

## **Programme Specification – Computer Science & Philosophy**

**Master of Computer Science and Philosophy (4 Years),  
BA Computer Science and Philosophy (3 Years)**

<b>1. Awarding institution/body</b>	<b>University of Oxford</b>
<b>2. Teaching institution</b>	<b>University of Oxford</b>
<b>3. Programme accredited by</b>	<b>n/a</b>
<b>4. Final award</b>	<b>M.Comp.Phil. or B.A. Comp.Phil</b>
<b>5. Programme</b>	<b>Computer Science and Philosophy</b>
<b>6. UCAS code</b>	<b>IV15</b>
<b>7. Relevant subject benchmark statements</b>	<b>Computing, published 2007. Philosophy, published 2007.</b>
<b>8. Date of programme specification</b>	<b>September 2012</b>

### **9. Educational aims of the programme**

- To provide a course of the highest academic quality in Computer Science and Philosophy in a challenging and supportive learning environment that attracts the very best students from the UK and elsewhere.
- To provide students with a broad, balanced knowledge of core areas and advanced topics in Computer Science, as defined by the QAA Benchmark Statement, including logic as a natural bridge with Philosophy.
- To enable students to appreciate the interest and importance of philosophical questions on a variety of topics, including links with Computer Science, and to contribute to the discussions of these questions.
- To enhance the understanding of both Computer Science and Philosophy by parallel study of these related disciplines with particular emphasis on the interdisciplinary subjects of logic and philosophy of science.
- To develop in students the ability to evaluate primary evidence critically and the conceptual understanding to marshal and present arguments and solutions based on primary data, relevant theory and the application of sound reasoning.
- To provide a learning environment which draws on the wide-ranging talents and expertise of staff in both Computer Science and Philosophy, and challenges and encourages students, with their differing needs, interests and aspirations, to reach the full potential, personally and academically.

- To develop transferable skills relating to problem solving, as well as promoting the ability to think independently, to develop powers of critical analysis, of sustained argumentation and of clear and effective communication both orally and in writing.
- To bring students to a position on graduation where they can choose confidently from a wide range of careers, both within the Information Technology sector and outside it.

And for students taking the 4-year MCompPhil

- To provide the foundations for graduate study at a leading university, in the UK or abroad, in either Computer Science or Philosophy.

## **10. Programme outcomes**

### ***A. Students will develop a knowledge and understanding of:***

- the general theoretical and practical principles of Computer Science;
- a broad range of topics in theoretical Computer Science and the architecture and implementation of information systems;
- relevant mathematical theories and techniques and their application to practical design problems;
- methods of software development;
- selected philosophical texts and central philosophical issues and the concepts needed to discuss those texts and issues in an effective manner;
- the elements of mathematical logic and philosophy of science.

### *Related teaching/learning methods and strategies*

- *Lectures* are the principal mode in which the course content is delivered. Lecturers will generally use lectures that outline the areas of knowledge they wish students to become familiar with, and to emphasize particularly important concepts.
- *Private study* using books and problem sheets allows students to consolidate their knowledge of the course content, to check their understanding, and to explore topics beyond the syllabus. Substantial periods of private study during both term and vacations are necessary and expected.
- *Tutorials* (usually in pairs) are used to discuss the more difficult concepts, stretch the most able students and provide focused help for those having difficulty. In the case of Computer Science, tutorials are typically based on sets of problems that help students to develop their understanding, and to draw out deeper aspects of the material covered in lectures. In the case of Philosophy

tutorials, students will normally present an essay on a topic prescribed beforehand, which will then be discussed by the tutor, who will aim to give constructive criticism of what has been written, to point out any important aspects of the topic that have been overlooked, and to open up further lines of thought.

- *Advanced classes* (6-12 students) on some parts of the course content allow students access to expert specialists in particular areas.
- *Laboratory classes* allow students to examine more closely the practical applications of the material covered in lectures.
- *Independent Computer Science project work or a Philosophy thesis* under the supervision of a member of staff allows students to gain experience in scientific investigation and in the development of more substantial piece of work.

### ***Assessment***

Formative assessment is carried out through tutorials, classes, laboratory classes and termly practice examinations (Collections), which are marked and returned to students. These are provided at college level and have no influence upon university examinations.

Public examinations at University level are taken at the end of each year for Computer Science, and at the end of the first, third and fourth years for Philosophy.

For those on the 3-year BA course, degree classification is based on their performance in Parts A (second year) and B (third year) together. In order to proceed to Part C (fourth year), a student working towards the 4-year MCompPhil degree must achieve upper second class Honours standard in Parts A and B together. Students on the 4-year MCompPhil course receive two degree classifications: for their performance in Parts A and B together, and for their performance in Part C.

For each examination, students' participation and performance in practical work is taken into account.

### ***B. Skills and other attributes***

***Students will have the opportunity to develop the following skills during the course:***

#### ***I. Intellectual skills***

1. The ability to demonstrate knowledge of key concepts and topics in Computer Science, both explicitly and implicitly in the solution of problems.
2. The ability to understand and analyse problems, formulating them in terms of appropriate theoretical frameworks, in order to facilitate their solution.

3. An understanding of how Computer Science concepts and theories may be applied to the solution of problems including, where appropriate, an understanding that this may give only a partial solution.
4. The ability to select and apply appropriate techniques and processes.
5. The ability to construct and develop logical arguments, with clear identification of assumptions and conclusions.
6. The ability to abstract, analyse and construct sound arguments and identify logical fallacies.
7. Skills of analysis and argumentation, of independent and creative philosophical thinking, moving between generalization and appropriately detailed discussion, inventing or discovering examples to support or challenge a position, distinguishing relevant and irrelevant considerations.
8. Willingness to evaluate opposing arguments, to formulate and consider the best arguments for different views, to identify the weakest elements of the most persuasive view, to make their own minds on the issues and to argue for their own view in a clear and cogent fashion.
9. Understanding and appreciation of perspectives different from their own.

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

These skills are acquired through lectures, classes, tutorials, independent study and project/thesis work.

#### *Assessment:*

These intellectual skills are assessed summatively in the examinations at the end of each year of the programme, and formatively in weekly classes and tutorials and in termly college examinations.

## ***II. Practical skills***

1. The ability to design and implement computer programs to solve specified problems.
2. The ability to consider, develop, assess and criticise the architecture of larger computer-based systems on a rigorous basis.
3. The ability to formulate precise specifications of computer-based systems.

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

These practical skills are developed throughout the course in work done for tutorials and classes, but especially in the supervised practical work that is attached to many of the lecture courses, and in the extended, supervised project that is carried out in the fourth year.

## Assessment

Formative assessment of these skills takes place through tutorials, classes and practical classes. Satisfactory performance in practicals is necessary to pass each year of the degree.

### **III. Transferable skills**

<ol style="list-style-type: none"><li>1. The ability to study and learn independently.</li><li>2. The ability to analyse and solve problems and to reason logically and creatively.</li><li>3. Effective verbal and written communication and presentation.</li><li>4. Independent time management.</li><li>5. Teamwork.</li><li>6. The ability to think critically about problems and their solutions, and to defend an intellectual position.</li></ol>	<p><b>Teaching/learning methods and strategies</b></p> <p>A learning process that requires students to assimilate material from several sources, including lectures, tutorials, practical classes, books, and online sources, largely self-guided.</p> <p>Weekly problem sheets with tutorial or class support, often requiring significant development of ideas beyond material found in lectures or books.</p> <p>Weekly tutorial and class assignments, with discussion and defence of written work in tutorials and presentation of solutions in classes.</p> <p>Requirement to produce substantial amounts of written work to strict tutorial and class deadlines. Need to balance academic and non-academic activities.</p> <p>A group design exercise forms a major component of the practical work for all students in the second year. Tutorial partners are encouraged to explore ideas together, thereby enhancing each other's learning</p> <p>Discussion and criticism in tutorials.</p>
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*Assessment:* The tutorial system provides continual formative assessment of all aspects of students' intellectual development.

## **11. Programme Structures and Features**

The programme is offered as a four-year course leading to the degree of Master of Computer Science and Philosophy or, for those choosing to leave after 3 years, a BA in Computer Science and Philosophy.

### **Learning: Year 1**

#### *Subjects*

- Functional Programming
- Design & Analysis of Algorithms
- Imperative Programming I and II
- Discrete Mathematics
- Probability
- Introduction to Logic
- Elements of Deductive Logic
- Turing on Computability and Intelligence
- General Philosophy

### *Assessment*

Five written papers (four of 3 hours' duration and one of 2.5 hours' duration) together with assessed practical work.

### ***Year 2***

#### *Subjects*

Computer Science core course:

- Models of Computation

*Three optional Computer Science courses including:*

- Concurrent Programming,
- Object-Oriented Programming
- Advanced Data Structures and Algorithms
- Compilers
- Principles of Programming Languages
- Logic and Proof

### *Assessment*

Four written papers of 1.5-hour' duration papers on the Computer Science courses together with assessed practical work. (N.B there is no summative assessment for Philosophy in Year 2.)

### ***Year 3***

#### *Subjects*

Computer Science options (100%) including:

- Intelligent Systems
- Computational Complexity
- Databases
- Computers in Society

- Lambda Calculus and Types
- Computer Security

#### Philosophy options

- History of Philosophy from Descartes to Kant
- Knowledge and Reality
- Philosophy of Mind
- The Philosophy of Logic and Language
- Formal Logic
- Philosophy of Mathematics
- Philosophy of Science
- Philosophy of Cognitive Science

Candidates take must take between 25% and 75% of their courses from each of Computer Science and Philosophy.

#### *Assessment*

The equivalent of four written papers of 3 hours each, plus assessed practical work.

#### *Year 4*

#### *Subjects*

Candidates take three units of assessment from a list including some or all of the following courses. Each Computer Science option constitutes a half-unit, each Philosophy option constitutes one unit.

- Categories, Proofs & Processes
- Information Retrieval
- Computational Linguistics
- Automata, Logic and Games
- Probability and Computing
- Theory of Data & Knowledge Bases
- Quantum Computer Science

#### Philosophy options

- History of Philosophy from Descartes to Kant
- Knowledge and Reality
- Philosophy of Mind
- The Philosophy of Logic and Language
- Formal Logic
- Philosophy of Mathematics
- Philosophy of Science
- Philosophy of Cognitive Science

Candidates may choose to carry out a Computer Science project or a Philosophy thesis counting as one unit.

### *Assessment*

A 2-hour written paper or a take-home assignment on each Computer Science option plus assessed practical work. Philosophy options are examined by a 3-hour written examination together with an essay of at most 5,000 words.

## **12. Support for Students and their learning**

*College Support.* All students have a college tutor who oversees their academic progress. The college tutor arranges college teaching (tutorials and classes), advises on general academic matters such as the choice of options, oversees library provision of relevant texts in the college, arranges college examinations, and provides careers advice and references.

Students may also turn for help and advice to other officers of their college, including the Senior Tutor or Tutor for Undergraduates, the College Dean or Junior Dean, the College Chaplain, College Counsellor, College Doctor or Nurse, or the Head of the College. All students have access to college and university hardship funds and travel funds.

*Role of college teaching.* Undergraduates have tutorials and classes in their colleges during the first and part of the second year of the programme, typically two paired tutorials or one tutorial and one class per week. In the third year, undergraduates are supported by specialist inter-college classes, which typically contain 6—10 students, and are given by a class tutor assisted by a marker. In Philosophy, this pattern of college-based tutorials is continued into the third and fourth years of the degree course. For both Computer Science tutorials and classes, students submit their written answers to the assigned problems before the tutorial or class for marking. The advantage of the class system is that undergraduates can receive specialist tuition on the more advanced topics that are studied in later parts of the programme. A record of attendance and achievement is kept for inter-college classes and reported to tutors throughout term, or earlier if poor attendance or achievement gives cause for concern.

*Library provision.* The University's libraries provide all students with excellent resources. College libraries and the University's lending library for science undergraduates provide students with all primary course texts (often with one copy per student), and provide a wealth of supplementary reading. Other written resources include excellent local bookshops, printed lecture notes and supporting material distributed via the World Wide Web, several text books written by members of staff, and past examination papers and examiners' reports that are accessible online.

*Computing facilities.* The Department of Computer Science maintains a network of 83 PCs for undergraduate practical and project work. The teaching machines are provided with a comprehensive collection of general-purpose software, together with practical materials that have been specifically developed to support learning in the degree programme. Examples of these materials include simulation studies of systems performance (Operating Systems), a range of interpreters and compilers for example languages (Compilers and Programming Languages), simulations of computer arithmetic and processor architecture (Digital Systems and Computer Architecture), Concurrent Programming Libraries (Concurrent Programming) and application programming projects (Imperative Programming and Object-Oriented Programming). The Department provides demonstrating staff who assist undergraduate learning during practical classes.

In addition, the University is rich in computing facilities of various kinds, and operates a high-speed data network that links all colleges and departments. Colleges provide computing facilities on the network that are easily accessible to students, and the majority of undergraduate rooms are now linked to this network, with most Computer Science undergraduates having their own PCs. The Department's workstations are remotely accessible to students over the network.

### **13. Criteria for Admission**

- Applications are made to colleges of the University, not to the faculty/department, in the case of undergraduates.
- Grades required are usually A\*AA at A-level, including A\* in Mathematics, Further Mathematics, Physics or Computing, or other equivalent international qualifications.
- Offers are made on the basis of students' academic record, the recommendations of their teachers, and their performance in a written test and in interviews held in colleges in December.
- Applicants are required before interview to take a written test of basic manipulative ability in Mathematics. This test is based on that part of the common core of Mathematics A-levels that will have been covered by applicants by this time, and includes questions designed to assess aptitude in Computer Science.
- The purpose of the interviews is to determine those students, from an excellent cadre of applicants, who might best benefit from the intensive, tutorial-based learning methods employed in the University.

### **14. Methods for evaluating and improving the quality and standards of learning**

Overall responsibility for the programme is vested in the Supervisory Committee for Computer Science and Philosophy, which comprises members of the Department of Computer Science and the Faculty of Philosophy.

Responsibility for the content and delivery of the Computer Science part of the course rests with the Teaching Committee of the Department of Computer Science which is part of the Mathematical, Physical and Life Sciences Division, and for the Philosophy part of the course with the Undergraduate Studies Committee of the Philosophy Faculty.

The Divisional Boards have formal responsibility for the maintenance of educational quality and standards in their broad subject areas, and exercise the responsibility through the divisional academic committees, and in particular give scrutiny to new course proposals and proposed course revisions, to reports of examiners, and to more general questions of academic policy.

The Divisional Boards are also responsible for academic appointments and for the arrangements (including mentoring, appraisal, and reviews of performance) for the support of newly appointed lecturers and for monitoring their teaching competence.

Student feedback on lectures and inter-college classes is encouraged by the distribution and collection of anonymous multiple-choice questionnaires and comment forms towards the end of each course. Responses to these questionnaires and comments are collated each term, reported to the teaching staff concerned, and considered by the Course Review Committee for Computer Science courses and, the Undergraduate Studies Committee for Philosophy courses, for action to be taken where appropriate.

Undergraduates' representatives attend meetings of the Faculty of Computer Science and the Faculty of Philosophy which oversee the two sides of the programme, and student concerns are also discussed at termly meetings of the Joint Consultative Committee for Undergraduates.

Students' comments on tutorial provision in colleges are commonly sought by the Senior Tutor of each college, and are reviewed and acted upon in ways that vary from college to college.

## **15. Regulation of assessment**

### *Final Examination*

The Supervisory Committee for Computer Science and Philosophy is responsible for Examination Conventions within the framework of setting, checking, and marking examinations established by the Teaching Committee of the Department of Computer Science (for examinations in Computer Science) and the Faculty Board of Philosophy (for examinations in Philosophy). These are endorsed by the Division of Mathematical, Physical & Life Sciences, and published on the Web. Oversight of all university examinations is carried out by the Junior Proctor, who considers all complaints and applications for special consideration, for example on medical grounds.

The final examination is conducted in two parts for the three-year degree, and in three parts for the four-year degree, by a team of internal examiners and external examiners in both Computer Science and Philosophy. Examiners are nominated by the Department of Computer Science and the Faculty of Philosophy to make up the Examination Board that examines this degree, subject to approval by the Vice-Chancellor and Proctors on behalf of the University. Examiners normally serve for a period of three years.

The Board of Examiners, under its elected Chair, is responsible for setting all papers, and marking the scripts of the examinees. They may appoint Assessors to assist in the setting and marking of the more specialist papers. Normally, the assessor for a subject will be the lecturer who has taught the topic in question. After scripts have been marked, the Board of Examiners meets to classify the students.

External Examiners are appointed in order:

- To verify that standards are appropriate to the award, in part by comparison with the standards of comparable institutions, and to ensure that the assessment procedures and the regulations governing them are fair and otherwise appropriate.
- To ensure that the conduct of the examination and the determination of awards has been fairly conducted, and that individual student performance has been judged in accordance with the regulations and conventions of the Examining Board. This will entail signing the Class List as an endorsement that the processes of examination and classification have been fairly conducted.

External Examiners are expected to report to the Vice-Chancellor in each year in which they act. Their reports are expected to cover all the following points:

- the standards demonstrated by the students
- the extent to which standards are appropriate for the award
- the design, structure and marking of assessments
- the procedures for assessment and examinations
- whether or not external examiners have had sufficient access to, and the power to call upon, any material necessary to make the required judgments on students' performance in relation to their peers in comparable courses
- the coherence of the policies and procedures relating to external examiners and their consonance with the explicit roles required of them
- the basis and rationale for any comparisons made
- the strengths and weaknesses of the students as a cohort
- the quality of teaching and learning which may be indicated by student performance

The report is addressed to the Vice-Chancellor, and will be considered by the relevant divisional board, the faculty/department and by the University's Educational Policy and Standards Committee.

Where an external examiner's report contains particular suggestions or criticisms, it is the responsibility of the faculty/department to ensure that full consideration is given to these, to institute further discussion or action, and to inform the external examiner within a reasonable time of what is done.

## **16. Indicators of quality and standards**

The reports of External Examiners regularly address issues of quality and standards.

\* The Humanities and Mathematical, Physical and Life Sciences Divisions undertake, jointly with Education Committee, six-yearly reviews of their departments and programmes. These reviews have strong external representation.

\* The Teaching Committee in the Department of Computer Science and the Undergraduate Studies Committee of the Philosophy Faculty monitor the quality of courses, statistics on applications and acceptances for entry into the degrees, statistics on the success of students in examinations, and feedback from current students.

\* The External Advisory Panel of the Department of Computer Science includes experts from other universities and representatives of a number of potential employers of graduates from the programme. It meets annually with officers of the Department of Computer Science or Philosophy Faculty, and is consulted and kept informed about the content of degrees.

\* The annual returns on first destinations of graduates demonstrate the success of graduates in the job market and in obtaining admission to postgraduate study.

\* In the 2011 Philosophical Gourmet Report (which involves a survey of around 450 philosophers across the English-speaking world on the ranking of Philosophy departments, specifically from the point of view of graduate study) Oxford was ranked second in the world, narrowly behind New York University.

**Contact for queries:**

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