ENCOURAGING PROFESSIONALS TO TEACH UNIVERSITY LEVEL CLASSES

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Abstract - Active participation of professionals in teaching college classes can provide college students an insight to what a profession in the class topic might involve. The process of identifying the problem, knowing the process for determining the solution, and having the tools to provide that solution is something that professionals in the field do every day. This paper concerns the approach that was taken by the University of Tennessee at Chattanooga and several civil engineering professionals to provide a teaching environment to university students in the transportation engineering field by those who provide engineering design solutions on a daily basis.

This paper presents the process of recruiting professionals, selecting the topics to be taught by those most familiar with the topics, setting the schedule for the class, coordinating the numerous administrative activities that had to take place for the execution of quizzes and exams using five professional engineers as professors.

Keywords: adjunct instruction, coordinated instruction, team teaching

INTRODUCTION

Growing and supporting an academic program is always a challenge for universities across the United States. With limited funding and a small student demand, academic administrators to look for creative ways to build a program by providing a strong academic curriculum. The University of Tennessee at Chattanooga (UTC) School of Engineering in late summer of 2004 desired to have an introductory transportation class (ENCE 362 Transportation I) taught to continue their efforts in providing a transportation specialty for their civil engineering graduates. In the past the Civil Engineering Program was able to find an engineer in industry to teach its transportation classes, but the time required for preparation and teaching the class left no individuals who wanted to commit the time and effort necessary for such a small compensation.

The second author discussed the need for an adjunct professor with many individuals in the Chattanooga community, but none were able to set aside the time to teach the class. The first author suggested that a team approach to the problem be used. Due to his business commitments, he would be out of town many of the days when class was to be taught. He would not be able to teach the class, but he did agree to recruit several transportation professionals and would become the program coordinator (PC).

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PROGRAM APPROACH

The UTC School of Engineering requires that adjunct professors have a Master's Degree in their field to teach undergraduate classes. This narrowed the field of potential instructors available for class instruction. Several contacts were made. The primary discussions surrounded the amount of time that would be needed to teach the class. Each individual expressed that the time commitment was too great for him or her individually but they offered to help on a part time basis. They were told that a team teaching approach was going to be used. Because the teaching responsibilities would be spread amongst several instructors, the time commitment was workable. They were very motivated to teach because they enjoy their profession and wanted to show students that the profession was challenging and rewarding. Five transportation engineering professionals with master's degrees in civil engineering agreed to teach up to six classes each during the fall semester of 2004. Of those five instructors, four were registered professional engineers and one was an engineer in training. The number of years of experience in the group amounted to over 80 years.

Time was very limited for preparation of the class topics, syllabus, selection of a textbook, and class schedule which were all critical for a successful class. Three weeks before the class was to begin, the five instructors, the PC and the second author met to lay the groundwork for class instruction. For the next two hours the instructors discussed all that was necessary to conduct the introductory transportation class. Once again, due to the limited time for preparing the class, it was decided the textbook that was available at UTC would be used. The text was *Transportation Engineering Planning and Design*, 4th ed., Wright and Ashford, 1998.

The semester would last from August 24 through December 2, 2004. There would be a total of 29 seventy-five minute classes. It was decided to have five examinations and a course final that would cover all the material covered during the semester. Several instructors brought the syllabus they had received when they took a similar course. Others reviewed class descriptions from other civil engineering programs across the nation. Much discussion took place on which topics would be covered and in what depth. The instructors expressed their desire on what topics they preferred to present. It was decided to give closed book closed note tests and to provide the students with all appropriate tables and figures. The syllabus went through several revisions over the next week which included references, how many tests would be given, how the tests would be given and how much weight would be given to homework and quizzes. The instructors' names, office telephone numbers and email addresses were listed to allow communication for the students. The final syllabus is listed below.

ENCE 362

TRANSPORTATION ENGINEERING I

FALL 2004

Textbook: Transportation Engineering *Planning and Design*, 4th ed., Wright and Ashford, 1998

References: Manual on Uniform Traffic Control Devices, 2003

Highway Capacity Manual, 2000 Edition

Roadside Design Guide

Manual of Transportation Engineering Studies (MTES)

Roundabouts: An Informational Guide (RAIG)

A Policy on Geometric Design of Highways and Streets, AASHTO

Class notebooks will be required for this course. Keep all class notes, homework problems, exams, and quizzes in this notebook. It will be turned in on the day of the final exam. (This will be returned to you at a later date.)

All exams will be closed book and closed notes. Any necessary equations or charts will be provided to you on the exam. DON'T MISS EXAMS! Any make-up exams, if deemed necessary, will be significantly harder!

Quizzes may be given at the beginning of each class and will cover the reading assignment for that day's lecture material. The lowest quiz grade will be dropped.

Final Exam will be closed book and closed notes. It will also be multiple choice questions. All other exams will have random questioning from essay to problem solving to fill-in-the-blank.

All homework assignments must be turned in before lectures begin. All late homework will have automatic deduction in grade.

Grading: Final Exam - 30%

Exam 1 - 5 - 50%

Homework - 10%

Quizzes - 5%

Class Notebook - 5%

Instructors:

Stephen Meyer Program Coordinator	Volkert & Associates, Inc.	O: 423-842-3335	smeyer@volkert.com
Bill Allen	Transportation Planning at North GA Regional Development Council	O: 706-272-2300	tpc@ngrdc.org
Fritz Brogdon	Volkert & Associates, Inc.	O: 423-842-3335	fbrogdon@volkert.com
Karen Headlee	Volkert & Associates, Inc.	O: 423-842-3335	kheadlee@volkert.com
David McFarlin	Volkert & Associates, Inc.	O: 706-278-9288	dmcfarlin@volkert.com
John Van Winkle	Chattanooga Traffic Engr.	O: 423-757-5005	vanwinkle@mail.chattanooga.gov

Class	Date	Major Topics	Professor	Reading Assignment
1	Aug. 24	Introduction & Class Overview Functional Classification	Bill Allen	Chap. 1-3

Class	Date	Major Topics	Professor	Reading Assignment
2	Aug. 26	Functional Design - Roadway	David McFarlin	Chap. 4 & 6
3	Aug. 31	Functional Design - Intersections	John Van Winkle	Chap. 13, Pg. 411-420 Handout
				RAIG Chap. 1 & 2
4	Sept. 2	Horizontal Alignment	Fritz Brogdon	Chap. 12
5	Sept. 7	Vertical Alignment	Fritz Brogdon	Chap. 12
6	Sept. 9	Exam #1		
7	Sept. 14	Pavement Design	Bill Allen	Chap. 14, pg. 457-473
8	Sept. 16	Drainage	Fritz Brogdon	Chap. 14, pg. 427-447
9	Sept. 21	Drainage	Fritz Brogdon	Chap. 14
10	Sept. 23	Drainage	Fritz Brogdon	Chap. 14
11	Sept. 28	Exam #2		
12	Sept. 30	Earthwork	Fritz Brogdon	Chap. 14, pg. 447-456
13	Oct. 5	Roadside Design	Karen Headlee	Chap. 13, pg. 392-397
14	Oct. 7	Traffic Control Devices	Karen Headlee	Chap. 5, pg. 113-125
15	Oct. 12	Capacity Analysis- Roadway	David McFarlin	Chap. 8
16	Oct. 14	Capacity Analysis- Intersections	John Van Winkle	Handout, HCM 2000
				Chap. 10, p.10-9 to 10-35
17	Oct. 19	Exam #3		
18	Oct. 21	**Fall Break - No Class**		
19	Oct. 26	Traffic Studies	John Van Winkle	Chap. 8, Handout
				MTES Chap.2,3,11
20	Oct. 28	Traffic Studies	John Van Winkle	Chap. 11, Handout
				MTES Chap. 9
21	Nov. 2	Bicycles/Pedestrians/ADA	Bill Allen	Handout
22	Nov. 4	Bicycles/Pedestrians/ADA	Bill Allen	Handout

Class	Date	Major Topics	Professor	Reading Assignment
23	Nov. 9	Exam #4		
24	Nov. 11	Parking Design	Karen Headlee	Chap. 15, pg. 482-487
25	Nov. 16	Railroad Design	David McFarlin	Chap. 4, pg. 98-109
25	Nov. 16	Railroad Design	David McFarlin	5, pg. 132-133 Chap. 12, pg. 363-364 367, 379-384, 360-362, 356-357,351-353 Chap. 13, 397-411, 420-425 Chap. 15, 487-497
26	Nov. 18	Airport Design	David McFarlin	Chap. 4, pg. 84-93 Chap. 5, pg. 134-147 Chap. 6, 178-181 Chapters 16, 17 and 18
27	Nov. 23	Exam #5		
28	Nov. 25	**Thanksgiving - No Class**		
29	Nov. 30	Program Modeling/ Software Intro		
30	Dec. 2	Review Class for Final	ALL	

PROGRAM IMPLEMENTATION

Early in the process there was the realization that coordination between the instructors was going to be critical to have a successful teaching environment. There was also a large amount of reading required by the class and there was no time to get all the publications into the campus library. The PC requested that all instructors either send to him their respective readings in a PDF format or send the documents to him for scanning and creating a PDF document. Each of the documents was copied to a CD and given to the second author who then created 18 CDs, one for each student in the class. This way each student would have the reading materials for each class available on any computer.

The decision to have quizzes before a class period was suggested to encourage students to read the class assignment before the class period. A problem arose in returning the quizzes due to the number of changes of instructors during the course. A system was devised to have the grading instructor transport the tests back to a campus mailbox. The next instructor had to be reminded that the previously graded papers were available for distribution.

This created a problem not only for quizzes but for questions in general. When there is not a consistent instructor available on campus, how do you answer students' questions? If the questions were straightforward, the instructor in the classroom answered the question. If the instructor could not answer the question, the student had to contact the instructor who precipitated the question in the first place. In most instances the students used email to get their questions answered.

One thing that was observed during the teaching process was that with the numerous references, homework problems presented the need and the practice for students to understand where to go and how to use the references as it is practiced by engineers on the job. This is a process the professionals use daily during their work day and were able to convey during the class period.

Developing and grading of exams created another challenge. The PC would send an email at least a week in advance of an exam to the instructors who taught the respective classes since the last exam. The length of the exam was seventy five minutes, so the length of time they were allowed for exam questions was determined by dividing the number of classes they taught into seventy five. The PC would then receive questions from each instructor and have them copied to the exam. Also the answer key was to be sent to the PC which would be given to the students after the exam. Because each instructor had to grade his or her questions, those questions of that instructor had to be placed on separate sheets on the exam. After the exam each instructor received the appropriate pages to grade. The exams were then put back together, points added up and total numerical grades were written on the front of the exam. The PC then returned the exams to the campus mailbox for distribution. This turned out to be a very time consuming process and since the class only met on Tuesdays and Thursdays, it could be a week before the test was returned.

PROGRAM RECOMMENDATIONS

At the time of this publication the class is still being taught, so the final assessment of its success or failure will be made in the near future. However a few lessons can be passed on now.

1. Select your instructors as early as possible for the class.
2. Start selecting the textbook and readings at least 3-4 months before class is to begin to allow for textbook and publication ordering and delays.
3. See what you can do to compensate the professionals for the time and effort required. This will increase the potential number of recruits you will find who will commit to the endeavor. Universities might consider special foundation grant monies. Another possibility would be to have local engineering firms donate gifts to a fund for the project. They will definitely benefit by hiring more qualified engineering students from the program. Another option is to have individual engineering professionals also donate to the fund for special instructional programs.
4. When recruiting, make sure the PC is aware of all of the latest teaching tools available at your institution and how they could be used. Provide instruction as needed.
5. Make sure the PC sets aside plenty of time for coordinating multiple professionals.
6. The PC needs to establish and maintain communications between professionals for smooth operations.
7. If there are special laws, rules or guidelines instructors should be informed on what those are. In this case there were requirements from ABET for which the instructors had to conform.
8. When preparing for the class instruction, make sure any prerequisites necessary for students to successfully take the course are identified and listed as prerequisites for the class.

9. Do not allow professors to overload students with reading materials outside of their textbook. Supplementing the textbook is necessary for some topics, but making students responsible for materials that aren't readily available to them is not always fair. Providing one copy of that book in the library is not sufficient if you have more than just a few students in a class. Have professors introduce the supplemental handbook and build on the topics out of their original text.

10. Tell your instructors that the instructions for homework should be very specific. When a 1000-page manual is made available and a question is asked about how important is this material – do not answer "everything!". The students really want to know which pages should be read and studied in detail.

11. Professors should be aware of the time and effort that is involved in giving students feedback. Whether grading homework or exams, professors should be responsible for providing the students a quick turn-around for grades and be as available as possible to answer questions.

12. Give each instructor and each student an email address list of all students. Then when a student asks a question by email all other students should be copied. The instructor should then click on "Reply to All" when answering the question.

CONCLUSIONS

The primary purpose of the program presented above was to recruit professionals to teach college engineering classes and provide a quality classroom experience for the students. Recruiting the professionals to teach the class was not nearly as difficult as coordinating the class content presentation and providing a consistent method for instructors and students to communicate outside of class time. Overall, the response from the instructors was positive and a number of students indicated that their experience with professionals in the field added to their learning experience. Of the eighteen students in the class, there was only one D and one F awarded at the end of the semester.

Another concern was the compensation which id often offered for instructors to come in on a part time basis. The amount of experience the instructors had for this course was over 80 years in transportation engineering and professional engineering licenses. Currently the compensation for the class is $1500 for preparing the class content, reviewing homework, making and grading tests and providing consultation to students. If two hours were assigned for preparing for each contact hour of 28 classes (which was less than it actually took) and 1.25 hours for instructing the students for each class period there was a total of (28*1.25*3) or 105 hours. For a professional engineer with a Master's Degree with at least 10 years of experience to provide consulting services you would expect to pay $100 per hour as a minimum. The cost for consultation would be 105* $100 or $10,500 as a minimum. This should be taken into consideration the next time you want to have professionals come teach your engineering classes as an adjunct instructor.

Biographical Information - Stephen E. Meyer, P.E. is an Assistant Vice President at Volkert & Associates, Inc. located in Chattanooga, Tennessee. He received a Bachelor of Science in Engineering from the University of Tennessee at Chattanooga graduating Magna Cum Laude with Honors in Engineering and received his Master of Science Degree in Civil Engineering from the University of Minnesota. He has several publications in transportation journals. He has practiced transportation engineering for over 30 years. He is a Registered Professional Engineer in 14 states and serves on several professional and community boards of directors. He is a member of ITE, ASCE, IMSA, NSPE and ACEC.

Biographical Information- Edwin P. Foster, PhD, P.E. is Professor of Civil Engineering and Director of the Graduate Engineering Program at the University of Tennessee at Chattanooga. He received his B.E., M.S. and Ph.D. from Vanderbilt University with a year of postgraduate work at the University of Illinois at Urbana. He has over fifty publications in five countries and has been with the University of Tennessee for thirty-six years. He has worked for American Bridge Division of U. S. Steel in Cocoa Beach, Florida; Brown Engineering in Huntsville, Alabama. He was a NASA-ASEE Summer Faculty Fellow and is a member of ASCE and ASEE.