Carnegie Mellon University
Software Engineering Program
Distance Education Instructor Handbook

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Abstract

Many universities are now investigating the use of distance, or distributed education due to many *perceived* benefits over traditional classroom education. These *perceived* benefits include: flexibility with student location, ease of program scalability, and (many times erroneously) believing that it is at a lower cost. However, successful development of courses for distance delivery is not as simple as turning on a video camera and placing recordings on the web. Course content developers, distance education instructors (not always the same people as the developers) and support staff must be aware of the differences between on campus and distance delivery in areas such as technology support, appropriate assessment techniques, classroom management and communication with and between students. This handbook provides the current methodology and recommendations for successful course development/delivery used for the Carnegie Mellon Masters of Software Engineering ten year old distance program.

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1. Introduction

1.1 Purpose

This handbook provides guidance, insight, and helpful hints for Course Content Developers, Distance Education (DE) Instructors and Support Personnel involved in DE for the Professional Masters of Software Engineering (MSE) program at Carnegie Mellon University (CMU).

1.2 Mission

The mission of MSE Distance Education is to provide the same high quality program as the on campus versions. While on campus students may take MSE-DE (Masters of Software Engineering – Distance Education) courses with approval of their advisors, the program is targeted at full time working professionals who will take courses in their spare time. Accordingly the largest value that DE provides is in its flexibility for delivery.

1.3 Program Overview

The MSE-DE program is a professional education program offered by Carnegie Mellon University since 1996. Students can participate in the MSE-DE program in one of four ways. Students can take:

1. Individual MSE-DE courses for or without credit (if taken not for credit there will be no official transcript generated by CMU).
2. MSE-DE courses for credit towards a Certificate in Software Engineering (CSE)
3. MSE-DE courses toward an MSIT-SE Degree (Master of Sciences in Information Technology – Software Engineering emphasis)
4. SE-DE courses toward an MSE Degree (Master of Software Engineering).

A more complete overview and history is in Appendix 1.

1.4 Assumptions

The success of the MSE-DE program is in part contingent on the continual camaraderie between the Course Content Developers, Distance Instructors, Support Personnel, and the quality of students accepted in the program. In general, the assumptions about these groups in the program are that they:

- Maintain the smooth and timely flow of information between stakeholders

- Work to resolved all issues regarding technology changes and methodologies in a timely manner
- Understand the benefits and constraints of new technology in the delivery of course materials
- Evaluate and learn technology (hardware and software) needed in the delivery of course materials
- Understand the mission and strategies employed to ensure increased quality in educational outcomes
- All students accepted to the MSE-DE program regardless of whether for CSE, MSIT or MSE go through the same review process. It is assumed that students accepted into on of these programs have met established criteria ensuring their ability to complete the program.

2. Current Communication Technologies

Various technologies are currently available for use in the MSE-DE program. These technologies fall into two major categories.

- *Synchronous* technologies utilize real time communication methods between parties. This may include student – instructor interaction or student – student interaction.
- *Asynchronous* technologies also play a significant role in the how the MSE-DE curriculum is designed. These technologies allow students to interact with course materials at their leisure, without demanding the immediate attention of an instructor.

The current state of technology available is constantly changing, improving, and must be evaluated by all associated with the MSE-DE program. Additionally, different courses will have different technology needs. Course Content Developers should contact the MSE-DE, or Associate Director of DE to ascertain what is currently available to support their courses.

2.1 Synchronous Technologies

Synchronous technologies enable instant, real time communication between participants. With synchronous technologies, students get more of a sense that they're communicating with a person than they do with asynchronous mediums. This makes synchronous activities and technologies valuable for team building and group collaboration. Please note that the size of a DE group within a class, or the whole class itself involved in synchronous communication is a critical element that needs to be managed. The MSE-DE program has found that groups should not exceed 10-12 people. Optimum size appears to be around five to eight participants, and that a group, (or whole class involved

in a synchronous discussion) of 10-12 will normally result in only five to eight students participating each chatroom session. However, Course Content Developers and DE instructors will need to reevaluate this for each class. In general, these are the synchronous technologies used in the MSE-DE program:

- Conference calls are used when network constraints such as bandwidth or firewalls restrict the use of computer based synchronous technologies.
- Online chat using discussion boards like BlackBoard™s' virtual classroom is a popular way for students and instructors to communicate synchronously. One of the advantages of a server based chat medium is that it can archive discussions for later reference or review.
- Instant messaging is a very popular method for synchronous collaboration. The fact that it is informal and easy to use makes it a popular choice for student – student communication. Some of the newer IM software also permits larger groups of participants… as many as five with some clients. This makes it very easy to have ad hoc meetings without requiring server resources.
- Video conferencing provides a way for instructors who may not want their materials captured permanently to present course content to remote students.
- Voice, video, desktop sharing over IP. This is new in 2005 and is still evolving. These provide synchronous communication and many allow simultaneous use of voice, video, "chats" and sharing of computer desktop environments. Many also allow recording of sessions
- Pod Casting. As of 2006 this is new and will require further study on its effective use in promoting DE.

All DE instructors should communicate with the Director or Associate Director of DE for the MSE program on what technologies are currently being used. Course Content Developers also need to be aware of what the currently technology is as it will impact how they prepare their course for distance delivery. The Technical Advisor for Distance Delivery (TADD) will be the key advisor on this during any course capture..

2.2 Asynchronous Technologies

Asynchronous technologies play a critical role in the MSE-DE program. Most if not all MSE DE classes have a large volume of asynchronous materials. These materials are used in tandem with other asynchronous communication technologies to provide the core components of a DE course. Below is a brief summary of these technologies:

- Video & course capture is used to transmit individual lectures to remote students. This permits students to view a lecture at their convenience. Another advantage of this format is that it allows students to play back sections of a lecture that they may not have understood initially. This can be very beneficial for foreign students for whom English is a second language. Well designed capture

technologies also allow students to access portions of a lecture in a random access fashion rather than serially. This gives captured courses additional functionality as reference materials.

- Asynchronous discussion boards have been used by the MSE-DE program for several years. They provide a good method for temporally separated individuals to communicate regarding course materials and assignments. It has proven difficult, historically, to coordinate synchronous activities with participants in widely varying time zones. BlackBoard™ offers discussion boards as part of its software suite. The fact that BlackBoard™ has been adopted throughout the university means that the effort involved in setting up and supporting one of these boards is very small.
- Assignments and assessments are typically completed asynchronously. They must be designed so that they can be completed using the resources available to a DE student. Certain types of online surveys and tests may prove problematic for students without a reliable or inexpensive internet connection

- Reading materials are the standard asynchronous tool used in DE course delivery. Any materials required for completion of the course must be available to remote students. This means that requiring students to access resources from the campus library may be inappropriate, such as a book put on "hold" for the course. However, while the library can't put a whole book online under what is called an "electronic hold" they can scan specific chapters or sections and have those available online.

3. Program roles and Responsibilities

3.1 Overview of Individual roles

The successful delivery of the Software Engineering DE program is contingent on the cooperation of the faculty and staff who develop and support the DE program. There are three major roles which must be addressed in assembling a DE course unit:

- **Course Content Developer:** The course content developers are responsible for determining what material the course will cover. They must also provide appropriate materials to insure that the instructional goals of the course are being met. Finally, the content developer needs to design and structure the course so that it can be successfully completed by students who are learning at a distance. The course content developer also owns the intellectual property of the course.

- **Technical Advisor for Distance Delivery (TADD):** This individual will be assigned by the MSE Distance Director, or Associate Distance Director. They

will be familiar with MSE course capture and distance delivery methods, and hence will typically be a member of the MSE core faculty. They will advise the course developer on:

- Development of the course with regards to its appropriateness for distance capture and delivery.
- Capture of the course, typically sitting in on all classes during the first taping of the course.
- Development of the course's instructor handbook

They will also be involved with the first distance offering of the course.

- **Video Teaching Assistant**: This could be the classes regular TA. Different though than a regular TA the Video TA will compile samples of annotated graded assignments for inclusion in the course Rubric. They will also assist in editing the captured lectures. This role may also be assumed by the TADD.

- **Support Personnel:** The support personnel are responsible for capturing and packaging the materials created by the course content developer so that they may be presented at a distance. Typically, the team of support personnel includes video technicians and courseware specialists.

- **DE Instructors:** De instructors are sourced from core and adjunct faculty. Most adjunct DE instructors are alumni of the program. The DE instructor's primary role is to help the students work through and understand the materials that have been created by the course content developer. Each time a class is presented, a DE instructor is assigned to work with the class. The DE instructor will collect and grade assignments, answer questions regarding the course materials, and verify that the DE materials are accessible to the students participating in the class.

3.2 Content Developer – Roles and Responsibilities

A course content developers responsibilities may be divided into two major functional areas. The first is the actual design of the course itself. The second area of responsibility is ensuring the quality of the DE materials themselves with regards to lectures, transcripts and written materials that support the course.

Designing an effective DE course requires that the course author completes these tasks:

Before production begins:

- Define the course's requirements and goals. It's difficult, if not impossible, to determine whether a course is successful without knowing what it is attempting to achieve. Courses must be designed with distance education in mind. Anderson and Garrison in 1995 [AG] identified three major interconnected nodes that must be kept in mind: Student, Content and Instructor:

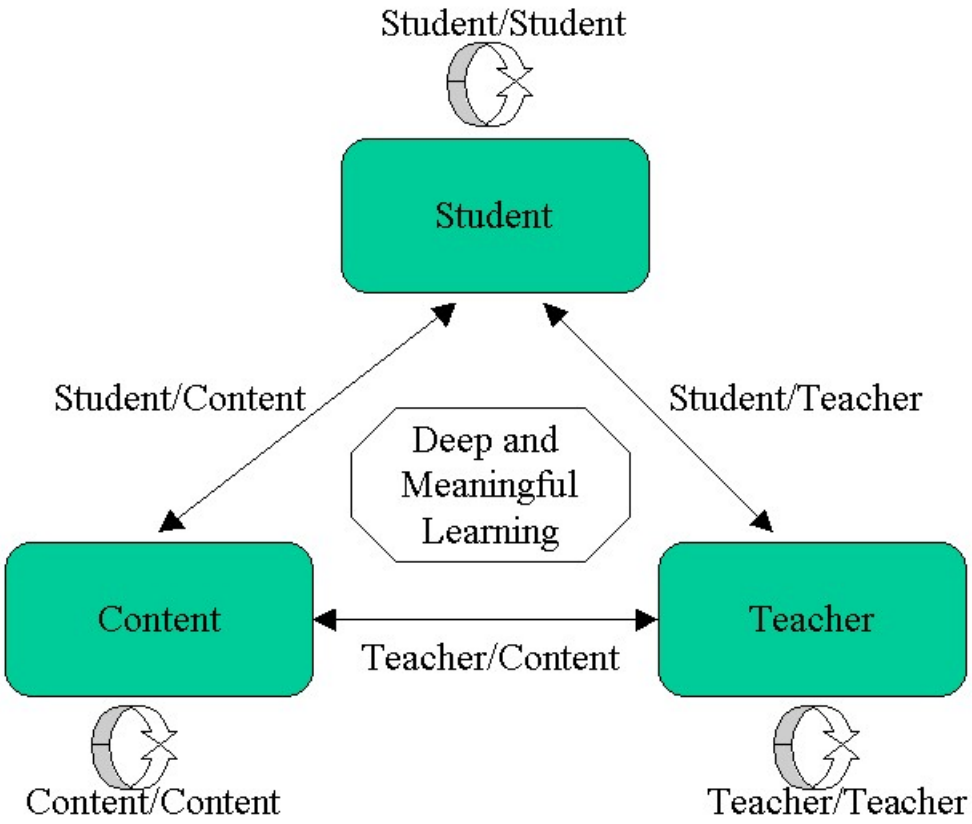

Figure 1. Modes of Interaction in Distance Education from Anderson and Garrison, 1995

- Define course constraints. These may include:
  - Access to certain material or software that is readily available on campus, but may not be off campus. For instance using readings from books available at the school libraries, but not readily available elsewhere without a large purchase price, may hinder your class's ability to be done at a distance.
  - Minimum number of students. Some classes need a minimum number of students in order to "piece-work" the assignments, such as required book reports, reviews, or to do group project work.
  - Maximum number of students. This may be important when considering the work load for a DE instructor that will be grading all of the assignments. The MSE-DE target is for 5-8 hours per week of work for any DE instructor. This includes all chatrooms, answering emails/phone calls and grading homework.

Assessment methods, assignments, homework. All should be appropriate for the goals of the course and in class and distance use. Assessments should be designed to measure two different things. First, they need to determine whether students are successfully learning the material being covered. Next they need to provide feedback which allows the instructor to determine how the DE format is affecting learning.

- Tests work well for both on campus and distance students. Ensure that the test taking time limit is included with the test. Due to the constraints of DE tests that are "take home" work better than in class type as the DE instructor will typically have no control over the environment that the DE student is in while taking the test.
- Presentations. These are very hard to do online where the DE students are scattered about different time zones. However, they are still possible using certain technologies that allow desktop, voice and even video to a group. Asynchronous communication may work better, such as a threaded discussion board. This works on campus and DE. For instance, the presenter starts the thread, and then is required to answer all questions posed by the DE instructor and other students. Also, the other students are required to comment on the initial thread and one or more other student comments.
- In class exercises may also be difficult to do in a DE setting, however this isn't impossible. The use of PC desktop sharing along with Voice over IP has allowed this to be effectively done in distance classes.
- Coupling with MSE studio projects. Remember that the distance students will typically not be able to work with a studio project team, so if required an academic project will have to be set up. One method for this is to use a past project. However, if this is done the developer may have to request limited access to that projects website to prevent DE students from copying past developed material instead of learning by developing it on their own. Also, it may be simpler to just de-couple the course from studio as the majority of DE students are MSIT-SE that do not have to do a studio project.

Review the available content delivery methods and technologies.
One of the best indicators for success in DE is the level of interaction students are engaged in while taking the course. Choose presentation technologies which will engage the students without distracting them from the course itself. One such technology is Web Arrow™. This allows chat, VOIP and the sharing of PC desktops so all can see what a specific participant is doing.

Select supplemental materials which are appropriate for distance learning.
The Technology, Education, and Copyright Harmonization Act of 2002 (Teach Act), (Public Law 107-273, section 13301), which amends US copyright law, describes what kinds of copyrighted materials can be used in what contexts. (Summaries of the act can be found at Http://www.library.cmu.edu/OtherInfo/Copyright.html). While it may be appropriate to view a movie in an on campus class, it may not be legal in a DE context. Also, course materials should be available for the lifespan of the DE class itself.

- Copyrighted videos are very problematic. While they can be used in class the fact that for DE they will be captured again electronically and used is the problem. If needed make the videos part of the required material to be bought by the student.
- Library held resources. Realize that while good for on campus the DE students will not have physical access to campus libraries. However, with that said, it may be possible to copy/scan small portions of some books and have them held in electronic reserve. The TADD can help with this.
- Shared resources. Some courses expect student groups to share a book, or other material. This is not feasible typically for DE.

Set a schedule which is appropriate for students who are learning at a distance. Build in time for communication problems etc. Realize that MSE DE courses will follow the same time line as on campus courses. In other words, DE courses will **not** be offered asynchronously compared to on campus courses by starting in the middle of a on campus semester.

Rubrics Development.
These are typically not developed for on campus courses, but are needed for DE instructors. Also, some developers have found that developing rubrics helps them refine their assignments. One simple method for doing this is to keep a file of **annotated graded** samples from the on campus assignments. The annotation should show why the assignment was acceptable, or why not. The on campus TA or the assigned TADD can assist with this. The DE Instructor will need to coordinate with the Course Content Developer, or the MSE-DE program on the expectations with assignments the first time they teach the course.

Class participation.
This can be easily done in DE as most chat sessions, discussion board threads are recorded. The on campus and DE instructor can look to see if students are participating and providing meaningful discussion material.

Class Management
Carnegie Mellon has adopted BlackBoard[tm] as the university standard for a web based class management application. The university provides training and support for using this system and should be contacted for a full demonstration on its capabilities . Briefly, BlackBoard[tm] provides:

- Asynchronous communication through email, announcements and discussion boards.
- Synchronous communication through recordable chatrooms and/or virtual classrooms. The virtual classroom allows the use of a whiteboard, or linking to URL's.
- Student team management. The system allows the instructor to easily set up student groups that can have their own chatrooms and discussion boards.

- Online, editable syllabus that allows instructors to provide direct links to readings and assignments.
- Ability to copy BlackBoard[tm] course content to another section, or semester.
- Wizards to set up online tests and surveys
- Online gradebook where the instructor can control when grades are visible to the students. This also provides a means to weight assignments in order to keep track of cumulative scores. However, the gradebook is very limited with compared to a simple spreadsheet.

However, as BlackBoard[tm] does have constraints, such as with the grade book some course developers prefer using their own web sites for course support. This has caused some unforeseen problems though, such as student access to past class material such as answer keys, and that someone must maintain the course site. Developers that use their own sites must ensure that access to previous class sites is limited, and they must provide their own support of the current site.

Student communication.

Communication is critical for on campus and DE delivery. In lieu of face to face discussions that on campus affords courses need to be able to support electronic synchronous and asynchronous communication. These also work for on campus:

- Telephone. Individual or conference
- Chatrooms.
  - These can be recorded, but should have some overlying rules to ensure their effectiveness. For instance, chats of over 10 people usually become too hard to control, breaking down into a few separate discussions. However, with the right control they work well.
  - The DE instructor will need some guidance on what to discuss for each unit of the course as a baseline where chats can be started from.
  - Discussion Boards. Asynchronous in nature these can help non native speakers on campus and DE as participants have more time to formulate thoughts.

Frequently Asked Questions.

As with any class there is always a set of questions that come up. Developers must plan to capture and sort these for later use. The simplest method is to put these in categories further broken down into each subject, assignment or general course "housekeeping" (such as format for papers, submission methods such as BlackBoard™ dropbox). Experience has shown that breaking a course into clearly defined instructional units greatly assists with the categorization of frequently asked questions (FAQ's). Developers need to recognize questions that are "on campus specific only," and to separate these out as they are not needed for distance delivery.

- In class questions. These will be on tape, but it would help DE students, and DE instructors if pertinent questions and answers are captured in writing during each lecture and put in a FAQ format online. Besides in class questions, some developers

use a discussion board to capture these, and some use email. Capturing these in class is hard unless the developer or their TA is ready to do so. Capture via discussion board or email is easier. The developer should arrange these into groupings for each unit of the course and should also have a general FAQ section for questions on the administration of the course, such as when will grades be posted, problems with the course material (CD/DVD won't run) or problems with the course management systems, BlackBoard[tm].

Taping of Lectures

Past experience with the MSE distance program course capture has provided the following lessons:

- The audio component of the lecture and especially of student questions during the lecture is the most critical aspect of the capture process. The least critical is the video of the lecturer. Accordingly, the developer, TADD, Video TA and the videographer must work together to ensure a quality result from the tapings. It is recommended that all involved in the taping meeting before taping starts and weekly during taping to discuss problem and recommendations for improvement.
- The developer needs to understand how the capture equipment works before they start lecturing. This usually requires a very short instruction period. The developer should never try to learn this while taping the first class. This is especially true when using media other than just powerpoint slides, such as a VCR, DVD video, using a hyperlink from the lecture, or a computer application demonstration.
- When taping try to:
  - Keep on campus "house keeping" issues such as group assignments to very beginning or end of class. This allows easier editing for the distance classes. Work with the videographers to let them know when to start/end/pause taping.
  - Watch the videographer during taping. The videographer will be able to tell you if there is a problem, especially with the audio. Prearranged hand signals work well for this, and are less disruptive to the class.
  - Repeat questions from students when able. This not only ensures that the question is heard, but also helps understanding the question.
  - When students or guest lecturers present material ensure that the videographer has time to make sure that they properly attach the wireless microphone. Audio is the critical component of the DE taping, so please take the extra time to ensure it is working.
  - If there is a problem during the lecture, such as the taping or a demonstration, then mark the time as it is possible to insert an edited piece later.
- While the TADD, the Video TA and the Videographer typically have the experience to review taped lectures, the Developer should also take the time to review their own lectures. This not only ensures the quality of the taped product but also provides the developer with excellent feedback on their classroom presence.

Instructors Manual
Developers, with the help of the TADD will also have to develop a DE instructor manual for their courses. This manual will typically include:

- Syllabus description with specific information on each unit
- Texts for the course
- Discussion of assignments. This will have specific instructions for any assignments like threaded discussions.

Rubrics for grading assignments. These historically have been annotated samples of answers taken from on campus delivery, or the first distance offering.

Contact for DE instructors. Developers will need to be available for future DE instructors, and thus provide a method for contact. If instructors have questions regarding DE materials, they need a reliable, timely method to contact the developer.

3.3 Support Staff – Roles and responsibilities

The support staff that work with the MSE DE program include both video technicians and courseware specialists. They are responsible for the capture and packaging of the final DE products that will be delivered to students. They are also responsible for testing the course materials for consistency and quality. If there are problems in the creation of a distance education class, these people should be the first to know it.

Video Technicians
Video capture technicians are responsible for completing the following tasks:

- Collect any presentation materials which go with the session being captured. It is important that these materials be available ahead of time so that any problems with file formats etc can be addressed. Failure by the course creator to provide these materials will increase production costs and resource requirements.
- Test the video capture equipment to make sure that it is working properly before capture begins. Equipment should be working properly and have enough disk space or video tape to capture the entire lecture, even if it runs beyond the allotted time.
- Show up early to set up. This may be difficult when classes are scheduled back to back in the same room. Showing up early insures that the camera can be set up in the most effective available location. Also, if circumstances permit, the video technician should try to use a consistent location for all lectures in a course series.
- Capture the entire lecture. It's easy to remove data after the fact. It's more expensive to have to re-capture a session after the fact.
- Edit the captured session. Remove any leading or trailing footage which is not relevant to the lecture presented. Mid session breaks may also be removed.
- Upload the captured session to the server it will be stored on. The equipment used to capture lectures is portable. The frequency with which it's moved

increases the likelihood of failure. This makes it a bad location for long term storage.
- Verify that the captured lecture can be played back from the server. If the technician can't view the video, no one else will be able to either.

Courseware Specialists

Video on its own doesn't make a complete DE course unit. The other resources that go with the video include reading materials, assignments, activities, projects, etc. These materials are contained in the course packets distributed to students when they register for a distance education class. The courseware specialists are responsible for assembling these packets. They should be included during the initial development of a course so they can start assembling the needed materials. They follow this process in assembling the materials:

- Setup and test the distance education technologies which will be used for teaching the course. This includes configuring BlackBoard™ resources, identifying where videos can be accessed online, duplicating CDs that will be distributed, and checking the course packets for completeness.
- Verify access to materials. If materials are protected by passwords or security, the courseware specialist makes sure that the resources are available to the appropriate students and mentors.

3.4 DE Instructor – Roles and Responsibilities

To a great extent, the success of a DE Instructor depends on the materials (schedules and assignments), that are developed by the Course Content Developer (Author). There are cases where DE Instructors need to modify existing materials to successfully deliver a course at a distance. Sometimes the traditional face-to- face techniques and methods **DO NOT** work in a distance learning environment. Training and familiarity with the technology in use allow the instructor to better address the areas:

- Strategies for group activities and personal practice.
- Encouraging student – student interaction.
- Increasing the quality of student – instructor interaction.
- Increase the effectiveness of technology in the learning and teaching process.
- Motivate of students participating in DE.

The DE instructor is expected to increase the student sense of belonging and fully involve students in course activities. It is the responsibility of the instructor to encourage group discussion among students, and facilitate their progress. The instructor also assesses the

students and provides ongoing feedback regarding their work. Assessment can be in the form of interviews, surveys, tests or other methods. The below listed factors have been identified as positively impacting the success of DE courses. They are the helpful tips that will assist in the delivery of a successful, disaster free DE class.

3.4.1 Key learning factors for successful delivery

Review Courseware: When you agree to teach a DE course, you will receive a packet including a syllabus, assignments, reading materials, etc. Carefully, review this material, and make sure it's all there and that it makes sense to you. Do not wait until the day before the course. It is a good practice to be familiar with materials ahead of time, this gives room for any questions and feed back from the course author and faculty on the materials delivered to you.

Early Preparation: Prepare early by setting up grading spreadsheets, mailboxes, mail groups. You will receive an enormous amount of e-mail from your students as individuals and as teams if teamwork is involved in your course. Plan now how you will deal with it, how you will store it, how you will organize it. Make sure that you have a workable and realistic back-up strategy in case your system crashes and you loose all of your grades, correspondence, assignments, etc.

Try out the Technology: Before the class begins try out the administrative support applications (BlackBoard™)BlackBoard™, chatware, etc. that you plan on using. Make sure you try out the technology on the system you plan to use during the course. In the past, DE Instructors would use a system at home that could access a university site only to find out that they were unable to access a university site from another system. Beware of firewalls and set appropriate security level on the class website, as you do not want people who do not register for the class access your materials.

Be Flexible Within Reason: The logistics of DE sometimes make precise assignment delivery difficult for a variety of reasons. Even though e-mail is probably more reliable than traditional snail mail, sometimes there are problems especially with large corporate systems behind firewall. Many instructors use the drop box function in the management application BlackBoard™. Be clear with your students about what is too late, and recommend that they find multiple ways to ensure that assignments reach you. Be careful not to digress from the courses curriculum due to possible problems.

Tailoring the course: DE instructors are allowed to tailor the course for their specific class by 10%. This means you can change assignment weighting, add assignments, add reading materials, etc. This should be done only as needed to make the course more relevant to the students. Many DE instructors add more current readings, or assign graded reading questions are two commonly seen additions to courses.

Student Participation Grade: Most MSE courses have a participation grade included. While it seems that this can be difficult in a distance environment, participation can still be evaluated during synchronous and asynchronous communication. As an example, asynchronous communication, such as a discussion board input on subjects can be done in both on campus and distance classes through assigned participation. Many use a simple 3 tiered grading scheme with the highest grade per class/chat/discussion board item for those that added meaningful value to the discussion; the next grade for those that participated but perhaps in a minor way; and the lowest grade for those that attended a session, but did not add or participate.

Presentation Methods: Giving presentations is common in MSE program coursework. You need not be limited in the DE format because you do not have access to video teleconferencing. Current technology, such as simultaneous voice over IP with sharing of a PC desktop can make this work. However, the students now have the additional burden of having a stable connection (dial up has been problematic) and the need for speakers, microphone and/or a head-set. Alternately, students can submit PowerPoint presentations or host web pages. The presentation or URL can then be distributed to all of the students in the class. Students can then meet in a chat room where the presenter can step through each slide or the web page and discuss their presentation. Other students in the chat room can read and comment on the presentation as they watch the presenter's comments in the chat window and view the slides or web pages in another window. Instructors must check with MSE DE office about what technologies are currently available to assist this. Part of the DE instructors decision will lie in the students availability for synchronous communications.

Make Contacts Early: Make contact with students as soon as possible. Verify that their e-mail works and set up the appropriate e-mail groups early. Make sure that you contact the Courseware Specialists at CMU. Encourage your students to also try out the technology that you will be using during the semester and request feedback, sometimes have student access level username to be able to see what your student are seeing at the other end.

Chat and lectures Times: Since DE students may be located all over the world, it can be difficult to reach consensus about when to have chat times. After determining where your students are located, offer times and days that are reasonable. Avoid Fridays and Sunday. Fridays and Sundays are the Sabbath in many parts of the world and sometimes Mondays are often holidays. Offer reasonable options for your students to select from but, in general, don't negotiate. When you have students in widely separated time zones you may have to to offer chat sessions about 12 hours apart on various days. You may schedule as many chat sessions per week as you would like as these are at the discretion of the DE Instructor. (Making chat sessions mandatory or not is at the discretion of the DE instructor.)

Testing and Work Submission: You will receive a great deal of work products from the students. You need to consider

- The assessment and evaluation methods used in a course are integral to the design of the course itself. The DE instructor is responsible for ensuring that students get timely feedback regarding the assessments they complete.
- How you will want students to submit their assignments, when each one is due and how it should be submitted. Make it clear to students the penalty on late submission.
- How you will grade and comment the assignments. Comments, or feedback on assignments is critical to the success of the DE program. Some do it all on their PC, using the word tracking function, and others prefer to print assignments out. If you choose the latter make sure you have the ability to print the volumes required for the course.
- You must track the submissions of who turned what in, and what is graded. Some DE instructors use a simple spread sheet, while some rely on BlackBoard™'s grade book. If you use BlackBoard™'s grade book then simply using a text mark such as an "*" works to show that you received the assignment.
- You should establish naming conventions for the files you will receive. This makes it easier to search for lost assignments. For instance, you could have the students put their name and the assignment name in the files they submit.
- You should make sure you have off line storage to deal with the volume of work and recovery/back-up process.
- How to test the students if the DE course calls for test? These should be provided, but work with the developer so the tests stay fresh and current, and to prevent later classes from using previous tests. Also, should the test be proctored? It is also advisable to considere how the testing questions will be secure and only available on examination time period. . BlackBoard™ supports this. If the test will be accessed online, via BlackBoard™, you can makeup passwords to protect the test and only give it before the start of the test. Tests can also be set up so once started they must be finished, i.e. the students cannot come back to the test later.
- If your course uses groups/teams then determine early the composition of each team and team projects. If the course requires access to a project the developer should also have provided these.
- Virtual teams may have other problems that need to be specifically considered and addressed, when compared to on campus classes. For convenience sake, you may allow co-located people to be on same team, but this may cause a perceived unfair advantage to a collocated team. It is highly recommend that you use peer evaluations to determine that all on a team "pulled their own weight," or to find the "lone rangers" that disrupt groups/teams. Remember that the MSE program has found the optimum size for any group to be around 5-8.

Some captured classes discuss previously turned in assignments, case studies, etc. So DE students don't have an unfair advantage in seeing these you may have some lectures password protected. DE instructors must be very careful about the timing of releasing these. BlackBoard™ through its class announcement system supports setting up announcements with passwords at predetermined times

Instructor Environment: Web pages have been established to help you track the student in your course. For some courses, the student work submission can also be collected for you on the web site. Some spread sheets are available to help you with grade tracking for the course, but you are free to use any method you wish. Whatever method you choose it should be of a nature that if needed the course's instruction can be easily passed to an alternate instructor. Accordingly please make sure your assumptions on delivery and grading are documented, and given to the MSE department.

Copyrights issue: Request and be familiar with the CMU policy and guidelines on copyright and intellectual property usage, and the TEACH Act of 2002. This information is available through the CMU library at http://www.library.cmu.edu/OtherInfo/Copyright.html.

3.4.2 Other responsibilities

The DE instructor will maintain and ensure that all students are getting the right material for the class and are legitimate participants of the class. Create an environment that will fully engage and carry along students with instructions and other materials use to enhance the learning activities. "adult students and their instructors must face and overcome a number of challenges before learning takes place including: becoming and staying responsible for themselves; "owning" their strengths, desires, skills, and needs; maintaining and increasing self-esteem; relating to others; clarifying what is learned; redefining what legitimate knowledge is; and dealing with content. - Brundage, Keane, and Mackneson (1993) [BKM] suggested are the challenges in relation to DE. Other responsibilities include:

- Grade all material submitted by the students for correctness and provide feed back to the student as early as possible.
- Provide evaluation and answers to questions in a timely fashion
- Lead discussion in chat sessions to try and maximize the learning opportunity for students

- Evaluate student performance and provide grades of that performance

3.4.3 Teaching Practice in DE

Students and instructors are responsible for their individual parts in SE/ DE. Students are expected to have strong motivation, goals and objectives and technology savvy enough to enroll for classes in Software Engineering Department of Carnegie Mellon University. A study- Seven principles of teaching practices originally published in 1987 by Racine Wisconsin [CG] is a good checklist for instructors, these principles are listed below:

- Good practice encourages students-faculty contact
- Good practice encourages cooperation among students
- Good practice encourages active learning
- Good practice gives prompt feedback
- Good practice emphasizes time on task
- Good practice communicates high expectations
- Good practice respects diverse talent and ways of learning.

4. Student Roles

The SE-DE program has two categories of students as follows:

4.1 Corporate Sponsored Students

These are students who are corporate sponsored for their tuition and/or income while enrolled in the program. They come from industry were there is an interest in software engineering education for employees. The SE-DE courses and delivery that the students receive is negotiated and paid for directly by a corporate sponsor. Typically, the students are co-located on one or more corporate facilities and take courses as groups similar to our local MSE resident students. Corporate students are often encouraged by their corporate sponsors to complete courses successfully and in a timely fashion due to financial, professional, and promotional motivation. Corporate students can take either the MSIT-SE or MSE degree.

4.2 Independent Students

These are students who are not enrolled through corporate sponsorship. These students take SE-DE course alone and may be geographically distributed around the globe. Payment for the courses is the responsibility of the student (although their employer may reimburse them). Non-affiliated independent students can only take the MSIT-SE degree in its entirety at a distance.

Appendix
The Carnegie Mellon Professional Masters of Software Engineering Program Overview:

The MSE-DE (Masters of Software Engineering – Distance Education) program is a professional education program offered by Carnegie Mellon University since 1996. Students can participate in the MSE-DE program in one of four ways, students can take; Individual MSE-DE courses for or without credit (if taken not for credit there will be no official transcript generated by CMU); MSE-DE courses for credit towards a Certificate in Software Engineering (CSE); students can take MSE-DE courses toward an MSIT-SE Degree (Master of Sciences in Information Technology – Software Engineering emphasis); or Students can take SE-DE courses toward an MSE Degree (Master of Software Engineering). However, note that in order for students to complete a MSE DE program there must be a minimum of four to five students collocated who will work on the Studio portion of the curriculum simultaneously

Students in the MSE program typically come from industry and must have a minimum of 2 years industry experience. On average, though, MSE-DE students have approximately 5 years of experience in industry before coming to the program. MSIT-SE students are required to have a minimum of 6 months of industry experience. The program is designed to hone a student's level of professionalism and technical competence, preparing them for leadership roles in industry. The software Engineering Distance Education program consists of three major components, the Core, the Software Development Studio designed for MSE students or the Software Development Practicum for MSIT-SE students, and Electives.

As of 2006, the Core component is five courses that provide the backbone for the Software Engineering-Distance Education program and its completion signifies the requirements for the Certificate in Software Engineering (CSE). These courses are:

Methods: Deciding What to Design
Management of Software Development
Models
Software Architecture
Analysis of Software Artifacts

These courses explore the scientific and engineering foundations for software engineering that depend on the use of precise, abstract models for characterizing and reasoning about properties of software systems. Concepts such as composition mechanisms, abstraction relations, invariants, non-determinism, inductive definitions and denotational descriptions are recurrent themes throughout the core courses.

Methods of Software Development that require an understanding of successful methods for bridging the gap between a problem and a working software system are practiced equipping students with both a broad understanding of the space of current methods, and the specific skills necessary in using these methods.

Managing Software Development on a large scale requires the ability to manage resources both human and computational as they cycle through control of the development process. Topics include life cycle models, requirement elicitation, configuration control, environments, and quality assurance, all of which are used broadly in other core courses and studio.

The Analysis of software artifacts enhances the students' ability to build, maintain, and reuse software systems. All kinds of software artifacts, specifications, designs, code, etc; traditional analyses, such as verification testing, and promising new approaches such as model checking, abstract execution and new type systems will be addressed. Analysis of function used for finding errors in artifacts and to support maintenance and reverse engineering and for performance and security are examined and studied. The ability to describe, evaluate, and successfully design and create complex software systems at an architectural level of abstraction; and to design new systems in principled ways using well-founded architectural paradigms is taught.

The software development studio is a laboratory setting that provides an opportunity for the **MSE** students to undertake projects from industry. Teamwork, presentation skills, and general communication skills, are explicit elements used, equipping students to become more effective in a professional environment in the future. The software development practicum is a monitored setting where MSIT-SE students undertake projects from industry. The students may work alone but typically work in groups of two to three and are responsible for all managerial, design, and technical aspects of the project.

A variety of subjects that offer students the opportunity to explore topics of personal or professional interests are also available. The SE-DE (Software Engineering – Distance Education) program is committed to the highest quality of excellence in educational content using cutting edge technologies. Together, the Content Developers, Instructors, and Support Personnel work as a team to ensure its' continued success.

References:

1. [AG] Anderson, T., & Garrison, D.R. (1995). Transactional issues in distance education: The impact of design in audio teleconferencing. *American Journal of Distance Education, 9*(2), 27-45.

2. [BKM] Brundage, D., Keane, R., and Mackneson, R. (1993). Application of learning theory to the instruction of adults. In Thelma Barer-Stein and James A. Draper (Eds.) The craft of teaching adults (pp. 131-144). Toronto, Ontario: Culture Concepts. (ED 362 644). See at http://www.uidaho.edu/eo/dist8.html#improving

3. [CG] Seven Principles for Good Practice in Undergraduate Education, Arthur W. Chickering and Zelda Gamson, see at http://www.byu.edu/fc/pages/tchlrnpages/7princip.html