

Development of an Electrical Engineering Technology Distance Education Curriculum

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Abstract:

Thirty-seven of North Carolina's fifty-nine technical and community colleges offer the Associate in Applied Science Degree (AAS) program in Electronics Engineering Technology (EET). Until Fall 2000, prospective students in the state of North Carolina interested in pursuing education beyond the two-year degree in the electrical or computer engineering technology fields found their options very limited. The University of North Carolina at Charlotte (UNC Charlotte) is one of only two universities in the state that provide a Bachelor of Science in Engineering Technology (BSET) program that permits transfer from the community colleges in a 2+2 format. In addition, just five of the thirty-seven community/technical colleges offering the AAS program are within reasonable commuting distance of the University.

The purpose of the conversion from face-to-face or 2-Way Interactive Television instruction to Web-based instruction was to provide a means for graduates of AAS programs throughout the entire state of North Carolina to pursue a BSET degree. Graduates of AAS programs were surveyed to determine how many of them would pursue a baccalaureate degree if the opportunity were available. The survey results showed that many students were interested in completing the final two years and obtaining the degree; however, significant numbers of them were unable to attend one of the two universities where the program was available because of distance, job, family obligations, etc. To meet this demonstrated need, the Engineering Technology Department in UNC Charlotte's William States Lee College of Engineering developed and implemented a plan to offer the instructional courses that comprise the junior and senior years of the BSET, via the web to students where-ever they happen to be located.

The University's Distance Education Office employs a staff of instructional technology consultants who trained EET faculty in online course design, trained EET faculty in the use of WebCT (UNC Charlotte's Course Management Software/Delivery Platform), and provided technical assistance to faculty and students participating in the program. The EET faculty designed, developed and implemented the online courses for the junior and senior EET students. This paper will discuss the process and success of UNC Charlotte's Online EET program.

Background:

Thirty-seven of North Carolina's fifty-nine technical and community colleges currently offer the Associate in Applied Science Degree (AAS) program in Electronics Engineering Technology (EET) and five additional community colleges will begin offering the Associate in Applied Science Degree (AAS) program in Electronics Engineering Technology (EET) in the near future. The approximate location of these community colleges is shown in Figure 1.

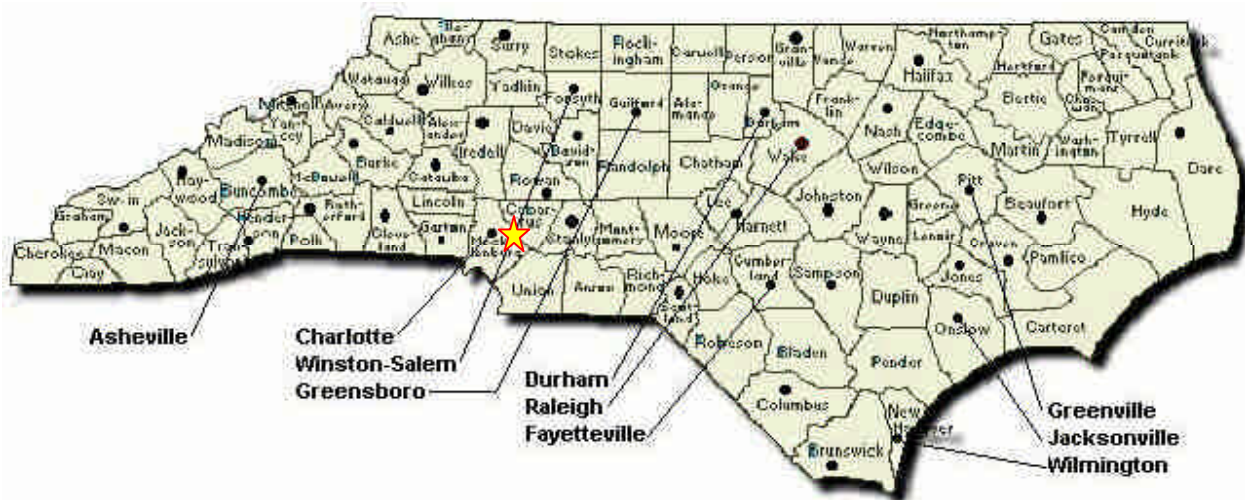


Figure 1: Approximate Location of Community Colleges in NC

Until Fall 2000, prospective students in the state of North Carolina interested in pursuing education beyond the two-year degree in the electrical or computer engineering technology fields found their options very limited. The University of North Carolina at Charlotte (UNC Charlotte – shown by the star in the map of Figure 1) is one of only two universities in the state that provide a Bachelor of Science in Engineering Technology (BSET) program that permits transfer from the community colleges in a 2+2 format. In addition, just five of the thirty-seven community/technical colleges offering the AAS program are within reasonable commuting distance of the University.

For more than 15 years UNC Charlotte has offered a distance education (DE) program in electrical engineering technology to graduates of AAS programs. In the beginning courses were offered through Wake Technical Community College (WTCC) in Raleigh North Carolina. Instruction was delivered in one of three ways:

1. Professors would travel to WTCC two nights a week or on Saturdays to deliver instruction to students in the DE program,
2. Professors would deliver instruction from UNC Charlotte through 2-Way Interactive Television, or
3. Professors would videotape lectures and mail the tapes to students at WTCC.

All of these methods were less than ideal because UNC Charlotte could still not reach many of the graduates of AAS programs. Faculty were willing, although reluctantly, to travel twice a

week to Raleigh (a three hour drive from Charlotte), but only one or two courses per semester were available to students using this method. For many graduates of an AAS engineering technology program the original problem remained: it was too far to travel to Charlotte or Raleigh to participate in classes.

Videotaped instruction provided a better option for faculty and DE students, but presented new problems for traditional students who were participating in the class as it was videotaped. Many traditional students were unwilling to enroll in a class that was being videotaped for distribution to DE students because they felt restrained in the classroom. Many traditional students were uncomfortable asking questions or participating in classroom discussion when being taped. The reluctance of traditional students to enroll in these classes caused low enrollment and canceling of classes.

2-Way Interactive Television was a very good option for many students. The main difficulty with this method was the amount of time the University could reserve and the time slots available to reserve on the North Carolina Information Highway that provided the high-speed site-to-site connection necessary to deliver instruction in this way. There were also a limited number of sites where students could participate in this kind of distance education. So, once again, using this method we were unable to reach all the students we wanted to reach.

Conversion to Web-Based Instruction:

In 1995, the UNC Charlotte Provost decided to implement a Pilot Project in Distance Education. The Electrical Engineering Technology program was selected by the Deans Council as one of those to be offered. The Pilot Program used 2-Way Interactive Television and was started in the fall of 1997 with about 71 students. Due to the technology limitations of the NC Information Highway and other delivery methods, the ET Department proposed and received permission to change to Web-Based delivery for the second group to be admitted.

The rationale used to convert from face-to-face or 2-Way Interactive Television instruction to Web-based instruction was to provide a means for graduates of AAS programs throughout the entire state of North Carolina to pursue a BSET degree. Graduates of AAS programs were surveyed to determine how many of them would pursue a baccalaureate degree if the opportunity were available. The survey results showed that many students were interested in completing the final two years and obtaining the degree; however, significant numbers of them were unable to attend one of the two universities where the program was available because of distance, job, family obligations, etc. To meet this demonstrated need, the Engineering Technology Department in UNC Charlotte's William States Lee College of Engineering developed and implemented a plan to offer the instructional courses that comprise the junior and senior years of the BSET degree, via the web to students where-ever they happen to be located.

The Engineering Technology Department was charged to deliver the upper division BSET program over a 4-year period with a new group being admitted to the DE program each year. The Engineering Technology faculty insisted that the DE courses be in all respects equivalent to the traditional on-campus program. The required science and foreign language classes required by the University could be taken at another 4-year college/university via Transient Study Permits, if

the required course was not available via the Internet through UNC Charlotte. Many of the community colleges offer foreign language and science course that are part of an articulation agreement with the university system of North Carolina. Where possible, students may also enroll in these courses at the community colleges and receive the science and foreign language credits necessary to meet the requirements of the University.

Administrative Details:

The pilot project was a huge undertaking for the University. Because of this, an administrative organization, under the Continuing Education Department (the Distance Education Department), was formed to help with or conduct activities such as recruiting, administration, records keeping, registration, etc. The Distance Education Department funds travel, for both faculty and distance education personnel, to the community colleges across the state and throughout the southeast. Students are informed about the unique opportunities they have to continue their education via the Internet after completion of the AAS degree at the community colleges. Prospective students are provided with detailed information about tuition and books, where to order books, how to enroll in classes, how to access course materials, etc.

After acceptance into the program and enrollment in the first course, students are required to travel to UNC Charlotte, meet with the professors and distance education personnel, and participate in a one-day orientation program. During the one-day orientation, students are given an introduction to WebCT and the courses in which they have enrolled. Students visit the bookstore to purchase textbooks and supplies, take care of any advising and transfer problems by meeting with their advisors and department officials, and receive an introduction to WebCT and Centra and other programs necessary to be successful in their studies.

Training:

The original course management system chosen by the University was TopClass. Faculty were paid a stipend to attend a one-week introductory workshop provided during the summer to learn how to use and implement a web-based course using TopClass. At that time no other training was provided. The University changed the course management system to WebCT after about 18 months of using TopClass.



Figure 2: Faculty Member using 2-Way Interactive Television

The University's Distance Education Office now employs a staff of instructional technology consultants who train Engineering Technology faculty in online course design and in the use of WebCT. An initial two-week workshop is offered in a hybrid, traditional and online, format and allows the faculty a chance to participate in a web-based course as the student and a course designer. It is helpful for faculty to experience the course from a student's perspective so that they develop a course being fully aware of the problems that students may encounter.

The highly competent and friendly staff provides unlimited technical assistance to faculty and students participating in the program. To faculty they offer technical workshops in:

- Online Course Design
- Fixing broken links and missing images,
- Setting up the browser and downloading and installing plug-ins
- Adding, maintaining, revising and updating content to an existing course
- Converting PowerPoint slides to web pages
- Quizzing
- Advanced topics in WebCT as interest is expressed

For students, the DE staff offers training and help in everything from submitting assignments in WebCT and how to handle common problems to providing a Student Study Guide for Online Learning. The DE staff takes care of all technical problems that may arise as well as registration, record keeping, finding suitable proctors for testing, and mailing and receiving tests. Faculty need only concentrate on teaching their course as they would almost any other course.

Course Development:

The Electrical Engineering Technology (EET) faculty designed, developed and implemented the online courses for the junior and senior EET students. Faculty were offered the release from one class to develop a web-based course. A tremendous amount of individual learning, trial and error, and revision was required of each faculty member developing a class. Sometimes months of effort were actually required to develop an acceptable product.

Faculty were given a considerable amount of freedom in developing their courses so that there is a considerable variation in delivery, format, and style. For example, some of the courses contain a syllabus with reading assignments, a section on WebCT for homework (quizzes), an area for discussion, and a place to keep track of grades. For some courses, all course materials, tests, etc. are mailed to the students or proctors and then mailed back to the faculty for grading.

Additional features that have been implemented in some courses include the creation of a dedicated personal space for each student within WebCT and the posting of homework and test solutions. The individual personal space allows each student to upload and maintain assignment submissions and alleviates the potential problems associated with U.S. mail, faxes and email attachments. WebCT allows the designer to define release criteria, so homework and test solutions may be automatically made available after the submission deadline. This facilitates a form of immediate feedback that allows students to determine areas of potential concern.

Other courses also include online reading materials and animated lectures as well as the other, more standard features of a web-based class. For those using animated lectures, some faculty prefer to use PowerPoint presentations with the professor's recorded voice playing for each slide. PowerPoint slide shows are distributed by snail mail on CD. Other faculty use Flash with the professor's recorded voice playing for each slide. Flash files may be distributed through the Internet or on CD if the students request it (for very slow Internet access). Still other faculty use Centra or NetMeeting to give an online lecture via the Internet at a scheduled class time. Particular benefits of using these synchronous modes of delivery, in addition to the WebCT course structure, have been found to include a more conventional (and comfortable) interaction between the instructor and students, the ability to share applications (e.g., sketches on the whiteboard and PSpice simulations), and the capacity to record the session for playback at a later time for any student who was unable to attend the live session or wishes further review.

Lab Classes:

Faculty debated the best way to offer laboratory classes. The compromise reached was that all laboratory classes were to be offered to DE students during the summer session on the UNC Charlotte campus. Students travel to UNC Charlotte to perform laboratory activities four times during the summer. Lab classes are scheduled to meet every other Saturday from 8:00 am to 5:00 pm with an hour for lunch. Students are expected to conduct two or three experiments each Saturday, write their lab reports during the two weeks between class meetings, and then submit those reports at the next meeting. If any preliminary work needs to be completed prior to the scheduled lab activity, students either receive that information before they leave, or they obtain the required information from the course website.

Other formats for the delivery of lab classes are under consideration. One method under consideration for an engineering company in Georgia is to have the faculty member travel to Georgia to oversee and conduct lab activities on-site. Another option under consideration is to offer the labs at community colleges throughout the southeast after a partnership agreement has been established. In this method, faculty at the community college would be hired as adjunct professors of the University and would teach the labs using the same format used in a typical

semester for traditional students. Details of these two methods still need to be refined and formalized.

Success of the Program:

The Pilot Project for Distance Education in Electrical Engineering Technology started in the fall of 1997. A total of 71 students initially enrolled, with 46 students remaining after the first few weeks. By the end of the four-year project (Fall 2001), 37 students were completing degree requirements. Most of those students were graduated at the end of the second 2001 summer session. At least 35 of the 37 should graduate. Thirty-five of 46 serious students successfully completing the program yielding a graduation rate of more than 75%. As the national average for completion of distance education is around 20%, this success indicates the level of commitment and effort provided by the students, the teachers, and the support system provided by the University.

Initial enrollment for the program starting in the fall of 2000 was 49 students. New student enrollment in fall 2001 was 22. Approximately 43 students are continuing in the program with 24 enrolled in summer 2002 laboratories and general education classes. In the fall of 2002, 84 new students enrolled in the DE program. Retention, so far, exceeds 50%.

The ET Department has now entered into new articulation agreements with Augusta Technical College in Georgia and Greenville Technical College in South Carolina to transfer graduates from associate in applied sciences programs to UNC Charlotte's Bachelor of Science in Engineering Technology (BSET) programs.