UWE **BRISTOL** Faculty of
Computing, Engineering
and Mathematical Sciences

MSc Software Engineering by Distance Learning

Definitive Documentation – April 2006

Part 1:   Programme Specification

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Part 1: Programme Specification

Programme Specification

Section 1: Basic Data

Awarding institution/body	University of the West of England
Teaching institution	University of the West of England
Faculty responsible for programme	Computing, Engineering and Mathematical Sciences
Programme accredited by	British Computer Society
Highest award title	MSc Software Engineering
Default award title	
Interim award title	PG Dip in Software Engineering PG Cert Software Engineering
Modular Scheme title (if different)	
UCAS code (or other coding system if relevant)	G70012
Relevant QAA subject benchmarking group(s)	Computing
On-going/valid until* (*delete as appropriate/insert end date)	
Valid from (insert date if appropriate)	1st September 2006

Authorised by…   **Date:…**

Version Code 1
For coding purposes, a numerical sequence (1, 2, 3 etc.) should be used for successive programme specifications where 2 replaces 1, and where there are no concurrent specifications. A sequential decimal numbering (1.1; 1.2, 2.1; 2.2 etc) should be used where there are different and concurrent programme specifications

Section 2: Educational Aims of the Programme

The general educational aims of the faculty's taught postgraduate programmes are:

- to provide an intellectual experience of advanced study, underpinned by staff expertise, research, and experience;
- to enable the student to further and deepen his/her knowledge, understanding and analytical abilities in a stimulating and challenging academic environment;
- to prepare the student for further professional development in his/her chosen field;
- to develop the student's ability to conduct research in their chosen field;
- to offer postgraduate opportunities for part-time students in employment.

Specifically, after completion of this programme students will:

- Have developed advanced knowledge of all aspects of the software engineering process.
- Be able to apply software engineering principles in a professional manner.
- Understand the problems and constraints that routinely confront a Software Engineer and possess the underlying technical and cognitive skills to resolve them.
- Be able apply the research skills they have developed in the area of Software Engineering

Section 3: Learning Outcomes of the Programme

This programme is delivered within the common University framework of UWEOnLine. Details of UWEOnLine can be found on the university website at www.uwe.ac.uk

The programme is designed with an emphasis on a combination of resource-based and problem-based learning. Thus throughout, the learner is directed to a variety of resources and expected to undertake a series of activities in relation to them. In addition, the learner is also encouraged to undertake independent reading both to supplement and consolidate what is being taught/learnt and to broaden individual knowledge and understanding of the subject. For the most part, access to resources will be provided on-line. However, for some individual modules, it will be necessary to purchase a course text. Details of such necessary purchases are given in the individual module specifications.

To support the learning outcomes, all modules will provide on-line conferencing facilities within UWEOnLine. The conferences will provide learners with easy access to their fellow learners and provide a forum for the discussion of issues raised during the programme. Each forum will be monitored by the relevant module leader.

The award route provides opportunities for students to develop and demonstrate knowledge and understanding, intellectual skills, subject-specific skills and transferable skills as shown in the following pages.

A. Knowledge and Understanding

On successful completion of the programme students will have gained knowledge and understanding of:	Teaching/Learning Methods and Strategies	Assessment
1. Theoretical perspectives that underpin Software Engineering and distinguish it from other disciplines and which thus allow it to be used as the basis for organised software development. 2. Project planning, estimation and control methods and aids 3. The common activities associated with requirements elicitation, analysis, specification, validation, and management 4. The concerns associated with the analysis, design and implementation of object-oriented software 5. The problems associated with development within a particular application domain. 6. The nature of the research process 7. How to carry out research in order to synthesise a computer-based system that meets given requirements.	The general approach to teaching on this programme is to use the first semester to deliver theoretical concepts (SE Concepts/Project Management) and fundamental software engineering stages (Requirements Engineering/OO Design and Programming) and then to move to a more applied approach in semester 2. For example, in semester 2, the module "Groupwork Software Development" takes a holistic approach and allows the students the opportunity to pursue the whole software development lifecycle from requirements through to delivery. The module "Advanced Databases" provides the opportunity of looking at a particular application domain and considering how software is engineered in that area. In semester 2, students are also encouraged to think about the business of research and their dissertations in particular by the study of Research Methods. All of these outcomes are supported by the use of tutor input in the form of on-line narratives/presentations and activities, as described above. In addition specific outcomes are supported as follows: ▪ 1 by the use of on-line exercises and submissions to the group by individuals on selected areas of systems development as well by experiencing the use of SE principles in the group development of a software system. ▪ 2, 3 and 4 by the completion of on-line practical work, with samples solutions and a commentary from an academic ▪ 5 by the use of electronic conferencing and the completion of on-line exercises. ▪ 6 and 7 by reading, completing exercises and by individual supervision of the production of a dissertation. ▪	The learning outcomes are assessed in a variety of different ways including the assessment of contributions to audio/video conference collaborations; project reports, which may be submitted in stages; essays and exams. Research related learning outcomes are principally assessed by the production of a research proposal. Outcome 7 is assessed by a dissertation report and a software product.

B. Intellectual Skills

On successful completion of the programme students will have the intellectual skills necessary to:	Teaching/Learning Methods and Strategies	Assessment
1. To comprehend new concepts both for use during the course and, later, professionally 2. Understand human roles and how various functions interact to successfully produce an artefact. 3. Recognize the role of the engineering approach in the production of an artefact – in particular a software system. 4. Formulate, analyse, visualise, synthesize and communicate plans and designs to solve problems in software applications 5. To explore, evaluate and use software development technology 6. Evaluate alternative approaches to problem solving within an application domain. 7. Critically analyse theoretical perspectives relevant to the research process 8. Evaluate research methodologies, tools and techniques, and the process of research	In general, the skills listed on the left are developed by asking the learner to read some (usually) on-line background material. Students then follow activities that encourage reflection, analysis and/or critique of their reading. Individual skills are also supported as follows. Learning outcomes are addressed in various modules,m the principle ones are described hear foreach LO: ▪ Outcome 1,Software Engineering concept module which introduces different models of SE and encourages students to think more deeply and critically about these by requiring individual presentations to be posted to the group of students enrolled on the module. The presentations explore topics introduced in presentations produced by the tutor. ▪ Both Software Groupwork Development and Project Management address 2 via asynchronous conference collaborations and individual and group exercises. In particular, the role of management is considered together with the risks that might impede attainment of a successful product is examined in Project Management. ▪ 3 is considered in a number of modules (Software Engineering Concepts, Groupwork Software Development and Requirements Engineering). In particular, Requirements Engineering uses case-studies as a means of exploring the engineering of software requirements. ▪ 4 is principally addressed in the context of OO Design and Programming where students undertake a range of programming exercises. Exercises and, subsequently, model solutions are presented on-line. During published time-slots, students will be able to access 'real-time' support through the use of computer-mediated telephone support and instant messaging. ▪ 5 is considered in both Requirements Engineering and OO Design and Programming, in which students are encouraged to consider the use of CASE tools. ▪ Learning outcome 6 is considered throughout the programme by the use of examples and case-studies. ▪ Research Methods covers the tools and techniques of 7, and their evaluation. The dissertation is the specific medium through which the appropriateness of these tools is considered in relation to a particular problem (LO8)	Assessment is by a variety of means including examinations, software development exercises, . essay-type questions and group projects 7 , 8 are assessed by the research proposal and the production of a supervised dissertation.

C. Subject, Professional and Practical Skills

On successful completion of the programme students will have gained Subject/Professional/Practical Skills that enable them to:	Teaching/Learning Methods and Strategies	Assessment
1. Apply SE concepts throughout the lifecycle of a non-trivial software project (SE Concepts, Group Software Dev., Dissertation) 2. Use established methods to assess project risk (Project Management) 3. Use requirements engineering methods to develop software requirements specifications for software and computer-based systems (Requirements Engineering) 4. Use a range of software tools (throughout) 5. In depth knowledge of an OO programming language. (OO Design and Programming, Component based Software Development) 6. Development data-based using advanced technologies (Advanced databases) Prepare a research proposal in the subject area (Research Methods)	For the most part, subject specific skills reside in individual modules. The list given is the minimum that a graduate of MSc Software Engineering could be expected to possess. Additional specific practical skills are likely be gained through undertaking the dissertation, which requires the production and demonstration of a software artefact. These will vary with the dissertation topic. ▪ 1 through on-line conferencing and presentations, individual and group exercises and supervised research ▪ 2 through the staged solving of a demanding planning exercise ▪ 3 through directed reading and a practical exercise ▪ 4 through exercises that require the use of a range of tools e.g. CASE tools and IDEs ▪ 5 through programming experience. ▪ 6 through conferencing, reading and practical exercises. ▪ 7 through conferencing and investigative reading.	Outcomes are assessed by a variety of means including examinations, practical exercises, conference contributions and the research proposal.

D. Transferable Skills and Other Attributes

It is assumed that students enter this programme having already developed the transferable skills listed. The programme offers opportunities to develop these skills further, as described in the table below:

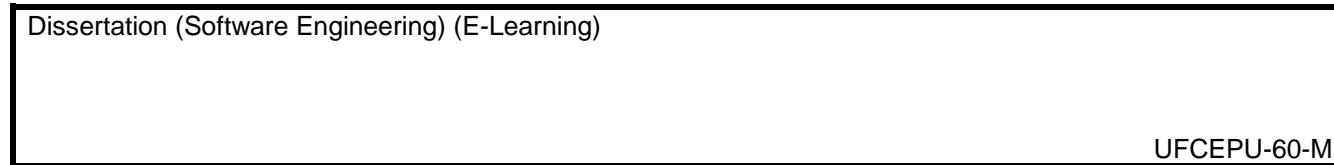| Transferable Skills and Other Attributes	Teaching/Learning Methods and Strategies	Assessment
1. Communication skills**:** to communicate principally in writing, including for instance, the results of technical investigations, to peers and/or to "problem owners".	The emphasis on group work in some modules particularly ensures that 1 and 7 are met.	Written and practical assignments assess skills 1 – 4. The dissertation proposal and the dissertation itself assess all skills, but particularly skills 5 and 6. Conference collaborations and the Group Software Development module assesses skill 7.
2. Self-management skills: to manage one's own time; to meet deadlines; to work with others having gained insights into the problems of team-based systems development.	Transferable skills 1- 6 are developed through the use of on-line conferencing, written assignments and individual research	
3. IT Skills in Context (to use software in the context of problem-solving investigations, and to interpret findings)	Acquisition of 3 is developed throughout the programme, both in terms of the mode of delivery, which requires the use of IT skills and the use of particular tools in particular modules, for example, the use of CASE tools and software development environments.	
4. Problem formulation: To express problems in appropriate notations.	Acquisition of 4 , 5 and 6 is through individual investigative, problem-solving and research tasks	
5. Progression to independent learning: To gain experience of, and to develop skills in, learning independently of structured class work. For example, to develop the ability to use on-line facilities to further self-study.		
6. Comprehension of professional literature: to read and to use literature sources appropriate to the discipline to support learning activities.		
7. Working with Others**:** to be able to work as a member of a team; to be aware of the benefits and problems which teamwork can bring.	Acquisition of 7 is encouraged throughout the programme by the use of student conferencing. It is particularly emphasised in the Group Software Development module.	

Section 4: Programme Structure

Programme Structure for   **MSc Software Engineering**   **For October 2004**

This structure is indicative and subject to change

Dissertation (Software Engineering) (E-Learning)
UFCEPU-60-M

Semester two

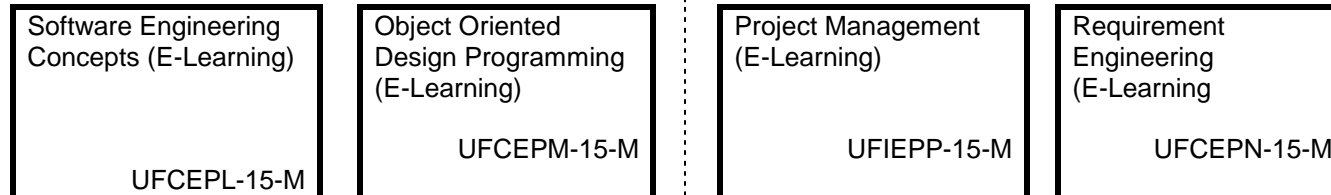| Group Work in a Large Scale Software Development (E-Learning) UFCEPS-15-M	Advanced Databases (E-Learning) UFCEPQ-15-M	Research Methods (E-Learning) UFPEPT-15-M	Component Based Software Development (E-Learning) UFCEPR-15-M

Part-time students in year one take modules to the left of the dotted line and in year two to the right of the dotted line

Semester one

Software Engineering Concepts (E-Learning) UFCEPL-15-M	Object Oriented Design Programming (E-Learning) UFCEPM-15-M	Project Management (E-Learning) UFIEPP-15-M	Requirement Engineering (E-Learning UFCEPN-15-M

Core Modules

Section 5: Entry Requirements

The university's requirements for entry to a postgraduate programme apply. An honours degree in Computer Science, Software Engineering or a closely related discipline or extensive relevant professional experience is required. The University's general entry requirements are described in Section D of the Academic Regulations. A copy of the Academic Regulations is available from the University web site.

Section 6: Assessment Regulations

The University's Modular Assessment Regulations apply to this programme.

Section 7: Student Learning: Distinctive Features and Support

This programme is distinctive in that it is one of only very few full masters degrees in Software Engineering to be offered by distance learning by a UK university. The programme makes extensive use of UWE's virtual learning environment (UWEOnLine) to provide an integrated entry point to the modules on offer. For ease of use, all modules on the programme are offered with a common look and feel. Technical support is well-established and the reliability of both hardware and software well-proven. All modules have their space on UWEOnline. For each module, this space will include all the resources needed to complete the module. A separate on-line space is provided for information relating to the programme as a whole.

Academic Support
A named module leader is responsible for each module on the programme and the module leader is responsible for providing academic support for his/her module. In addition, the programme is managed by a programme leader. The programme leader is also available to provide academic support across the modules.

Pastoral Care
The faculty offers pastoral care through its Student Advisers, a team of staff who provide a comprehensive, 9 - 5 (UK time) support service. This service can be accessed by email or telephone. Where appropriate, support can also be given via an instant messaging service. All students on the programme are allocated to the same Adviser, who is trained to provide advice on matters commonly of concern, including regulatory and other matters. The Adviser will, when necessary, advise the student to seek advice to from other professional services including the university's Centre for Student Affairs or from members of academic staff.

Progression to Independent Study
All of the modules on this programme require students to carry out independent study, such as research for projects and assignments. An extensive range of on-line journals and reference material is available to students of UWE. These materials are accessed through the University's library web-site.

The progression to independent study will also be assisted by the nature of the support offered in individual modules. Typically, module leaders will provide a plan for the module indicating the activities to be carried out and the forms of learning to be undertaken during the delivery of the module, with a view to encouraging students to plan ahead and to take responsibility for managing their time and resources.

 Student Collaboration
One of the great potential benefits of E-learning is the enhanced possibilities for collaborative work. In classroom-based programmes it is comparatively rare for students to have legitimate access to the work of fellow students. In this programme students will post some of their work on conferences and examine the work of others. Some of this work, including the review of the work of others, will contribute to the assessment. Conference contributions will also be used for discussion of key topics

Section 8 Reference Points/Benchmarks

In designing this programme, the faculty has drawn upon the following external reference points:
1. The QAA Framework for Higher Education Qualifications in England, Wales and Northern Ireland
2. The QAA Benchmark Statement for Computing
3. UWE's Learning & Teaching Strategy

The QAA Framework for Higher Education Qualifications in England, Wales and Northern Ireland describes the attributes and skills expected of Masters graduates. It is our view that the learning outcomes of this programme are fully consistent with the qualification descriptor in the Framework, and hence that graduates will be able to demonstrate that they meet the expectations of the Framework. For example, students will be introduced to contemporary research in Requirements Engineering and be required to analyse and critique that work thoughout their period of study; Students will develop "a comprehensive understanding of techniques applicable to their own research or advanced scholarship", both through the study of the Research Methods module, though the development of their dissertation and elsewhere.; students will "deal with complex issues both systematically and creatively, make sound judgements in the absence of complete data, and communicate their conclusions clearly to specialist and non-specialist audiences" especially in the context of the group software development module.

The **QAA Subject Benchmark Statement for Computing**

The QAA Subject Benchmark Statement Computing applies most closely to this programme Although the published benchmark statement refers to Bachelor's Honours degrees rather than to an MSc programme, there is a proposed benchmark standard for taught masters in computing. The proposed standard is built on the Bachelor's Honours statement and has been used to inform the development of this programme.

The defining principles of the study of Computing according to the draft benchmark are:

- Knowledge and understanding of aspects of computer systems and their use;
- A combination of theory and practice, with practice being guided by theoretical considerations
- A strong emphasis on applications with usability being important
- The use of specification, design, implementation and maintenance being important features which characterise the lifecycle and contribute fundamentally to the concept of process
- An understanding of and attention to the many and varied aspects of quality and
- An understanding of professional, social and ethical issues related to Computing.

The design of this award has followed these principles. In particular, the proposed statement suggests that, irrespective of the discipline from which a student enters the programme, a masters programme must *"add value* to undergraduate degrees" and "be characterised by an ethos of advanced work and scholarship".

Immediately upon entry to this programme, students will be required to make use of knowledge and skills appropriate to an honours graduate in computing. They will be required to use skills of software development and design to analyse and extend problems presented in the first semester; they will use critical evaluation to discuss journal papers at an advanced level; they will use their understanding of key aspects of computing to extend their knowledge in new directions. Ultimately, they will also be required to demonstrate original thinking in the development of their level M dissertation.

UWE's Learning & Teaching Strategy

This initiative chimes well with UWE's stated Learning & Teaching Strategy as articulated at :
http://www.uwe.ac.uk/info/landt/

In its strategic objectives, the university has stated its commitment to:

- Open-minded and systematic enquiry into their (the staff's) practice and its effects;

- A student-centred approach, that encourages students to take responsibility for aspects of their learning, and teachers to take responsibility for facilitating that learning;

- Enthusiasm for teaching supported by continual development of their subject through an appropriate combination of research, professional practice, consultancy and engagement with the national Subject Centres;

- Curriculum development and the critical appraisal of curriculum content and delivery as a central aspect of the teaching role;

- The expansion of opportunity and removal of unnecessary barriers to learning;

- The development of student skills for research and inquiry as a major part of student learning;

- The development of skills that will equip students as lifelong learners.

The nature of this programme has required the staff involved to reflect extensively on their teaching practice. The section in on Staff Development provides more detail of the way that this reflection has been encouraged. The remote delivery of the programme directly contributes to an expansion of opportunities for learning.

Part 2: Module Specifications
(See Appendix A)

Part 3: Contextual Documentation

Contextual Documentation

1.   Demand for the Programme

The MSc Software Engineering is a well established programme and is currently delivered by a conventional classroom-based approach. It has two primary start points. First, students commence in September and attend for the whole programme as full-time students. Second, students from collaborating international colleges undertake study on modules equivalent to those scheduled in Semester One at UWE and are then granted exemption from these modules on the basis of accredited prior learning. They attend UWE for Semester two and a notional semester three to complete the programme, again in full-time mode. This can be regarded as a 1 + 2 semester model. The majority of students are international and in 2005/6 they constitute 67% of the semester 1 cohort and 78% of the Semester two cohort. Additionally, there are a small number of local part-time students, and a few referred candidates who switch to part-time mode to complete. Currently, there are 8 part-time students at various stages of completion.

As part of the Faculty's strategy to further develop international collaboration, colleges are being sought with a view, initially, to develop the 1 + 2 model of joint delivery. To overcome potential difficulties in ensuring the appropriateness of the semester 1 provision, it was initially proposed that the semester one modules be offered as distance learning supported by staff of the college, in preference to simply granting APL to the successful study of college modules. During discussions with colleges in India and SE Asia it has become clear that there is likely to be even greater demand for a full distance learning programme in part-time mode.

In addition, from time to time enquires are received from UK-based organisations seeking an MSc programme for a number of their employees over the medium term and the content of this MSc programme meets their needs. As these organisations have a number of sites around the UK, the possibility of undertaking some, or all, of the programme in distance learning mode is seen as attractive.

Consequently, the development of the Distance Learning mode of delivery is aimed at satisfying the needs of all of these clients.

It is also recognised that the availability of this mode of delivery may have a significant impact upon the recruitment to the UWE classroom-based attendance mode. In the medium term this could lead to the closure of the classroom-based delivery though, as discussed later, UWE will still provide classroom contact for students in the same way that students studying overseas will be able to attend face-to-face classes at collaborating colleges.

2. Design Approach

2.1 Comparison of Existing and Distance Programmes

It is important to clarify in what ways the new version of the programme is the same as and different from the existing version.

Learning Outcomes
From the outset, it has been the intention of the development team that the learning outcomes of the new distance learning version of the programme be as close as possible to the existing classroom-based version.

This has been achieved in just about all cases with the exception of the module Group Work Software Development which mimics large-scale cooperative software development in a large team. In this particular case a new module has been created in which face-to-face weekly group meetings are replaced with a series of tightly defined asynchronous conference postings and other collaborative mechanisms allowing the progression of the work. The outcomes for this module will be broadly in line with the original module but the student experience will be different, though no less valuable.

Assessment
Early in development, it was recognised that assessment and feedback plays a vital and integral role in the teaching of distance learning courses, even more so than in classroom-based delivery. In particular, the use of single end-of-course assessments in both coursework and examination was felt to be inappropriate.

As a result, the new coursework assessment regime has more assessments distributed throughout the modules but each of a smaller scale than in the current versions.

Module Specifications
The change in assessment strategy has necessitated the creation of new module specifications with the same learning outcomes as the existing modules but with different assessment strategies. The new and existing modules will be specified as alternates in the existing programme specification allowing students to take a combination of classroom-based and distance learning modules. This is particularly important during the piloting of the new delivery mode when students will be required to take a mixture of modes whilst based at UWE. It is anticipated that over a relatively short period of time most of the existing modules will be modified to become aligned with the new E-learning version of the modules and once at this point one version will be deleted.

Options
The classroom-based version of the programme offers a number of optional modules from which two are chosen in Semester 2. To reduce the initial development effort the two most popular option modules have been chosen for development in E-learning format and so, initially at least, no option choices will be offered to distance learning students. Should the number of students taking the E-learning programme justify the development effort for inclusion of option choices, they may be added later.

2.2 'Attendance' Modes

Students are likely to fall into one of the following categories where they will be:
1. constrained by geography or otherwise prevented from attending classes;
2. based at a collaborating college and able to attend classes;
3. based at UWE and able to attend classes;

Attempting to cater for all three of these categories initially seemed challenging but the solution we have adopted is comparatively straightforward. Provision of all core materials and activities is undertaken in the same way for all students via UWEOnline. Supplementary student support can be provided in several different ways depending on where the students are based.

So, for example, students based at a collaborating college or at UWE may be able to attend face-to-face tutorials to undertake exercises in groups, and to discuss their work with peers and a tutor. This support mechanism will be similar to that on the present classroom-based programme. Fully distance learning students on the other hand will have access to individual tutor support via individual email exchanges some initiated by the tutor. In addition, some modules will make use of synchronous one-to-one telephone or VOIP discussions at scheduled support times. This provides a highly personalised form of student-tutor communication. In adopting the latter approach we are conscious of the difficulties imposed by having students based in different time zones, but because the spread is likely to be restricted to a maximum of 8 hours ahead of GMT and 0 hours behind this does not appear insurmountable, with scheduled times being arranged in the morning GMT.

2.3 Collaboration Modes

To some extent the modes of student participation dictate certain modes of working with tutors at collaborating colleges. The model we have adopted is broadly that in existence in the Faculty for deployment of Visiting Lecturers (VLs). In this model VLs undertake face-to-face small (<20 students) class teaching and undertake marking. Organisation of an appropriate assessment regime is vital.

We anticipate that once in full operation three categories of tutor are likely to exist, those based at:
1 UWE;
   • a collaborating college where there is not an institutional agreement which specifies particular modes of operation for QA and assessment;
   • a collaborating college where the institutional agreement specifies particular modes of operation for QA and assessment;

Most tutors will be responsible for running face-to-face classroom tutorial sessions for their local students. Marking of non-computer-marked coursework will be undertaken by tutors for their local students and for some fully distant students.

All coursework will be submitted electronically. Tutors will be required to download the scripts for marking onscreen and to upload the marked scripts.

Marking undertaken by UWE-based tutors and tutors based at a college without a defined assessment mode will be subject to the normal UWE quality assurance procedures including double marking and moderation of marks before submission as part of the module cohort to the Field Board.

Marking undertaken by tutors based at a college with a defined assessment mode will be subject to the quality assurance procedures specified in the agreement. We anticipate that staff at UWE will still be involved in mark moderation in some form.

The marking of the dissertation always has two markers and the location of these markers will vary with the nature of the collaboration agreement. Students based at colleges without a defined assessment mode will be assessed by their local tutor and by a tutor based at UWE; the two tutors will agree the final mark. Those based at a college where the agreement

specifies an assessment mode are likely to be assessed by two tutors from the college. Fully distant students will be assessed by two tutors based at UWE.

At the time of writing, only potential collaborative colleges have been identified, and final agreements have yet to be reached.

2.4 Evaluation Framework

It is recognised that developing new versions of materials for a distance learning environment needs a new set of criteria by which to judge the quality of the materials produced. Waiting to see how the students respond to it will be inadequate. We have therefore adopted and adapted an evaluation framework devised at Northeastern State University, USA. The framework can be found in Appendix C.

All module developers are using the evaluation framework as guidelines for development. Each module developer has been allocated a second member of staff to act as a *critical friend* whose role is to review material as it is produced and to suggest alternative approaches and rewording of materials and to generally support the lead developer. The evaluation framework informs their judgement of the materials produced. For each pilot presentation at least one member of the team, who is not involved in the module development, will be a student on the module. A list of module developers, critical friends and *students* for each module is given in Appendix E.

2.4 Project Plan

A gradual phased development and delivery scheme has been devised incorporating a pilot run of each module with students based at UWE prior to going live with truly distant students. The plan is to offer two modules in distance learning mode, out of a full-time diet of four, to students based at UWE in September 2006. Another two modules will be offered in January 2007 to the same cohort of UWE-based students. In September 2007 and January 2008 these modules, will be presented to students in a collaborating college and to a few selected individual distance learning students. Also in September 2007 the second phase of two more modules will be presented as a pilot scheme to UWE-based students, the other two modules reverting to classroom-based delivery, at least for the period of the pilot programme. By September 2009 the whole of the distance learning programme will have been run in both UWE pilot and first international presentation modes and will be available for general take up. A detailed project plan is shown in Appendix D**.**

2.5 Learning Environment

In the early stages of planning, consideration was given to a variety of E-learning environments. Important issues in the selection of environment are:
- ease of use;
- integrated nature of all of the facilities;
- reliability and technical support;
- helpdesk support to students.

The integrated single point of entry is a significant virtue of UWEOnline even though some of its component facilities are not currently as good as the market leaders in particular tools such as asynchronous conferencing and content development. However, as each new update to UWEOnline is received the facilities improve significantly. Also, whilst the technical support and helpdesk support for UWEOnline is not yet sufficiently comprehensive for optimum international distance learning programmes, provision is at least as good as that currently provided within CEMS.

Helpdesk support UWEOnline
At the time of writing helpdesk support is available by phone for approximately 8.30am to 8.30pm Monday to Friday but not at weekends. It is understood that ITS is considering extending this to cover Saturdays. Whilst this is a step in the right direction Sunday availability is no less important than Saturday and we are encouraging ITS to extend cover to Sunday as well. In Malaysia, the country most ahead of GMT in terms of likely location of collaborating colleges, the 8.30-8.30 period is 4.30pm-4.30am (3.30pm-3.30am in the UK summer) and this may well be sufficient, giving good cover into the late evening, the period anticipated for peak use.

Technical Support UWEOnline
The cover for systems is broadly the same as for student facing support. Reliance is being placed on the reliability of the hardware and software rather than in providing comprehensive 7-day support.

The course team is aware that very small disturbances in IT services to students tend to cause a sudden loss of confidence in the whole programme. With e-based distance learning programmes availability is paramount. We are particularly concerned that during the pilot phases there should be no interruptions to IT services as the demoralizing effect will swamp the pedagogic issues leaving us unable to sensibly evaluate the early deliveries. ITS points confidently to the excellent availability record of UWEOnline to date.

2.6 Module Design

This section refers to the development of the majority of modules with the exception of the Dissertation and the module Group Work Software Development, considered separately.

Scheduling
There are, potentially, advantages in having different schedules for those studying in distance learning and classroom-based modes. However, it is important to be able to integrate both modes of attendance so that students can take modules using a mixture of modes. Consequently, each module will run over a period coinciding with UWE semesters. The Dissertation runs over a longer period, described below.

All modules in the programme, with the exception of the Dissertation, are of size 15 credits. Each module is currently delivered and assessed over one semester of 15 weeks duration. The material is packaged into units of 1 credit that constitute 10 hours of study time and represent one week's work for the module. Each unit will be made up of a number of learning objects.

Potentially, one of the advantages of E-based distance learning is flexibility of scheduling. In spite of this we have adopted a fairly rigid schedule because there appears to be an increase in non-participation where the schedule is loose or non-existent. However, we are conscious of the impact of slipping behind schedule on completion of the module and the programme. To help mitigate this we anticipate offering advice to students on what to do if they do get behind. In simple terms this will suggest that they continue with the current week's work and then try to schedule time to cover any omitted work later. Where an omitted week's work is a prerequisite for the current week's work then they should complete the prerequisite work then skip on to whatever is then the current week's work, again scheduling the omitted work for a later date. The aim is to keep students feeling that they are still broadly on schedule.

Look and Feel

The development team has been keen to devise a standard format for the presentation of all modules that will nevertheless cater for the wide range of material to be delivered. A simple layout has been adopted based on a combination of specimen modules - devised by Liz Falconer, E-learning Development Officer in IT Services, to illustrate effective E-learning environments - and that provided on the Open University short-course T186 Understanding E-learning. This includes a series of tabs across the top of the screen providing access to the module calendar, learning outcomes, assessments, conferencing, resources and a glossary together with a structured contents list of the current week's learning objects down the left hand side providing direct access to associated material. In addition to provision of individual module pages, it is anticipated that a single programme home page will be provided from which access to module pages can be gained. Samples of draft material will be made available for demonstration at the validation meeting.

Careful consideration was given to appropriate typefaces. Clarity when displayed both on screen and on paper was the primary criterion for selection and Verdana, for descriptive text, and Lucida Console, for display of program code and any other text requiring a fixed-spaced font have been adopted. It has been something of a wrench to drop old favourites Times Roman and Courier.

Development Environment

Some members of the team are proficient users of web development tools like DreamWeaver, others are not. After lengthy discussion it was decided to adopt a simple development environment as this would allow all those involved to progress quickly to focus on development of content rather than to spend time on developing skill in using the chosen development environment.

Materials are being developed in Word and transformed to presentation format in UWEOnline using Transit. Once a few minor modifications are completed, this environment will support all the requirements of the development team and yet the simplicity of the mechanism means that new staff joining the team can become productive quickly. The restricted facilities available through this mechanism have also meant that little time has been needed to determine the standards to be adopted by material developers.

Manuel Frutos-Perez, E-learning Development Officer in IT Services, has co-ordinated the modification of the development tool *Transit* to meet some of the detailed requirements of the development team. These included use of specific typefaces and the need to space program code differently to descriptive text.

Structure of Learning Objects

The intention has been to create a structure that will give a common look and feel across all modules in the programme without being overly prescriptive.

Each week's material consists of a number of learning objects. Each learning object consists of a number of blocks. Each block will be displayed in a single "window" that does not require the use of the (vertical) scroll bar when viewed on a 17" screen through a maximised window. Each block typically consists of explanatory text, a relevant image or diagram, an activity and a self assessment question. Answers to self assessment questions are included either as the next block or are accessible via a link. Links to other appropriate sources may be embedded in the text. Activities include: undertaking calculations using a spreadsheet, writing and testing program code, reading a paper, summarising key points from a paper and posting the summary to a conference, testing programs written by other students, critiquing plans proposed by other students.

The final block in a learning object is some form of block review and may incorporate use of computer marked questions or crosswords – use of Hot Potatoes http://hotpot.uvic.ca/ has

proved useful in preparing such items. Use may be made of the UWEOnline facility or other similar tools for onscreen completion of multiple choice questions and automated marking of the answers.

The structure is depicted below where * indicates repeated one or more times:

```
Programme
  Module*
    Week (10 hrs) Teaching material*
      Learning Object*
        Teaching Block*
          Explanatory text
          Activity
          Self assessment question*
        Review Block
            Self assessment question*
Week (10 hrs) Assessment*
```

Additional materials are included when important to the subject matter such as downloadable spreadsheets, program files, papers, and direction to conference participation.

Availability of Materials
An important feature of the learning environment will be the availability of key learning materials for easy download and, in all likelihood, printing. Key primary journal papers and articles will be held in UWEOnline and will be subject to the payment of appropriate copyright fees. This will be co-ordinated by the library. Appropriate URLs (links) to important secondary sources will be included in the explanatory text. There is a need to be vigilant over maintaining the currency of these links as there is a tendency for some to become unavailable over time.

In some modules students will be directed to undertake their own research. To facilitate this they will be directed to some important archives. However, there are licence restrictions and some are unavailable to distance learning students. The team is mindful of these restrictions and will avoid directing students to make unlicensed access. Appendix F contains details of journal access restrictions.

Student Collaboration
One of the great potential benefits of E-learning is the enhanced possibilities for collaborative work. In classroom-based programmes it is comparatively rare for students to have legitimate access to the work of fellow students. In this programme students will be encouraged to post some of their work on conferences and to examine the work of others. Some of this work, including the review of the work of others, will contribute to the assessment. Conference contributions will also be used for discussion of key topics and at the start of the course may serve a social function as well.

2.7 Dissertation

The Dissertation commences in June and there are two opportunities for submission in November and in May. Failure to submit by May will be regarded as failing the first assessment opportunity. Referred submissions can be made by any of the three submission dates for consideration at the next Field Board and failure to resubmit within 12 months will be regarded as failing the second assessment opportunity.

Preparation for the Dissertation takes place in the supporting module Research Methods. The aim is that the final proposal submitted for assessment of the research methods module constitutes the starting point for the dissertation.

For students based at UWE or a collaborating college the dissertation will be conducted in broadly the same way as it as at present. For truly distant students, the face to face discussions used to clarify the research area and to periodically review progress will be undertaken entirely by email. This is not quite the dramatic change from current practice it may seem as much of the supervision is already conducted via email with students submitting documents for comment by their tutor and the responses both being made by email.

Remote assessment of the software product poses perhaps the greatest challenge. The module leader for the Dissertation has been experimenting with the use of instant messaging facilities to undertake synchronous discussion and execution of software on the remote student's PC. The team is confident that these facilities, which allow the tutor to take control of the remote student's PC and to run the software whilst simultaneously running a messaging conversation or internet based phone conversation, will prove more than adequate for the assessment of the software produced.

In early presentations it is intended that second readers will be based at UWE to ensure appropriate standards. The intention is to gradually move to second marking being undertaken at collaborating institutions, and for second marking to remain based at UWE for all other students. There is a need for some form of training for supervisors and markers, who will need clear guidance about what constitutes Distinction, Merit, mid-range pass, bare pass and borderline fail. This will be based around example dissertations and software for each of these categories.

2.8 Group work

The module Group Work Software Development (Student Led) simulates a typical approach to the development of large software products. Students work in teams to develop a software product starting from defining the requirements, through design, to implementation of working software. In the classroom-based version students do part of this work in a scheduled face-to-face 2-hour class each week.

In this distance learning version, the face-to-face meetings are replaced by collaborative work via conferencing postings. Each week students must make a minimum number of postings to the conference. Their contributions are monitored by the tutor and silent students will be contacted. The individual component mark will be based on the contributions made to the conference. The product, the Project Report, will be assessed to determine the group component of the mark.

2.9 Assessment Philosophy

The examinations set will remain the same for classroom-based and distance learning versions of the programme. Consideration has been given to the impact of a paper being sat at different times due to time zone differences. This is not expected to be problematic but several remedies are available should it prove necessary, ranging from retention of question papers, through the use of pre-published case studies, to the setting of pre-published exam papers.

The appropriate nature of the coursework assessment has proved a more interesting question. Coursework assessment takes on an even more important role in motivating

students on distance learning programmes. Our own experience, as students, of submitting a short, low contribution (10%), 20-question, multiple-choice test in week 5 of a short course proved hugely motivating despite its relatively trivial nature. Also, the designation of a week for such a coursework assessment allows students to get back on schedule where otherwise they may remain behind throughout the duration of the course. This apparent slack in the schedule can transform what might otherwise be a hugely demoralising experience into a stimulating one.

The team has revised the nature of coursework assessment from the classroom-based version of the programme which had a single coursework assessment at the end of each module. Several modules, for example Project Management, now adopt staged coursework assignments, allowing submission of parts of the whole piece of work at intervals throughout the module. Others set small tasks to be submitted after about 5 weeks with larger pieces of work due later in the module. By aligning the coursework to the learning outcomes, undertaking the coursework will facilitate achievement of those outcomes. The risk in adopting several staged coursework assessments is that the volume of work increases overall. The development team are mindful of this and will endeavour to redistribute the assessment load rather than merely to add in new pieces of work.

2.10 Marking of Assessments

Marking Examinations
It is anticipated that all exam marking will be undertaken at UWE.

Marking Coursework
There is greater variety in the approach to marking coursework than examinations. All coursework will be submitted electronically. A small number of submissions will be computer marked. The rest will be downloaded, marked onscreen and uploaded by a tutor based at the collaborating college or at UWE. The usual moderation of marks and the quality of feedback will be undertaken by the module leader. There may be variations from these principles for marking the work of students at collaborating colleges depending on the details of the agreement.

2.11 Student Support

The development team recognise the importance of providing an accessible student support system for distance learning students. At present approximately 40% of enquiries to the CEMS student advisors are dealt with through email and by telephone. These facilities are easily extended to distance learning students. In addition, CEMS is launching a student advice website in August 2006 which should address some of the more common queries brought to the advisers and this will be accessible via the MSc Software Engineering community (home) page on UWEOnline. We also intend to incorporate a student support conference. Here, students may post non-personal queries to which student advisors will also post the responses. This facility will be made available to the whole programme cohort.

Students based at a collaborating college will also be able to make use of the local student support provision, particularly for dealing with personal matters.

3. Responsibility for Programme Leadership

Overall academic responsibility for the programme in Software Engineering will lie with the Director of Taught programmes postgraduate, Dr Christine Perry. Programme leadership will be located in the School of Computer Science, in CEMS, and led by Jane Berry.

4. CVs for Module Leaders and other Relevant Staff

CVs are attached in Appendix B.

5. Standards and Quality

UWE enjoys an excellent reputation for the quality of its taught programmes, confirmed through Subject Reviews, Teaching Quality Assessments and Institutional Audits carried out by the QAA. The Faculty's honours degrees are accredited by appropriate professional bodies, including the British Computer Society and the Institution of Electrical Engineers.

The Faculty's research in various branches of Computing, especially Artificial Intelligence, Software Engineering and Grid Computing, is highly regarded in national and international circles. Its many research centres and groups, including the Centre for Complex Cooperative Systems, the Intelligent Autonomous Systems Laboratory and the AI Group, carry out collaborative research and consultancy with many national and international partners, including Motorola (UK), CERN (Geneva), Siemens (Germany), CNRS (France), Beijing Institute of Technology (China) and university hospitals in Cambridge, Paris, and Udine and Genoa (Italy),

6. Staff development

Early in the life of this programme development project it was recognised that transforming an existing programme into one that could be effectively delivered in a distance learning mode was not a simple matter. From the outset the intention was to make the programme an e-learning one rather than paper-based as this provided greater flexibility and many more possibilities for enhancing the student experience; not least of which is the ability to provide an enhanced degree of collaborative work.

As part of the preparation, nine members of the development team undertook the Open University short (10 credit) course T186 Understanding E-learning. Despite its level 1 badge, this was a modified version of a previously presented M-level course. Naturally, the programme was delivered in e-learning mode and the medium was as much the message as the content itself. Not only were the issues of course development important but, perhaps of even greater value, was experiencing at first hand what it is like to be a student in this environment. Of note, has been our change in attitude towards the nature of assessment, the importance of very simple uncluttered styles of presentation and the unimportance of gimmicks and high cost multimedia features. Also offering great insights has been our experiences of using asynchronous conferences for viewing other students' work as well as other technologies. This experience has had a significant influence on the development of this programme. Perhaps above all else the most important consensus is that our material should be focused on activities.

Members of the team have also attended a number of UWE workshops covering a variety of aspects of developing material for use in UWEOnline. Special workshops have been organised for the team by Liz Falconer and Manuel Frutos-Perez,
E-learning Development Officers in IT Services.

Three members of the team have significant experience of involvement in the running of online asynchronous conferences as an integral part of distance learning courses.

A seminar on appropriate language for international students was led by a colleague from a local language school.

During this development project it has been recognised that we have paid much greater attention to the consideration of learning and teaching issues than is usual when developing classroom-based programmes. A consequence of this is the likely modification of existing practice in other programmes.

6. Management and Quality Assurance

The programme will operate under the quality assurance procedures of the Faculty of Computing, Engineering & Mathematical Sciences as approved by the university's Academic Quality & Audit Committee from time to time and most recently in 2001.

7. Institutional Policies, Mission & Strategy, Regulations, Procedures and Notes for Guidance

The programme is consistent with these.

Appendix C **Online Module Development Evaluation Instrument**

Module Code: _____ **Module Title:** _____

Module Developer: _____ **Evaluator's Name:_____ Date: _____

Evaluator: Consider how well the module meets each of the following ten criteria for an effective online course. The bullets are provided to give clearer meaning to each criterion, but every bulleted item need not necessarily be included in the course to earn an excellent score.

Evaluation Criteria	Does not meet criteria (0)	Partially meets criteria (1)	Meets criteria (2)	Comments
The learning experiences have a clear purpose with well-defined objectives and outcomes. • The learning design considers both the nature of the content and the characteristics of the learners. • High expectations are clearly communicated. • Efforts are made to relate the design of the course to students with different learning and organizational styles. • Evaluation/grading procedures are clearly explained.				
Well-designed discussion and cooperative assignments are incorporated to facilitate collaborative learning among students. • These assignments are clearly integrated into the course. • There are a sufficient number of discussion assignments. • There are provisions for instructor mediation of the discussions. • Opportunities are provided for students to learn by reflecting on theirs and others contributions. • Mechanisms are in place to ensure that all students participate in group discussions/ assignments. • Discussions are designed to promote engagement and evaluation rather than simple repetition of content. • There are discussions within the class as a whole and within smaller groups.				

The learner is actively engaged. • There are active, hands-on, problem-solving opportunities. • The course relates content and outcomes to real-life experiences through simulation and/or application. • Mechanisms are used to encourage the student to participate with the instructor, the content, other students, and technology. • Course projects are an integral part of the learning experience. • Projects and/or papers are open to instructor and peer critique and feedback.				
The course goes beyond knowledge transmission to knowledge creation and critical thinking. • Students are equipped to use new knowledge in problem-solving. • Analogy and simulation are used to relate new content to past knowledge/experience. • Higher order thinking skills such as analysis, synthesis, and evaluation are developed by the learning experiences provided in the course.				
The learning environment makes appropriate use of a variety of media. • Different media are used to address different learning styles. • Use of various media is consistent with the nature of the content, learning goals, and access to technology. • The course goes beyond an "electronic correspondence course."				
There are clear mechanisms and guidelines for interaction between the student and the instructor. • A variety of communication options are provided. • Methods are in place to encourage students to interact with the instructor. • Policies are in place describing the types of communication that should take place over different channels. • There are clear standards for instructors' timelines for responding to messages.				

The course emphasizes time on task. • Assignments are appropriately spaced and clear deadlines are set for their completion. • There are clear guidelines for determining the relative importance of different sections of the course. • More challenging content/skills are addressed with more extensive and more varied learning strategies.				
Prompt feedback is provided. • Reasonable feedback time for questions and assignments submitted to the instructor is specified. • Receipt of assignments is acknowledged within a reasonable and specified time.				
Effective procedures are in place for acquiring access to appropriate resources to support the course. • There are clear instructions for accessing library resources. • There are clear instructions for acquiring bookstore resources. • Links are provided for a variety of online resources. • There is a way for students to self-assess whether or not they have the needed technology access and skills to succeed in the course. • Meets Web Content Accessibility Guidelines. For more information, refer to: http://www.w3.org/WAI/gettingstarted/Overview.html				
The course respects diversity, varied talents, and different learning styles. • Students are encouraged to express their informed opinions in a non-threatening environment. • Mechanisms are provided for students to bring varied backgrounds and experiences into the learning experience. • Assignments, presentation of content, and feedback are designed to account for different learning styles. • Students are allowed to choose from different projects.				
Points				**= Total Points**

The original version of this form is available at: http://arapaho.nsuok.edu/~wooddg/ctl/newsletter/spring2003/onlineinstrument--new.htm

Appendix D

MSc Software Engineering by Distance Learning

Module Delivery Schedule (16 March 2005)

Key Dates   Activities and Events

June 2006   **Validation**

Sep 2006 UWE Pilot Semester 1 Year 1 Part-Time modules
           Object-oriented Design & Programming
           Software Engineering Concepts

Jan 2007 UWE Pilot Semester 2 Year 1 Part-Time modules
           Advanced Databases,
           Component-based Software Development

Sep 2007 First Remote Delivery Semester 1 Year 1 Part-Time modules
           Object-oriented Design & Programming
           Software Engineering Concepts

           UWE Pilot Semester 1 Year 2 Part-Time modules
           Requirements Engineering
           Project Management

Jan 2008 First Remote Delivery Semester 2 Year 1 Part-Time modules
           Advanced Databases,
           Component-based Software Development

           UWE Pilot Semester 1 Year 2 Part-Time modules
           Software Engineering Group Project - Student led
           Research Methods

May 2008 UWE Pilot **Dissertation: Software Engineering**

Sep 2008 First Remote Delivery Semester 1 Year 2 Part-Time modules
           Requirements Engineering
           Project Management

Jan 2009 First Remote Delivery Semester 2 Year 2 Part-Time modules
           Software Engineering Group Project - Student led
           Research Methods

May 2009 First Remote Delivery Dissertation: Software Engineering

Sep 2009   Available for widespread adoption in FT and PT mode (PT recommended)

Bold indicates first delivery in distance learning mode

Appendix E

MSc Software Engineering by Distance E-Learning

Module Development Staffing

Module Code	Module Title	Author	Critical Friend	Student	UWE Pilot
UFCEPL-15-M	Software Engineering Concepts (E-learning)	Andy Gillies	David Coward	Deborah Street	September 2006
UFCEPM-15-M	Object-oriented Design and Programming (E-learning)	Jin Sa + Ian Anderson	Jane Berry	Peter Rawlings Stewart Green	September 2006
UFCEPQ-15-M	Advanced Databases (E-learning)	Tony Solomonides	Paul Raynor	Jane Berry	January 2007
UFCEPR-15-M	Component-based Software (E-learning)	John Jabroo	Jane Berry	Jin Sa	January 2007
UFCEPN-15-M	Requirements Engineering (E-learning)	Stewart Green + Mohammed Odeh	Praminda Caleb-Soley	David coward	September 2007
UFIEPP-15-M	Project Management (E-learning)	Robin Smitherman	Peter Rawlings	Paul Raynor	September 2007
UFCEPS-15-M	Group Work Software Development (Student Led) (E-learning)	Andy Gillies	David Coward	No staff participation	January 2008
UFPEPT-15-M	Research Methods (E-learning)	Deborah Street	Paul Raynor	Jane Berry	January 2008
UFCEPU-60-M	Dissertation (Software Engineering) (E-learning)	Stewart Green	Julian Webb	No staff participation	May 2008

Appendix F

Journal Access

Some publishers place restrictions on the access permitted for students based overseas and studying on distance learning programmes as part of the UWE license agreement.

The following exclude access to students based overseas
Barbour
Electronic Collections Online
Employment Law Online
Focus
IEE online journals (unless these students constitute fewer than 5% of users)
IEEE Xplore
International GAAP
Justcite
Lexis/Nexis Executive
Lexis/Nexis Professional
RefWorks
Statutory Instruments
Web of Knowledge
Weekly Law Reports

The following allow use in e-reserves
ACM
Analytical Web Base
Animal health and production compendium
IEEE Xplore (up to 25 PDFs)
Ovid biomedical collection
Royal Society of Chemistry (but 30 days after end term)

The following allow deep-linking at journal level
Employment Law Online
Firstsearch
IEEE xplore
Lawtel
Lexis/Nexis Executive
Lexis/Nexis Professional

The following allow deep-linking at document level
Academic Press
Business Source Premier
Ingenta journals
Lawtel
Lexis/Nexis Executive
Lexis/Nexis Professional
Ovid Biomed
Statutory Instruments
Weekly Law Reports