PROGRAMME SPECIFICATION

MSC COMPUTING

Awarding Institution	University of London
Teaching Institution	Goldsmiths College
Department	Computing
Final Award	MSc
FHEQ Award Level	7
QAA subject benchmarking group	Computing
Date	March 2010

1. Background to this Programme Specification

Goldsmiths Department of Computing research is highly interdisciplinary studying interaction between computing, arts practice and cultural theory. In RAE 2008 20% of our submission was judged world-leading and 40% internationally excellent. The panel stated that the "inter-disciplinarity of the submission is strongly commended and contributes substantially to the diversity of UK research in this area." They went on to say that our outputs "demonstrated a body of research of a quality that is internationally recognised, internationally excellent and in a significant proportion of cases, world leading." Our research environment was described as "substantially of internationally excellent quality" and noted that "the strategic focus on the creative industries that contributed in very large part to a vital, sustainable and credible submission."

This document is part of our revision of masters provision to provide a broader range of options for students. This programme provides a broad background to research level work in Computing with a focus on Goldsmiths' unique approach to arts and practice-led computing. We believe that there is an opportunity for a computing masters which is broader than our specialist masters but nonetheless represents our unique approach to computing. We are well placed to benefit from London's reputation for the creative industry as there are no other masters of this kind in London. We believe that this type of programme could attract a range of students from the UK and internationally.

2. Introduction to the Programme

This programme will aim to gives students advanced knowledge of computing, with a particular focus on Goldsmiths' key interdisciplinary research areas of Computing for the Arts and Creative Industries. Students will have been introduced to a range of computing

topics such as Creative Coding, Games Programming, Physical Computing and Audio-Visual Processing. They will use a wide range of contemporary technologies tools and platforms such as C++, DirectX, Processing, OpenFrameworks, Objective C, the iPhone, Xbox 360, MaxMSP, Arduino, computer vision, robotics and motion capture. Students will undertake substantial independent research projects that will involve research skill, project planning and management as well as written and oral presentation skills.

3. What are the admissions criteria?

Upper second class undergraduate degree in computing, engineering or mathematical sciences, and an interest in – and capability for – working in interdisciplinary contexts. In exceptional circumstances, outstanding practitioners or individuals with strong commercial experience may be considered.

Non-native English students should normally have a minimum IELTS score of 7.0 or equivalent.

4. What are the aims of the programme?

The aim of this programme is to produce graduates who are independent, creative and reflective computing practitioners. Our graduates should have:

- Knowledge of computing technologies across a range of core and specialist topics, both in terms of the latest research advances and industry standards
- Understanding of the contexts in which computing technologies subsist in real world work, with an emphasis on the arts and creative industries
- The ability to design, implement, integrate and test software systems in the context of project specifications and user requirements
- Strong transferable skills, particularly ability to work independently and in groups and reflectively evaluate their own work
- The ability to work with industry and creative organizations. We run a regular industry seminar series and students will be encouraged to take internships as part of their final project.

5. What are the learning outcomes of the programme?

Learning Outcomes for the PGCert, PGDip and MSc

Knowledge and understanding

Graduates should have:	Taught by:

Graduates should have:	Taught by:
A systematic understanding of the state of the art of computing technology particularly as used in the arts and creative industries	A range of specialist courses. Including Introduction to Programming for Games and Interactive Graphics Advanced Programming for Games and Interactive Graphics Workshops in Creative Coding I Workshops in Creative Coding II Physical Computing Creative Technologies and Practices Visual Arts Computing and Applications Audio Engineering Physics and Animation for Computer Games
A systematic understanding of the mathematical and computational underpinnings of interactive and audio-visual technology	A range of specialist courses Introduction to Programming for Games and Interactive Graphics Advanced Programming for Games and Interactive Graphics Workshops in Creative Coding I Workshops in Creative Coding II Advanced Audio-Visual Processing Visual Arts Computing and Applications Audio Engineering Physics and Animation for Computer Games

Thinking (cognitive/intellectual) skills

Graduates should be able to:	Taught by:
Apply research-lead specialist knowledge in the design of software	This will be taught throughout the programme
Critically analyze the application of technology to real world problems particularly in the creative industries and arts	This will be taught throughout the programme

Practical (including subject-specific) skills

Graduates should be able to:	Taught by:

Graduates should be able to:	Taught by:
Independently research and apply state of the art technologies in the context of concrete problems particularly within the context of the arts and creative industries	This will be taught in throughout the course and in particular in the final project
Design and program advanced computer software	This will be taught in the Advanced Programming course

Transferable skills

Graduates should:	Taught by:
Be able to reflect on and evaluate their work	This will be taught throughout the programme

Be able to work effectively in groups	This will be taught in group projects within individual courses. Including
	    Introduction to Programming for Games and Interactive Graphics
	    Advanced Programming for Games and Interactive Graphics
	    Workshops in Creative Coding I
	    Workshops in Creative Coding II

Be able to present themselves and their work orally and in writing	This will be taught throughout the programme

Be able to make decisions and solve problems in complex and unpredictable creative contexts	This will be taught throughout the programme but particularly in:
	    Workshops in Creative Coding I
	    Workshops in Creative Coding II

Additional Learning Outcomes for the MSc

Thinking (cognitive/intellectual) skills

Graduates should be able to:	Taught by:
Propose, plan and evaluate a significant piece of original work.	Research project

Practical (including subject-specific) skills

Graduates should be able to:	Taught by:

Graduates should be able to:	Taught by:
Specify, design and implement complete interactive software systems	This will be taught in throughout the course and in particular in the final project
Execute a piece of rigorous technology research	This will be taught in the final research project. Research skills will be taught as part of the project and Workshops in Creative Coding I and II
Execute a significant piece of original work.	This will be taught in the final research project

Transferable skills

Graduates should:	Taught by:
Be independent and creative workers and learners, able to exercise initiative and personal responsibility in their work.	This will be taught in throughout the course and in particular in the final project

6.   What courses are offered on this programme?

The programme consists of the following core courses in the first two terms (all are 15 credits):

- Introduction to Programming for Games and Interactive Graphics

- Advanced Programming for Games and Interactive Graphics

- Mathematics and Graphics for Computer Games

- Workshops in Creative Coding I

- Workshops in Creative Coding II

In addition students may select 3 elective courses totaling 45 credits These will be updated regularly, examples of current courses that may be available include:

- Physical Computing

- Advanced Audio Visual Processing

- Consciousness and Computation

- Embodiment and Enactivism

- Creative Technologies and Practices

- Visual Arts Computing and Applications

- Audio Engineering

- Physics and Animation for Computer Games

The programme handbook will include details of all elective courses, including content, their relevance to careers and advice on choosing courses. Programme leaders will advise students on their choice of electives.

In the third term students will be expected to undertake a substantial research project. Students have the option of doing their project as an internship in a suitable company within the computing industry.

Indicative Bibliography

Accelerated C++: Practical Programming by Example (C++ in Depth Series) by Andrew Koenig and Barbara E. Moo Addison Wesley (8 Sep 2000)

Introduction to 3D game programming with DirectX 9.0c : a shader approach by Frank D. Luna. Wordware Publishing Inc.,U.S. (1 Jun 2006)

Best of game programming gems. edited by Mark DeLoura. Delmar (2 July 2008)

3D Math Primer for Graphics and Game Development by Fletcher Dunn, Ian Parberry Wordware Publishing Inc., (1 Jun 2002)

Programming Interactivity: Unlock the Power of Arduino, Processing, and OpenFrameworks by Joshua Noble. O'Reilly Media; 1 edition (21 July 2009)

Physical Computing: Sensing and Controlling the Physical World with Computers. By Tom Igoe and Dan O'Sullivan. Premier Press (28 May 2004)

Learning OpenCV: Computer Vision with the OpenCV Library. by Gary Bradski (Author), Adrian Kaehler O'Reilly Media; 1 edition (24 Sep 2008)

Computer Vision: Principles and Practice by Pedram Azad, Tilo Gockel and Rüdiger Dillmann. Elektor Electronics (14 May 2008)

Beginning iPhone 3 development : exploring the iPhone SDK by Dave Mark and Jeff LaMarche. APRESS (14 July 2009)

Action in Perception, Noe, A, (2006),

The Cambridge Handbook of Situated Cognition. Philip, R. & Murat, A., (eds), , (Cambridge Handbooks in Psychology) (2008)

Affective Computing by RW Picard MIT Press (2000)

Interaction Design: Beyond Human-computer Interaction by Helen Sharp, Yvonne Rogers and Jenny Preece John Wiley & Sons; 2nd Edition edition (12 Jan 2007)

Computer Animation: Algorithms and Techniques (The Morgan Kaufmann Series in Computer Graphics) by Rick Parent Morgan Kaufmann; 2 edition (11 Nov 2007)

Digital Art (World of Art) by Christiane Paul. Thames and Hudson (2008)

Creative Code: Aesthetics and Computation by John Maeda and Red Burns Thames & Hudson (13 Sep 2004)

How will courses be taught?

The Department of Computing is committed to a diverse and stimulating range of learning and teaching methods that ensure the programme outcomes are addressed rigorously and effectively. Learning emphasises a close synthesis between theoretical understanding and practical application that helps you develop an advanced, critical approach to the subject of computing.

The various courses of the programme provide a diverse range of topics across the scope of computing but are designed to form a coherent and cumulative body of knowledge and skills. These are further developed through your independent research and learning activities directed towards course assignments and the large-scale project component. The department is committed to providing a diverse and innovative range of teaching styles across its degree programmes. These include traditional lecture and laboratory sessions but also a range of more interactive and self directed activities focusing on independent, creative work and self presentation. The nature of the learning activities will vary greatly between different courses, but includes programming, building hardware devices, software design, project planning, group activity and creative work. In addition students will be expected to engage in considerable independent reading and practical work for all courses culminating in the final year project. This independent work will be supported by library resources, access to lab space and supervision from teaching staff.

The programme provides a range of courses which provide a network of cross-referenced and cumulative knowledge across diverse areas of computing. All courses provide a weekly lecture, lab, seminar or other session, which reinforces preparatory or follow-up reading, and other related learning activities in both group and individual settings to foster new understandings and skills.

7. How will my work be assessed?

The Department recognises that high quality assessment is a vital part of learning, particularly when used formatively, providing valuable feedback for future learning. Our assessment is designed to reflect "real world" skills and activity in order to give our students a strong preparation for the work place.

No single method of assessment can capture all aspects of computing or the full range of skills required by our graduates. For this reason we are committed to providing many diverse styles of assessment and to the development and use of novel forms of assessment. Our methods of assessment are designed to reflect business relevant activities and to encourage independent, creative work. As well as traditional examinations, our assessment includes many different types of "hands on" practical work including software development, business planning and group work. Students will be required to present their work in a number of different ways that reflect the contemporary work place, including traditional reports but also oral presentations and extensive use of the web for self presentation. Above all we encourage our students to be independent and creative thinkers and include considerable opportunities for open ended assessments that allow students to develop their own ideas.

Feedback is vital to effective continuing learning, the true value of assessment is that it shows students how to improve their work and learn more effectively in future. For this reason we are committed to providing timely and full feedback on all assessed assignments.

Throughout the degree programme assessment will happen in individual courses each having formative and summative assignments. As well as these small assignments, students will have a major project in the summer term. This is a substantial piece of work which should integrate what students have learned throughout the programme. It provides students with an opportunity to independently tackle a large project that engages with state of the art technology at a research level.

In all cases where students submit work that has been completed through collaboration with others, and most centrally but not exclusively when coursework is produced by students working in groups, extreme care must be taken by students to describe clearly in detail precisely the nature of their contributions, and the contributions of others. This must be delivered as part of student's written project reports and/or project evaluation documentation in a similar manner to any reference of this type in equivalent academic writing, although in cases where students are submitting work together, the nature of the collaboration must be described in significant detail that matches the scope of the contribution. The need for this information will be precisely indicated in the documentation brief, which will stipulate that students must report on the group dynamics, explain their role in the group, and indicate any problems that the group encountered. Supervising staff will attempt to identify and resolve group problems early as part of standard project supervision. In the event of problems or inconsistencies between group members, students will be reminded that their performance is graded with reference to the above stated criteria. Students must all comment on the way that the group functions, and describe their individual role. As such, the precise nature of a student's contribution to any project will be judged through this combination of appropriate supervision and assessment reporting.

Final projects will be assessed via a final report. Guidance on the structure and writing of the report will be given in the course handbook, as well as in the Workshops in Creative Coding II course. Projects will be marked by two members of academic staff and all students will have a viva voce examination including a short presentation of their work.

If a student is unable to submit an assessment on time due to illness or other unavoidable circumstances, they must provide documentary evidence to their personal tutor in order to be allowed a late submission. Evidence must also be supplied for students to apply for consideration of mitigating circumstances in assessment.

8. What are the grading criteria for an MSc degree?

Mark	Descriptor	Grading Criteria
0%	Non submission	Work was not submitted or it was plagiarized
1-9%	Very bad fail	A submission that does not even attempt to address the specified learning outcomes (shall be deemed a non valid attempt and unit must be re-sat).
10-29%	Bad fail	Represents a significant overall failure to achieve the appropriate learning outcomes (shall be deemed a valid attempt and not necessarily required to be re-sat).

Mark	Descriptor	Grading Criteria
30-49%	Fail	Represents an overall failure to achieve the appropriate learning outcomes. Students achieve some of the aims but were unable to demonstrate independence and originality beyond what would be expected at undergraduate level
50-69%	Pass	Demonstration of a sound level of understanding based on a competent grasp of relevant concepts, methodology and content; display of skill in interpreting complex material; organization of material at a high level of competence. Students should be able to demonstrate the ability to work independently to research and implement state of the art technologies
70-79%	Distinction	Students should demonstrate high independent work and originality beyond what is expected for a pass.
80-100%	Exceptional	Represents a level of high quality and original research work that goes beyond what is normally expected at MSc level, achieving some outcomes that would only be expected at doctoral level.

9. Final Degree Classification

Final degree classifications are based on 120 credits of taught courses and the final project (dissertation) and are assessed 100% by coursework component.

Student's final degree classification for PGCert and PGDip exit points will be calculated as follows:

Distinction: average mark over all taught courses 70% or above, with no marks lower than 60%.
Merit: average mark over all taught courses 60% or above, with no marks lower than 50%.
Pass: marks of 50% and above in all taught courses
Fail: failure in one or more of the courses.

The PGCert requires 60 credits of taught courses and the PGDip requires 120 credits (all taught courses).

In order to progress to the Final Project and the MSc assessment students must fulfil the requirements for a pass at PGDip level (pass all 120 credits of taught courses).

Student's final degree classification for the MSc will be calculated as follows:

Distinction: average mark over all taught courses and final project 70% or above, with no marks lower than 60%.
Merit: average mark over all taught courses 60% or above, with no marks lower than 50%.
Pass: marks of 50% and above in all taught courses and final project
Fail: failure in one or more of the courses or final project.

Students will be permitted to resit a failed course only once at the first opportunity. If students fail any of the courses a second time then students will get a Fail mark.

10. What support can I expect?

Expertise is provided by the Departments' resident staff who are dedicated and experienced teachers, but also distinguished practitioners and researchers in their own right, working in national and international contexts.

Student learning is supported by the Rutherford Information Services Building, which houses extensive book, score, CD/DVD and electronic resources. All registered students also have access to the University of London libraries network. In addition, the Department of Computing has extensive computer lab facilities. The Department make extensive use of the VLE grad.gold online facility, in order to support student learning in a number of ways, including the dissemination of learning resources and to provide an electronic forum for the exchange ideas and debate.

The MSc curriculum is supported by a wide range of activities that encourage awareness and involvement in the Department's high profile practical and research activities, including termly postgraduate conferences, the Digital Studios' 'Thursday Club', the Whitehead Lectures,

workshops, visiting speakers, and various other activities of the Digital Studios. Further information about these groups can be found from the Departments' web pages www.gold.ac.uk.

You are allocated a personal tutor during your period of study who offer advice, guidance or clarification of courses, options, requirements and regulations; and to monitor your progress through the programme. The Personal Tutor can also offer support in cases of academic difficulty. Should further advice be necessary, the Senior Tutor, the Chair of the Board of Examiners can also be consulted. If you encounter difficulties at any time with your studies, the programme convenor and other course tutors can provide additional academic support whilst the Senior Tutor is available by appointment to discuss welfare-centred issues. Staff members have office hours each week to discuss any matters; outside these hours students may arrange an appointment with staff via email or telephone.

The Department of Computing takes advantage of and pursue the College's Disability Awareness policies. Students with specific needs in this regard are considered on an individual basis. The College also actively supports students with specific learning difficulties (e.g. dyslexia), and provisions are made to ensure that all students, regardless of specific difficulty/disability, derive full benefit from the learning environment. In addition to specialist advice and assistance within the College, the Department ensures that course materials are suitable for all students and, where necessary, these are altered to meet the requirements of individual students.

The medical, counselling and financial services provide support for students when necessary, and in the case of students with special needs (including dyslexia), the Student Support Office will provide sympathetic advice and help. Goldsmiths also provides a wide range of other support services for students, which can be found on its web site at www.gold.ac.uk. Overseas students whose first language is not English may seek assistance from the Goldsmiths English Language Unit.

The Department is committed to making any reasonable adjustment that allows, as far as possible, for equality of opportunity and access, and to ensuring that students are not substantially disadvantaged because of specific learning difficulties or disability.

11.What Careers will be open to me?

- Computer programming,

- Research and development in computing

- Visual interface design;

- computer graphics;

- games and animation;

- music production and cataloguing services;

- multimedia systems analysis;

- research and development in media and entertainment;

- Film/television production and special effects companies.

Employers increasingly demand that new recruits are able to add immediate value to their organisation. Because this programme offers the option of an industrial placement year, students can demonstrate that they have already achieved a certain level of professional competence and maturity, which could help you stand out in the job market

12.How will teaching quality be monitored?

The Department is committed to effective programme monitoring, in which representatives from the MSc programme can comment about the programme, the Department and provision for learning, teaching, assessment and related activities. Student representatives contribute to the undergraduate Staff-Student Forums run by the Department: termly meetings that are minuted and report to the Department. Student representation is also included in the membership of the Department Board, meeting several times over the academic year. The MSc programme participates in the College's procedures for course evaluation, and students are strongly encouraged to participate in this process. Course leaders are encouraged to actively seek and respond to student responses.

13.Staff involved in Course Provision

For a full list of departmental staff and research expertise summary please visit

http://www.gold.ac.uk/computing/staff/

The key staff on this programme are

Dr Marian Ursu
Dr Marco Gillies
Dr Mick Grierson
Professor Frederic Fol Leymarie
Professor Mark Bishop
Professor William Latham
Professor Janis Jefferies