 2.5% of the relevant borderline. Nevertheless, candidates whom the Board deems to have exceptional circumstances may be considered for promotion even if their aggregate mark is more than 2.5% from the borderline. In such cases the necessary extra marks should be credited to bring the candidate's aggregate mark into the higher range.

d) **Role of external examiners:**

The primary duty of external examiners is to ensure that the degrees awarded by the College are consistent with that of the national university system. External examiners are also responsible for approval of draft question papers, assessment of examination scripts, projects and coursework (where appropriate) and in some cases will attend *viva voce* and clinical examinations. Although external examiners do not have power of veto their views carry considerable weight and will be treated accordingly. External examiners are required to attend each meeting of the Board of Examiners where recommendations on the results of individual examinations are considered. External examiners are required to write an annual report to the Rector of Imperial College which may include observations on teaching, course structure and course content as well as the examination process as a whole. The College provides feedback to external examiners in response to recommendations made within their reports.

23. Indicators of Quality and Standards:

• Recognition amongst employers.
• Favorable comments from the students.
• Favorable comments by External Examiners.
• Recognition and high profile of the course amongst applicants (as judged by the large number of applicants and their quality).
• Recognition in academic institutions of the quality of PhD candidates emerging from the MSc course.

24. Key sources of information about the programme can be found in:

http://www3.imperial.ac.uk/computing/teaching/pg/mcs

http://www3.imperial.ac.uk/pgprospectus/facultiesanddepartments/computing/postgraduatecourses/computingscience