

# **AC 2008-2025: TEACHING ENGINEERING ECONOMY ONLINE IN CONSTRUCTION PROGRAM**

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# Teaching Engineering Economy Online in Construction Program

## Abstract

The importance of Engineering Economy is very evident as more and more engineering and technology programs are offering it as a required course. The course is very important because most topics covered in it are used everyday in our both personal and professional endeavors. Although students have difficulties with the course when offered in the traditional classroom setting, those difficulties are exasperated when the course is offered online. This paper and/or presentation will highlight personal experiences teaching Engineering Economy online to construction management students.

## What is Engineering Economy?

Engineering Economy is a technical course that deals with the financial aspects of investments to help engineers and managers make decisions that are beneficial to the stakeholders. The course “provides a systematic framework for evaluating the economic aspects of competing design solutions.”<sup>1</sup> It is a required course in most engineering, engineering technology, and construction management programs. Sullivan et al (2006), observed that “Engineering (and construction management), without economy, usually makes no sense at all.”<sup>1</sup>

## What is Online Teaching?

It is the teaching of courses through the internet. For many years, teaching took place during face-to-face meeting in a traditional classroom. However, in the last decade or so, we have experienced “explosive growth” in the use of online learning. Some of the advantages of online learning to students that have been cited by scholars include greater and higher quality interaction with students, increased convenience and flexibility, better accessibility, enhanced knowledge of educational technology, increased opportunities for professional recognition, and high levels of student learning.<sup>2</sup> In spite of the aforementioned benefits offered by online learning, some of the commonly cited barriers by scholars are “more time required”, “inadequate compensation”, “ownership issues”, “more work to develop and teach online”, “technical difficulties”, and “inadequate training, support and the addition of new roles.”<sup>2</sup>

## Teaching Engineering Economy Face-to-Face

In general, engineering economy does not require rigorous mathematical background which is welcome news in the construction management program. Most daily real-world engineering economy problems can be solved with knowledge of algebra. In spite of the relatively simple mathematics knowledge requirement, students “sweat” in engineering economy course (Vajpayee 2001, v)<sup>3</sup> which has been addressed in previous ASEE Annual Conference presentation.<sup>4</sup> The reasons students sweat, I imagine, are as varied as respondents. In general, some students find engineering economy hard because of the *time* and *interest rate* components. The challenge the authors faced whether in online or face-to-face teaching was to make the

engineering economy course interesting and understandable to students who have very limited understanding and/or little interest in mathematics.

## **Teaching Engineering Economy Online in Construction Program**

Although we have had experiences teaching engineering economy face-to-face and teaching other courses online, this past summer was our first experience teaching engineering economy online. Due to the popularity of online courses, the online engineering economy course had full enrollment in spite of the fact that it was being offered by the department for the first time and during a four-week period in the summer.

Some of the writers who previously underwent Quality Matters training contributed experiences gained from the training to the development of this online course. Quality Matters is a peer-reviewed program of “inter-institutional quality assurance in online learning”.<sup>5</sup> A publication by Gary S. Moore and others was a good source for information on online learning.<sup>6</sup> The following is a discussion of what was done to successfully offer engineering economy course to students in the construction management program online.

### **1. Introduction and Course Overview**

We used this section to introduce ourselves to the students and provide them with the overview of engineering economy online. We were very careful to allay their fears of taking a course that has “engineering” in the title given their dislike of analytical courses. For the course overview, students were required to read and comment on a paper that was presented in 2003 at ASEE Annual Conference in Nashville. The paper removed the mystique, so to say, that students harbored about the course. After reading the paper a student wrote the following comment:

“This paper definitely clarifies the intent of this class. It is very calming to gain an idea of the major concerns of the teacher. The impact of this explanation is amplified by the source of the paper. Reading this creates an appreciation for a different view of this class and a change of perspective on the information. Reading a professor’s explanation of a class allows the student to gain a better idea of what the professor is concerned with; this can be achieved with a syllabus. But, I find a syllabus to be ridged and impersonal but reading a paper written about the topic pertaining to a class sheds a different light on the subject. I perceive this to be more casual and professional at the same time (as contrary as this seems). It is causal for the student because they are reading the ideas of their professor (I find this to be similar to a personal student-teacher conversation) while the ideas are being professionally presented by the professor. It is calming to know and be aware of the philosophies that a professor is using while orchestrating a class. This class definitely holds importance to real life application and I feel that this is as important, if not more, than the fact of student development as a whole. As far as the concern of students “sweating” through a class, this should be expected; if you don’t “sweat” you either don’t care or know the material. Overall, I feel that it should be common practice for college professors to submit this type of paper to students along with a syllabus. This gives the student insight about the teacher and the class information that is very practical.”

Other topics addressed in this section include contact information, technology requirements, goals, etc.

## **2. Learning Objectives**

Course objectives were defined to help students focus their learning activities. Each learning unit objectives were clearly written from the perspective of the students. Students were aware on how they can meet the learning objectives. The learning objects were written to ensure mastery of content, application of critical thinking skills, and core learning skills.

## **3. Assessment of Student**

The reward of a student who worked very hard during the semester is a possible good passing grade at the end of the semester if the student is correctly assessed. Assessment of students' work is very crucial as the outcome will determine what grade a student receives. By its nature, assessment of online is a challenge. Some scholars have developed strategies to address some of the dishonesty found in online learning.<sup>7</sup> We incorporated many of the strategies cited in the work by Olt.<sup>7</sup> The assessment strategies measured effective learning as well as assess student progress in the stated learning objectives. We clearly stated the course grading policy. Participation by students was assessed through discuss board participation. Students were assigned problems online and they in turn submitted their work for grading online. Graded assignments were returned to students a day after the due date.

## **4. Learning Materials**

Learning may not take place without the proper learning materials such as textbooks and instructor-prepared notes. A widely used engineering economy textbook by Donald G. Newnan, et al. was adopted for this online course.<sup>8</sup> The book is easy to read and understand. Additionally, instructor-prepared class notes were made available to the students with other reference resources such free publications by the Federal Reserve Banks available on the internet. The reading materials were examined for depth, breadth, and currency. Because the course was offered online, it made it very easy for logical sequencing and integration of the materials.

## **5. Learner Engagement**

Students were effectively engaged through discussion board activities. Student-student cooperation was encouraged by requiring them to work in a group of 3 or 4. Students were required to develop "electronic" course portfolio which "demonstrate and integrate knowledge of engineering economy beyond the required assignments and test."<sup>1</sup>

## **6. Course Technology**

Students enrolled in the online course were required to have personal computer and a broadband internet connection. Recommended application software was word processor (MS Word) and spreadsheet (MS Excel). Students were required to solve all problems using spreadsheet.

## 7. Support or Help Desk, and Accessibility

Students received technical support and had access to the online materials the entire class duration.

### Recommendations

The following points may be useful to some that are contemplating offering engineering economy online.

Expect to spend a lot of time developing materials for use by students. It is not enough to provide PowerPoint slides that came with the textbook in your course site. You will be well advised to prepare your own slides that will capture your pedagogy and address the learning objectives you may have developed.

Incorporate audio materials in your online course. I have found that students appreciate teaching pedagogy that addresses different learning styles.

Give students fun and critical thinking assignments as discussed in another publication to encourage participation.<sup>4</sup>

### Conclusion

The material presented here is work-in-progress which is constantly being updated to take advantage of availability of new materials. Although it is very time consuming to an online learning neophyte, one will be committing an equivalent of a professional suicide by shunning getting involved in online learning.

### Bibliography:

1. Sullivan, William G., Elin M. Wicks, and James T. Luxhoj (2006). *Engineering Economy*, 13<sup>th</sup> edition. New Jersey: Pearson Prentice Hall, Inc.
2. Increasing Access to Higher Education: A Study of the Diffusion of Online Teaching among 913 College Faculty. *The International Review of Research in Open and Distance Learning*, Vol 6, No. 2 (2005), ISSN: 1492-3831. Retrieved: January 17, 2008, from <http://www.irrodl.org/index.php/irrodl/article/viewArticle/238/493>.
3. Vajpayee, S. Kant (2001). *Fundamentals of Economics for Engineering Technologists and Engineers*. New Jersey: Prentice Hall, Inc.
4. "Teaching Engineering Economy in Engineering Technology Program" Session 1139: Trends in Engineering Economy, American Society for Engineering Education (ASEE) Annual Conference, Nashville, Tennessee, June 22—25, 2003.
5. *Quality Matters* homepage. <http://www.qualitymatters.org>>. Accessed 2008 Feb 29.

6. Moore, Gary S., Kathryn Winograd, and Dan Lange (2001). *You Can Teach Online: Building a Creative Learning Environment*. New York: McGraw-Hill Higher Education.
7. Olt, Melissa R. Ethics and Distance Education: Strategies for minimizing Academic Dishonesty in Online Assessment. Retrieved on January 18, 2008, from <http://www.westga.edu/~distance/ojdla/fall53/olt53.html>.
8. Newnan, Donald G., Ted G. Eschenbach, and Jerome P. Lavelle (2004). *Engineering Economic Analysis, 9<sup>th</sup> edition*. New York: Oxford University Press.
9. Quality Matters Rubric for Online and Hybrid Courses. MarylandOnline, Inc., Largo, MD.