Teaching Engineering Economics for the First Time

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Abstract

There are many graduate assistants in engineering departments who are assigned to teach an Engineering Economics course at the undergraduate level as their first teaching assignment. Engineering Economics is one of the basic engineering courses in undergraduate engineering education. This course exposes the students to the fundamental concepts of Engineering Economy. Many graduate assistants will have a difficult time in preparing for the course (i.e., how to the structure the classes, what structure the exams should take, what grading policy should be used, what presentation tools and techniques should be used, and many other issues). I have found limited publications based on direct experiences in teaching Engineering Economics for the first time.

The purpose of this paper is to discuss options in teaching an undergraduate level Engineering Economics class as they apply to a novice. Graduate students who will be teaching this course for the first time may find this paper useful. This paper presents my first teaching experience (in an Engineering Economics class, and includes my structuring of material to the time available, the structure of exams, the benefits of short quizzes, a grading policy, presentation tools and techniques). This paper presents the benefits that I gained during this teaching experience. Recommendations are made for using the teaching of Engineering Economics by graduate students as a component of their preparation for the professorate.

Introduction

New educators (i.e., graduate assistants) in the field of Engineering Economics are often unfamiliar with the Engineering Economy body of knowledge, as they may not have any direct experience or they may have been exposed to the field in a different environment[1]. While it is uncommon for graduate assistants to not have taken the course that they teach, this unfamiliarity may be more prevalent in Engineering Economy due to the variety of subject matter taught, the perception by many that anyone can teach a basic engineering

course, and its typical classification as service course with high demand for seats (and sections).

There are many graduate assistants in engineering departments who are assigned to teach an engineering economics course at the undergraduate level as their first teaching assignment. I was one of these graduate assistants. I was assigned to teach a section of Engineering Economics at the undergraduate level in the Fall 2003 semester at Old Dominion University (ODU). There were 36 students in my class. All of them had either junior or senior standing in their departments. They were from various departments - Civil Engineering, Electrical/Computer Engineering, Engineering Technology, Mechanical Engineering, and Computer Science.

Typically, the departments will select the textbook for the assigned graduate assistants. This helps as there are many texts (all with strengths and weaknesses) and this would be a daunting task for a graduate student to do well. The Department of Engineering Management and Systems Engineering at ODU selected Newnan, Donald G., Jerome P. Lavelle, and Ted G. Eschenbach; Engineering Economic Analysis, Eight Edition, Oxford University Press, Oxford, 2002. Most texts on Engineering Economics stress that the practical purpose of engineering economics is that it empowers the engineer to make sound investment decisions[2]. I kept this main concept in mind while teaching my first engineering economics course. It is all about decision-making.

Know Your Students

I found it was very important to know my students. A useful technique that will assist in learning the students' names and more about them is to collect some basic information. In the very first class, I asked my students to send me an email containing basic information about them. It may include (1) name, (2) preferred name, (3) student ID, (4) hometown and state, (5) local phone, (6) local address, (7) major, (8) advisor, (9) class (Fr., So., Jr., Sr.), (10) organizations, (11) occupation goals, (12) experience related to engineering economy, (13) current position if employed, (14) expected grade, and (15) class expectations. This information helped me know my students and their expectations. Therefore I could design, adapt, or adjust context of the class to suit my students' needs.

Grading Policy

I found it was very critical to identify my grading policy to my students from the beginning of the class. Table 1 and Table 2 were my grading policy and the distribution of the different graded elements to the total grade. Instead of having one or two midterm exams, I gave five during semester exams. In this way, each exam covered small amounts of new material. End of chapter quizzes comprised 10 percent of the total grade. The main purpose of end of chapter quizzes was to re-capture the main concept(s) of each chapter. There were two case studies in my class. Each of them comprised 10 percent of the total.

During semester exams (5 exams)	45%
Final exam	25%
End of chapter quizzes	10%
Two case studies	20%
Total	100%

Table 1. Percent distribution of the total grade

Letter Grade	Points	Letter Grade	Points
A	100-94	C	76-72
A-	93-90	C-	71-70
B+	89-87	D+	69-67
B	86-82	D	66-62
B-	81-80	D-	61-60
C+	79 -77	F	<60

Table 2. Grading Policy

The Structure of the Class

I followed the structure presented in Figure 1. The topical outline consists of three major sections: (1) basic concepts in Engineering Economics, (2) before-tax analysis techniques, and (3) after-tax analysis techniques. About 35% of this course covered "Basic Concepts" in engineering economics such as engineering costs and cost estimating, nominal and effective interest, the equivalence concept, and interest formulas. Another 35% covered major analysis techniques - present worth analysis, annual cash flow analysis, rate of return analysis, incremental analysis and other analysis techniques (future worth analysis, benefit-cost ratio analysis, payback period, and sensitivity and breakeven analysis). This 35% section covered "Before-Tax Analysis." The next 20% covered "After-Tax Analysis." The connections between before-tax analysis and after-tax analysis were the understandings of depreciation and income tax, which were introduced after the end of other analysis techniques in the before-tax analysis section. The last 10% covered replacement analysis and inflation. I found that my students had a better understanding of the overall picture of engineering economics when I presented them a diagram similar to Figure 1.

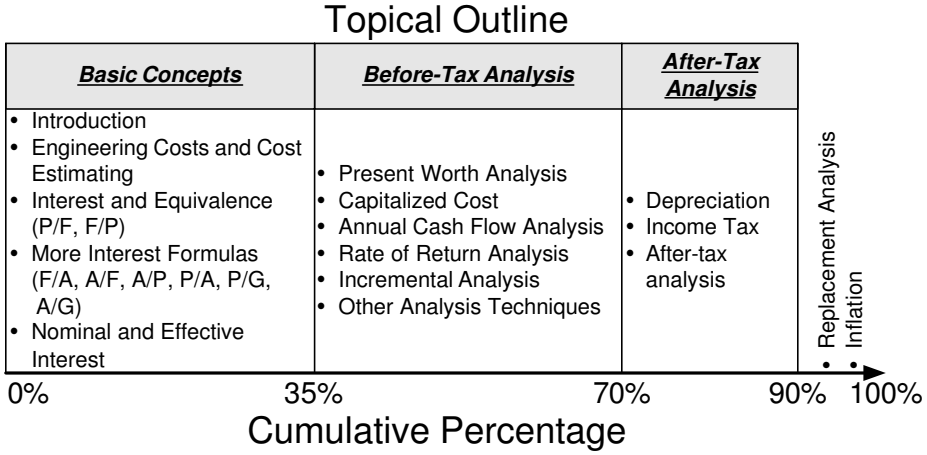

Figure 1. Relationship of topical outline and cumulative percentage

Class Preparation

It took me about 4 hours for preparation for each 75-minute lecture. I normally e-mailed my class slides to the students 24 hours prior to the class. In this way, students had time to review materials before coming to the class. At Old Dominion University graduate assistants should have at least 4 hours of office hours weekly. I set my office hours as the two hours prior to the class. I found that quick response to e-mail was highly recommended. I found that it was another way to show you paid close attention to your students. I usually responded to an e-mail within 24 hours.

The Structure of Exams

The during-semester exams and the final exam were a combination of short answer questions, basic or easy questions, moderate questions, and difficult questions as shown in Table 3. Short answer questions were used to demonstrate how well concepts and terms were understood and could be articulated by the students[3].

Type of Question	Percentage
Short answer (writing)	20%
Basic/Easy level (calculation)	20%
Moderate level (calculation)	40%
Difficult (calculation)	20%

Table 3. Structure of each exam

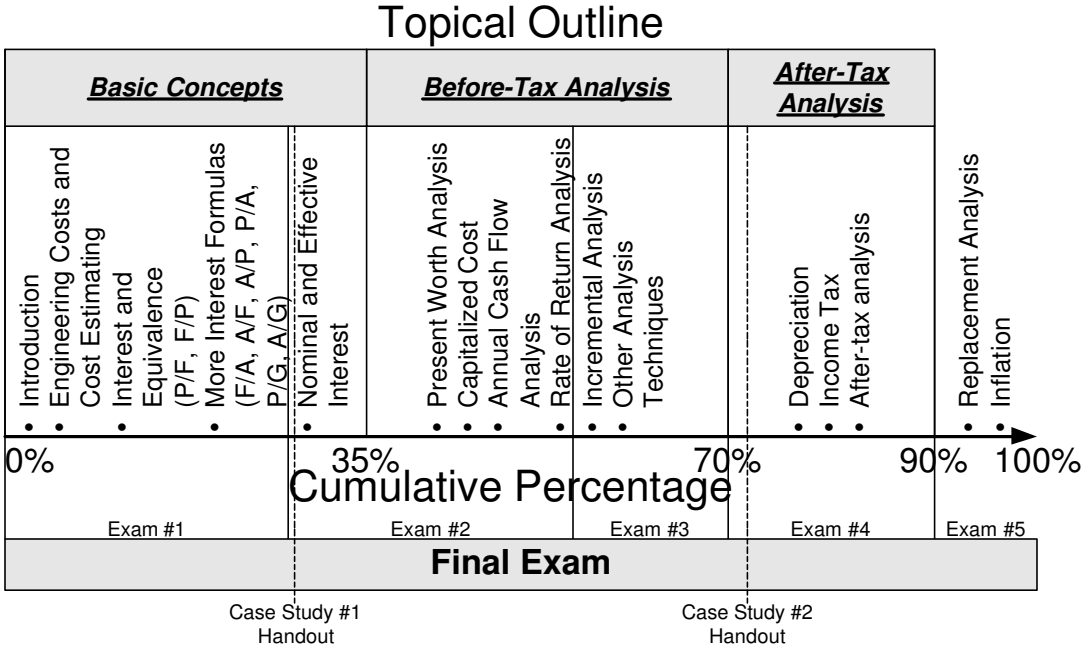

Figure 2. Relationship of during semester exams and topical outline

As shown in Figure 2, the first during semester exam covered most of the basic concepts section. The second exam covered major parts of the before-tax analysis section. The rest

of this section was in the third exam. The fourth exam covered the after-tax analysis section. The last during semester exam covered replacement analysis and inflation. The first case study was handed out after the first during semester exam. The second case study was handed out at the beginning of after-tax analysis section.

Presentation Tools and Techniques

I mainly used the chalkboard and an overhead projector. The chalkboard is very good for demonstrating basic calculations such as homework, quiz, and exam solutions. I found that the students would write when I wrote on the chalkboard. It is also a good tool for presenting an overall picture of each topic. When using the chalkboard, I always printed with large letters and neatly. I found that students had no problems reading my handwriting. I used the overhead project at the beginning of each lecture to present outline, graphics, definitions, examples, or tables related to that class.

Benefits

I gained valuable teaching experience after teaching this course. I was exposed to the other side of teaching (the instructors). Moreover, I now have a better understanding of the engineering economics topics that I taught (and how they relate to my dissertation). This experience helped me better prepare for the professorate and to better understand my future career (and evaluate its desirability).

Recommendations

Engineering Economics is one of the basic engineering courses in undergraduate engineering education. Graduate assistants who want to pursuit a career in academia (especially in Engineering Economics, Engineering Management, and Industrial Engineering) should be assigned to teach this course.

Bibliography

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