Teaching and Learning Strategy for UCL Computer Science

Stage 1: the ‘narrative’ or vision

What does the department stand for? What does it want to achieve? What is it going to do meet its objectives?

Drafters may wish to look first at the questions below and use them as 'prompts' or suggestions for the kind of things they might wish to include in their statement – but this element of the strategy is intended to be as 'individual' as possible: a chance for the department to present its vision in its own words.

The Computer Science department is part of the Engineering Sciences Faculty and is focused on the study and development of computer-based technologies and systems, along with their mathematical underpinnings. The development of such technologies has had the most profound and rapid effects on the ways in which society, commerce, industry, academia and government operate, and the department aims to lead and innovate in the continuing evolution of these technologies, in particular software-intensive systems.

As a young and highly dynamic subject, Computer Science has yet to entrench itself in academic orthodoxy, and is open to influences and collaboration with areas as disparate as mathematics, psychology, art and design, architecture, linguistics, physics, and engineering (to name but a few). The study of Computer Science requires knowledge and practical expertise that span science, engineering, and art and the profound role of computers in shaping society and their sheer ubiquity means that engineering professionalism is as important as scholarship. In both teaching and research the effective combination and application of practical and theoretical skills defines the essence of the department. Students at both undergraduate and postgraduate level graduate are well prepared for working in commerce, industry or research.

The department aims to strengthen its position as a leader in teaching and research in the UK and internationally. The undergraduate programmes are to be updated, while each research group now has its own advanced MSc programme and a substantial numbers of research students. In addition, there are now two strong conversion MSc programmes that will be further developed and strengthened.

The department is committed to attracting and admitting the best students from a wide range of backgrounds and nationalities, providing them with the highest quality education.
Stage 2: the department in context

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STRATEGIC ENVIRONMENT AND KEY GOALS

a) What is the nature of the strategic environment in which the department is working? How do external demands (and the department’s role in shaping or responding to those demands) affect the education service that is provided and how it is delivered?

The development and operation of software-based systems now underpins all major economies, representing a substantial proportion of overall economic activity. In consequence there is a strong demand for high quality graduates in both general Computer Science and also the specialist areas of our MSc programmes. The department has many contacts and relationships with commercial organizations, notably in the financial and consultancy areas, providing valuable input to the design and content of our courses, keeping them directly relevant to the needs of commerce and industry. Much of the department’s research is also in collaboration with commerce and industry, with the research activities feeding through into teaching.

Undergraduate student intake is dependent on finding candidates with good Maths skills, in particular those who can obtain grade A at A-level or equivalent. For the time being the supply of suitable candidates remains healthy and an increasing number of international students are studying Computer Science. In the future the MEng degree will be offered with a number of specializations to maintain interest and help distinguish it from competitors. Additional efforts will also be made to promote the undergraduate degrees and to distinguish our teaching style and content from those of our competitors, principally the other Russell Group universities.

Postgraduate student intake at the conversion MSc level is strong, with the department recently admitting a record number of students. A new MSc in Financial Computing has been established to reflect the growing demand for degrees combining Computer Science and financial content. The curriculum has been developed in conjunction with a number of commercial sponsors, one of which has provided the funding to completely refurbish and re-equip one of the department’s computer labs. The department will maintain and develop these relationships and the degree programmes.

At the advanced MSc level, the department has traditionally relied on providing specialist courses covering a specific subject in depth, drawing on the strength of the departmental research groups. The majority of students are international students and the intake profile changes over time as world-wide trends and circumstances change. High fees and slow processing of applications within the college make maintaining student numbers a challenge in some areas. Several of the advanced MSc programmes are to be reviewed and reorganized to ensure they continue to recruit good numbers of students.

At the research student level, applications and intake are both healthy, reflecting the department’s research success. Increased effort will be put into publicising the department’s research and actively seeking out the best PhD candidates.

b) How does the department innovate / mark itself out as distinct in this context?

The department combines a strong commitment to being a research leader and providing a high quality learning and teaching environment. A particular emphasis is placed on producing graduates who have strong practical and leadership skills, combined with a deep understanding of Computer Science. Recruitment of new academic staff is focused on attracting candidates, nationally and internationally, who are able to demonstrate strong research and teaching skills.

Our undergraduate programmes are recognised by employers as producing excellent candidates for internships and graduate recruitment programmes, resulting in many graduates working in the City and Docklands. As well as studying core Computer Science subjects, students also have a number of free options within the curriculum, allowing them to study a ‘minor’ subject in depth, for example to learn a foreign language. The MEng International programme allows students to take their third year at a university outside the UK, while further opportunities for international links are being explored.

At the postgraduate level there is a strong synergy between teaching and research activities. Extensive use of research expertise is put to good use both on advanced MSc courses programmes and the corresponding fourth
The department’s undergraduate Computer Science degree programmes and several advanced MSc programmes are fully accredited by the BCS and IET.

c) What are the department’s goals for the next period?

The department’s goals are to:

a) Continue to identify and recruit the best academic staff and students.

b) Move to the next stage of updating the undergraduate degree programmes, with greater emphasis on flexibility, student-centred learning and the development of transferable skills.

c) Continue the current progress in updating and developing the MSc programmes.

d) Continue the development of the PhD programme.

e) To provide greater opportunities, particularly at the undergraduate level, for students to be informed about and participate in research activities.

APPROACHES TO TEACHING, LEARNING AND ASSESSMENT

d) What is the teaching, learning and assessment philosophy of the department, and how does this fit with UCL’s overarching institutional aims?

The department aims to prepare students as leaders in commerce, industry and research. All programmes combine a strong mathematical and theoretical background with the practical skills needed to design and build software systems. Based on long standing experience examinations are used as the primary means of assessment on non-project based modules, as exams give the best indication of a student’s ability. Coursework is largely used for formative assessment, while project work directly assesses a student’s practical skills.

Each programme aims to be internally coherent, with an appropriate mixture of theory, practical skills, and professional development. The material taught aims to be leading edge, to be intellectually stimulating and to be the subject of regular review to ensure that it remains so. Advances in knowledge gained through research and scholarship within the department are fed into this process, and outside insight from external bodies is used to enhance this process.

The department is taking full advantage of college facilities and initiatives, such as on-line learning support, the Graduate School and the undergraduate transition programme, to enhance the student experience.

e) How does the department structure its teaching?

The department uses a range of teaching strategies, with lecturers given a wide degree of discretion on how to deliver their modules. Lectures are used as the default delivery mechanism, typically supplemented by supervised problem and lab classes, and group discussion. Many modules include group and small-scale project work, with student-led seminars and presentations. WebCT, Moodle and a range of other online tools are used to support teaching. The department also operates a number of specialist computer labs, with teaching based around the lab facilities.

All students are required to undertake a substantial project in order to complete their degree. The majority are individual projects, with two of the advanced MSc’s having group projects. A notable innovation on the Software Systems Engineering MSc has been to have all students on the programme forming a single large project group with an external client, reflecting the experience of a typical commercial software development team. Third year undergraduates also take part in a group software engineering project, where they are required to specify, design and build a software system for a client.

A full undergraduate tutorial system is in operation, with each student having member of academic staff as their tutor, changing each year. Tutorial attendance is monitored as a way of confirming that students are attending and
keeping up with their studies. Taught MSc programmes also have tutorial systems adapted to their specialist needs. Research student supervision fully complies with the Graduate School guidelines, supplemented by regular reviews of each student’s progress following departmental procedures.

The large majority of teaching is done by members of the academic staff, supported by a small number of teaching fellows. Research staff and students contribute by running problem and lab classes. In addition research staff are encouraged to take part in lecture-based teaching supervised by an academic staff member, as part of their training.

The department accepts a number of affiliate students each year and third year undergraduates on the MEng international programme spend the year at a university outside the UK.

There are still considerable opportunities to change the way we teach so as to deliver effective teaching in ways other than those based on traditional lectures. In particular, given the strengths of our research groups, there is a massive opportunity to engage students in research related activities from very early in their first year, to build independent thought, flexibility and a questioning attitude to learning.

f) How does the department’s approach to student recruitment impact upon its teaching and learning policies?

At the undergraduate level most students enter with three or more A-levels (ABB) or equivalent qualifications. A grade A, or equivalent, in Maths is normally required. The department also accepts students with other qualifications, such as those obtained from access courses, providing they can demonstrate a good potential for computer science and have the necessary Maths background. All home applicants visit the department and are interviewed.

The requirement for Maths is to ensure that students will be able to cope with the theoretical side of computer science and because mathematical ability is seen as a good indicator of programming ability. More advanced modules in the third and fourth years are able to build on this to go into greater depth. Recruitment of undergraduates has dipped in recent years but is now rising strongly again.

The department provides a full programme in registration week for new undergraduates and fully participates in the UCL Transition programme. All first years have a student mentor who is a second or third year student.

At the MSc level all advanced programmes require a first degree in computer science or closely related subject, so teaching is able to build directly on that to allow for greater depth. The conversion MSc programmes recruit students with a good first degree (that is not Computer Science) and are able to proceed at a fast pace due to the standard of the students.

The MSc in Financial Computing is a new MSc drawing on the strong demand for degrees combining both computing and financial content. This degree has recruited strongly and the subject area is a good indicator for future programme development. The advanced MSc in Software Systems Engineering also has a substantial financial component and has also increased its intake significantly.

The college initiatives on widening participation are factored into the student recruitment strategies, and the department has a very good track record at the undergraduate level of accepting students from lower social backgrounds.

g) How is the department engaged with the widening participation agenda and what measures are in place to support students from less-traditional backgrounds?

The department has a good record for recruiting students from a wide range of backgrounds, providing they have a good enough maths ability. Open days and a summer school are used to inform potential undergraduate applicants about the department and encourage them to apply.

A large proportion of students at both undergraduate and postgraduate level are from outside the UK. They are all required to have at least the minimum English language requirements but are directed to support courses within UCL if extra help is needed. Undergraduate students with weaker maths ability are advised on taking modules from the Maths department to improve their standard. Additional maths short courses are provided for conversion MSc students.

Applicants to Computer Science are predominately male, with women students making up no more than around 20% of the overall student body. The department is actively seeking to increase the number of women students.
h) Are there any issues around staff recruitment that might impact upon teaching and learning? How does the department encourage staff development in this area?

All academic staff are expected to take an active role in teaching but recruitment is primarily based on research ability. The department has been very successful in recruiting leading academics from around the world and their expertise clearly benefits teaching, in particular at the advanced levels. All new junior academic staff are required to complete the UCL new lecturer training programme.

The department has a large number of administration and technical staff. The administration staff handle many of the administrative tasks related to students and teaching, freeing academic staff for other duties. Similarly the technical staff manage all day to day operation of computing labs and teaching equipment in the department.

All staff are encouraged to attend the wide range of training courses provided by UCL.

i) How does the department measure its success in teaching and learning?

The department primarily uses end of year results to monitor the overall effectiveness of teaching. Exam board members and external examiners are presented with detailed results that allow them to determine how well a cohort of students has performed. The departmental Teaching Committee provides a forum for detailed discussion of issues and for formulating policy.

Students are able to give direct feedback on modules and degree programmes via online module assessment forms and the Staff-Student Consultative Committee. Feedback results are discussed with programme directors and lectures as necessary. Starting this year a report will be written for each module and programme in line with UCL policy.

j) How does the department prepare students for employment / further study?

All undergraduate students attend a range of workshops covering transferable skills such as making presentations. Third year group projects put many of these skills into practice, including making a major presentation to an audience including representatives of the group project sponsors (currently Goldman Sachs). Taught modules are frequently updated to include cutting edge material relevant to commerce and industry.

The department has a Careers tutor and website and interacts with the UCL careers centre.

DEPARTMENTAL BUSINESS PLAN AND RESOURCES

k) How is the department funding its strategic aims?

The department’s funding strategy is primarily determined by its research activities, which have been very successful in recent years. The research areas are used to identify and provide high quality degree programmes, in particular at the postgraduate level, and to determine the content and emphasis of each programme. Based on its research reputation, the department is able to follow a selective strategy of attracting high quality students, while maintaining student numbers at a good level. The number of students is expected to generally increase over the next few years, providing a good income stream to complement that coming from research activities.

The department diverts at least half of its Recurrent Grant to support teaching activities. The most significant expenditure is salary-related, in the form of Teaching Assistants (lab demonstrators and problem class assistants) and Teaching Fellows. We are committed to providing computer lab and problem class sessions as these are an essential part of the learning process. We also employ a number of Teaching Fellows to deliver courses where we do not currently have permanent staff in post. This is either because of vacancies pending reappointment, or because of specialist needs which must be met from outside (our courses in Financial Institutions and Markets, and Financial Information Systems, are examples of the latter category).

Each year the Director of Studies carries out a very careful teaching allocation process to make sure salary costs are kept within limits. Even so, our high expenditure on salaries is far from ideal, as it means that we are unable to invest elsewhere in new initiatives. Unfortunately, our cash constraints mean that there is no incentive to deliver interesting ancillary courses to non-Computer Science students. Whilst there is ‘credit’ in the department’s RAM via the Student Load Exercise, this does not translate into the real cash we need to fund our activities.

The Department has looked into offering existing modules as 'short courses' to raise additional income, but the complicated processes of setting up short course arrangements has been a deterrent to date.
The Department's new MSc in Financial Computing is expected to raise additional income to support its high costs. It was set up with the support of a group of financial institutions, donating money, equipment and expertise. There are recurrent expenses associated with the delivery of this MSc, and these costs are to be covered by charging non-standard fees.

ENGAGEMENT WITH INSTITUTIONAL POLICY

1) How far does the department's approach to teaching and learning draw on UCL's institutional policies (and other external bodies' requirements where appropriate)?

The various institutional policies are noted and used throughout the planning and management of degree programmes. In addition, a number of degree programmes are accredited by the BCS and IET (British Computer Society and The Institution of Engineering and Technology), the two professional societies associated with Computer Science. Frequent contacts and exchanges with a wide range of companies and individuals take place, giving feedback that is used in the design and implementation of degree programmes.

m) How does the department monitor the areas identified above?

As strategies and policies are published and updated, they are reviewed by the relevant staff and committees, in particular the Teaching Committee. Recommendations are then made on how to respond and information disseminated to relevant staff. Progress is monitored by the Teaching Committee to ensure that the department complies with the policies.