

## Freshman & Sophomore Engineering Programs Offered Solely by Distance Education

The University of Wisconsin Colleges is the freshman/sophomore institution of the University of Wisconsin System. Comprised of 13 geographically separate campuses; its mission is to offer the freshman/sophomore years of baccalaureate programs and professional studies with major emphasis on teaching excellence. The UW-Colleges offers engineering as part of its curriculum. Four of the thirteen campuses have resident engineering faculty, and ten of the thirteen campuses receive their engineering curriculum solely by distance education. This paper will address the freshman/sophomore engineering curriculum that is offered via distance education, -specifically the courses "Introduction to Freshman Engineering" and the "Engineering Economics", the methods of delivery, and an in-depth discussion of the pedagogy.

## Freshman & Sophomore Engineering Programs Offered Solely by Distance Education

### Introduction

The University of Wisconsin System (UW-System) is the public university system of the state of Wisconsin. The UW-System is composed of 13 four-year campuses, the 13 two-year campuses that as an institution are known as the UW Colleges and the statewide UW Extension. The UW Colleges are 13 geographically separate campuses whose mission is to offer the freshman/sophomore years of baccalaureate programs and professional studies with major emphasis on teaching excellence. The UW-Colleges offers engineering as part of its curriculum. Four of the thirteen campuses have resident engineering faculty, and ten receive their engineering curriculum solely by distance education (DE).

This paper is divided into four sections. The first section is a background of the UW-Colleges and the Engineering Department within the colleges. The second section is a discussion of the different Distance Education modes of delivery. The third and fourth sections include a detailed discussion of the "Introduction to Freshman Engineering" and the "Engineering Economics" courses. The discussions will include the methods of delivery, the purpose of the courses, the problems associated with offering the courses via distance education and the measures taken to combat these problems.

### Background

The University of Wisconsin Colleges has 18 academic departments, one of which is the Computer Science/Engineering/Physics (CSEP) department. The mission of the CSEP department is to provide the freshman/sophomore level courses for students interested in earning a baccalaureate degree in Computer Science, Engineering, or Physics. The CSEP department also provides service courses for other majors. There are four Engineering faculty in the CSEP department each located on different campuses. Three faculty are located on three largest UW-Colleges - UW-Fox Valley, UW-Marathon, and UW-Waukesha. The fourth faculty member is located on a smaller campus and has a split appointment between Computer Science and Engineering. Therefore, nine of the campuses do not have resident engineering faculty and ten receive their entire engineering courses via Distance Education. When referencing the Engineering students in this paper, the students are those at the 9 campuses without a resident engineering faculty member. The CSEP department has articulation agreements with the three campuses that offer a baccalaureate engineering degrees in the UW-System - UW-Madison, UW-Milwaukee, and UW-Platteville. The department is working on an additional articulation agreement with UW-Stout for their Manufacturing Engineering degree.

### Curriculum

The following curriculum is recommended for a student entering the colleges as an Engineering major:

- 3 semesters of Calculus
- 2 semesters of Chemistry
- 2 semesters of Calculus based Physics
- EGR 100 – Introduction to Engineering
- MEC 201 – Statics

MEC 202 – Dynamics  
EGR 282 – Engineering Economics  
CPS 217 – Java Programming  
Humanities and Social Sciences courses per transfer institution requirements.

Every student who enrolls as an engineering major is advised to immediately contact their transfer institution to ensure that the above recommended courses are applicable to their selected major.

### **Distance Education**

The mission of the University of Wisconsin Colleges to offer the freshman/sophomore years of baccalaureate programs and professional studies with major emphasis on teaching excellence. : In order to fulfill this mission for students on outlying smaller campuses the Colleges began offering some general courses through distance education in fall of 1996. Due to the low numbers of engineering students at most campuses, except for the three largest campuses, engineering courses are now offered via Distance Education (DE). There are three modes of DE courses in the UW-College; audiographics, compressed video and on-line. Audiographics uses an audio and computer link so that faculty and students can talk to each other and edit each other's documents in a real time classroom setting. Compressed video uses audio, computer links, and video connectivity so that faculty and students can not only converse and edit each other's documents but can also see each other in a real time classroom setting. On-line, or web-based, teaching is not in real-time. Students and faculty interact with each other as members of a class, over the Internet using web pages, discussion groups and e-mail. UW Colleges on-line courses never meet at a particular time or place although they are structured within an academic semester time frame.

### **Engineering Distance Education Courses**

Engineering Courses that are offered via Distance Education are:

EGR 100 – Introduction to Engineering offered via Compressed Video  
EGR 282 – Engineering Economics offered via On-line Programming & Audiographics  
MEC 201 – Statics offered via Audiographics  
MEC 202 – Dynamics offered via Audiographics

MEC 203 – Strength of Materials has been offered, but due to low enrollment has recently been taken off the courses being offered to our students. Courses that are being contemplated for offering via DE are GRA 113 – Engineering Graphics and EGR 106 – Technical Communication.

### **EGR 100 – Introduction to Engineering**

The purpose of EGR 100 is to introduce students to Engineering as a career and to help them prepare to become a successful engineering student. Topics covered in EGR 100 include Study Skills, Test Taking, Time Management, Engineering Majors, UW Engineering Campuses, Ethics, and Transferring Guidelines.

### *Method of Delivery*

One of the factors faced by Engineering students is that they do not have direct contact with a faculty member regarding their specific major. One of the purposes of EGR 100 is to give those Engineering students a link to a faculty member that can help them through the transition of high school to college and from the UW-Colleges to a four-year baccalaureate campus. For this reason it was decided to offer the EGR 100 course via Compressed Video. Compressed video enables the student to physically see and talk to the professor as if they were in the same classroom. , EGR 100 tends to be more of a forum/discussion class compared to a rigorous problem solving course and compressed video lends itself to discussion much better than audio graphics or on-line. Another problem faced by Engineering students at the UW-Colleges is the sense of the lack of an engineering community. EGR 100 will build the sense of engineering community even if the students are geographically dispersed throughout the state. Since the course is offered simultaneously at five sites- the host site and four remote sites, the students have the opportunity to interact with their counterparts and develop a rapport.

### *Problems and Resolutions*

There are several inherent problems that are faced by both the faculty member and the student when enrolled in a Compressed Video course. The following discussion will address the major problems the faculty member and the students face in the EGR 100 course and the methods of resolution.

#### *1<sup>st</sup> Day Jitters*

The most difficult of all days in a Compressed Video (CV) course is the first day. Most students, with the exception of those who have had CV course previously, are very skeptical and nervous about the course. Because this is a freshman level course targeted at new freshman most of the students do not know what CV is when they sign up for the course. In order for a student to communicate with the instructor or other members in the class they are required to hold down a microphone button and talk into a microphone. This microphone then activates the camera in their room so that the entire class including the instructor will see the person talking.

In order to alleviate any confusion and anxiety on part of the students the CV system is thoroughly explained to the students. Then the students are asked to interview the person sitting next to them and introduce that person to the class. This method is used because the student is now concentrating on remembering information about another person and not on using the equipment or speaking into a microphone or being on TV. Every person in all five classes is introduced to the entire class by using this method.

#### *The Talking Head*

One problem with using CV in the EGR 100 course is that instead of the student being an active participant in the class and the faculty member being able to read the body language and the mood of the room, the students become passive learners. The students are sitting in a chair watching an instructor talking over the TV (the talking head). To achieve active learning several methods are used to encourage free discussion and thought; but as one would expect of freshman students sometimes the discussions are hard to begin. A two-tiered approach is used to encourage dialogue among the EGR 100 students. The first method is to treat each site as a whole. A question will be presented or

a topic of discussion posed and the faculty member will call on a site to answer the question. This encourages the sense of unity among the students at the site and does not put any one person on the spot. The faculty member will choose one person on the site as the representative of the site for the day. This person will convey to the rest of the class the ideas/concerns of his/her classmates. This method is used to ensure that the class will flow and keep moving along. If the group method does not work the faculty member will begin calling on each student individually to answer questions or participate in discussions. When using this method it is important to rotate the questions between sites. This ensures that the students at each site stay involved in the class. If a rotation schedule is not implemented then one site will dominate the discussion and the TV screen and the other students will become passive learners and participants.

### *Building Community*

To build a sense of community and unity among the students in the class a group project is required in the course. The students are divided into groups of 3 or 4 at each site. Each group is then instructed to create a mousetrap car. The students are required to use the web site for the course to hold discussions regarding the car, build the car, race the car and then give a presentation about their car to the class which includes problems the car may have had. The final portion of the project is to address the problems with their cars, fix the problems and then participate in a second race with the modifications being made. This project gives the students the ability to feel like they are working on a project together and yet participating in a competitive project.

For the past two semesters, each group has given a five-minute presentation about their car, the design, the participants, the results and the problems with their car. A new approach will be used this year to promote more discussion among the students. The students tend not to pay attention to their colleagues unless they are required to ask or answer specific questions regarding the presentation. Therefore, this year each group will be paired with another team from a different campus and they will have to write a brief paper regarding the opposing teams project. They will discuss their projects via e-mail and discussion forums.

EGR 101 has been offered via CV at the UW-Colleges for three years and will be offered both semesters in the 2002-2003 academic years. Two sections of the course are offered each year and the course is continually evolving to engage students and prepare them for transferring to a baccalaureate degree university.

### **EGR 282 – Engineering Economics**

EGR 282 is the standard Engineering Economics course offered by all baccalaureate degree granting engineering schools. The UW-Colleges have transfer agreements with all UW schools offering an engineering degree.

### *Method of Delivery*

EGR 282 has been offered two different semesters at the UW-Colleges through on-line programming. The course is offered on Black Board, a web-authoring environment. UW-Learning Innovations and the instructor maintain the course. In on-line programming the student and faculty

member stay in communication via e-mail, fax, discussion rooms, or live chat. The course is totally asynchronous meaning the class does not have designated meeting times, but adheres to a semester long schedule. The faculty member and the student never meet face to face. This course was first offered via on-line due to a new program offering at UW-Fox Valley by UW-Platteville for Mechanical Engineering. Since the target audience is full-time employed working adults, the on-line format was viewed as the best alternative to reach these students with their work schedules.

### *Problems and Resolutions*

On-line courses have a different set of problems compared to compressed video. . The following will discuss the major problems the faculty member and the students face in the EGR 282 course and the methods of resolution.

#### *Time*

Many people, including students and faculty, feel the asynchronous nature of an on-line course is its greatest advantage in terms of delivery. But, the asynchronous nature is also one of its biggest downfalls. Students in an on-line course must realize that an on-line course takes more time than a face-to-face lecture class. Daily activities such as connecting to the Internet, gaining access to the site, and reading the course announcements are very time consuming. The first time the course was taught, neither the instructor nor the students realized how many hours a week the student should plan on spending on the course. Now, the students are informed on the very first day that they should plan on spending 15-18 hours a week on the course. This time is derived from 3 hours per week to “attend lecture”, 3 hours of out of class study per week for each credit (9), and 3 to 5 hours per week checking the site, reading discussions, and submitting homework.

#### *Connectivity & Participation*

As part of the training for on-line instruction it was stressed that the students should participate in discussions and problem solving as a group to ensure that they feel connected to the class and the university. During the initial offering students were required to participate in discussions at least three times per week and received a grade for their participation. After about the fourth week of the semester, participation in the course dropped off. When the students responded to a query regarding participation the response was that it was too time consuming and they needed to spend more time on the course. When questioned whether they found the discussions helpful there was an overwhelming “No” from the students. They viewed it more as part of their homework than as helpful for their homework. When questioned about connecting with the other students, the EGR 282 students did not feel a need to form these connections. The instructor believes the students did not need to connect with other students because the students were generally juggling school, work, and a family. They did not need one more commitment in their life.

#### *Traditional vs. Non-traditional students*

EGR 282 is offered both to traditional and non-traditional students. Traditional students are students between the ages of 18 and 20 who have moved directly from high school into college, and are full-time college students. Non-traditional students are typically over 21 years of age, work full or part-time, and may or may not have a family. During both

offerings the non-traditional students fared better than the traditional students. The first course, all traditional students dropped the course prior to the end of the semester. During the second course, one traditional student stayed in the course and passed. All other students were classified as non-traditional students or were students enrolled in different institutions taking this course to fulfill degree requirements at their institutions.

The instructor believes that non-traditional students fair better in this course because they are more disciplined than their traditional counterparts. They are willing and able to take the demands and lack of structure compared to the traditional student.

#### *Concepts to Practice*

The major problem the students face in EGR 282 is making the leap from understanding the concepts to applying them to engineering economics problems. Some students could not make the transition from reading the book, reading the lecture notes, and reading the discussions and announcements to performing the problems. To resolve this problem the virtual chat room in Blackboard was utilized during the second offering of the course. The virtual chat room allowed the student(s) and the faculty member to discuss and complete problems and draw on the same white board simultaneously. This method is wonderful because the student can converse with the faculty member as if they were in the same building -just in different rooms. Today's students are used to using instant messaging and found this tool very useful. In fact one student stated, "The Whiteboard program that is associated with Blackboard is by far an outstanding tool to help in my understanding of the class. By using the Whiteboard tool, I can actually see how the problems work and see what mistakes I may be doing wrong, something that is very complicated by just looking in a textbook, or sending an email to someone. By using the Whiteboard, I can converse with my Professor in real-time sense and directly ask questions and watch problems being performed. It makes me feel almost as if I'm in a classroom."<sup>1</sup>

#### *The Future*

Due to the nature of the course and the difficulty that the traditional students have with the course EGR 282 will be offered via Audiographics in the Spring of 2003. The move to audio graphics was prompted by the instructor to better serve the traditional engineering students attending the UW-Colleges. It will meet three times a week at regularly scheduled meeting times. The ability to converse with the students, to work on problems in real-time and to address questions instantaneously are seen as important features for the traditional student.

#### **Conclusion**

In conclusion Distance Education provides a means of offering engineering courses to students on all 13 campuses of the UW-Colleges. It is an invaluable tool because it allows students who attend smaller campuses with no resident engineering faculty member to have access to courses that they would not normally receive. Distance Education also allows the student to interact with other engineering students and to make connections with engineering faculty members. The Distance Education formats vary depending upon the course and the type of material covered. If there is a need for visible contact and interaction, use compressed video; if there is a need to edit documents and interact with students in real-time on various problems and projects, use Audiographics; if the

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<sup>1</sup> Matt Bushman, EGR 282 UW-Colleges, Spring 2002.

flexibility of timing in the course for the student is a factor then use on-line programming. Each method of delivery has different problems and solutions for both the student and the instructor; however, there are various methods that can be used to ensure that the student stays engaged in the course, feels as if they were in a regular classroom setting, and obtains the most information from the course. The Distance Education arena is constantly changing and as new methods of delivery are introduced the UW-Colleges and the Engineering faculty at the UW-Colleges will incorporate them into their courses.



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