

Engineering Economics and Cost Analysis

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Course Outline | Text Book & Objectives

□ Text:

Newnan, Donald G., Eschenbach, Ted G., and Lavelle, Jerome P. (2004). *Engineering Economic Analysis*, Ninth Edition, Oxford University Press, New York, Oxford, 2004.

Newnan, Donald G. and Wheeler, Ed. *Study Guide for Engineering Economic Analysis*, Ninth Edition, Oxford University Press, New York, Oxford, 2004.

□ Course Description:

This course deals with economic analysis of engineering, in particular, with the evaluation of projects in terms of time, costs and worth. Topics include interest rates, time value of money, present and future worth, economic evaluation of alternative decisions, replacement analysis, inflation, taxes, and economic justification of new technologies.

Tentative Course Outline

- ❑ Introduction
- ❑ Equivalence and Compound Interest
- ❑ Present worth analysis
- ❑ Annual cash flow analysis
- ❑ Rate of return analysis
- ❑ Incremental rate of return analysis
- ❑ Rationing capital among competing projects
- ❑ Other analysis techniques (Future worth analysis, Benefit-Cost ratio analysis, etc.)
- ❑ Depreciation
- ❑ Income taxes
- ❑ Inflation and deflation

Course Outline | Policies and Procedures

- ❑ **Quiz Schedule:** On most Tuesdays of the class a short, in class quiz will be given. Time varies on difficulty.

- ❑ **Final Project/Case Study:** This is a major problem that will involve many, but not all, parts of the class. A team will be assigned to work on the solution to the problem. In-class final project/case study presentations may be required.

- ❑ **Missed Quizzes**
 - The student is expected to notify the instructor in advance in the event an emergency occurs which prevents the student from taking a quiz at the scheduled time, if possible.

 - Make-up quizzes will **ONLY** be given for absence due to unavoidable situations.

Course Outline | Policies and Procedures

□ Homework:

- Homework problems will be assigned for each chapter. However, the homework will not be graded.
- However, every student must recognize that the quizzes will be based upon the problems at the end of each chapter (and most importantly the ones assigned in the homework).
- The better the student understands how to solve the end-of-chapter problems the better he/she will perform on the quiz.

Course Outline | Policies & Procedures

- ❑ **Attendance:** Strongly encouraged, but not required.
- ❑ **Email:** Students are responsible for all E-mail messages sent by the instructor.
- ❑ **Reading Assignment:** Students are strongly encouraged to read the chapters before the lecture period.
- ❑ **Academic Honesty:** Students will abide by Binghamton University's policy on academic honesty listed in the University Bulletin.
- ❑ **Absent Professor:** Students will be notified in advance if the instructor is going to be late for class.

Introduction

- ❑ **Objective:** This course is basically about how to decide to do things, or compare alternatives in terms of money.
- ❑ Contrasted with such subjects as quantum physics, which deal with the secrets governing the burning of stars, engineering economics deals only with the sordid details of handling money.
- ❑ On the other hand, it's easy. There is a certain amount of mathematics involved, but nothing beyond tenth-grade level. There are no difficult concepts to be mastered.
- ❑ There is one new idea -- ***that money has a time value!***

Introduction (cont'd...)

❑ Furthermore, this is almost certainly the first of the courses you've taken which you'll find directly useful, and you can expect to go on using it for the rest of your life:

- ❑ whenever you buy a car,
- ❑ get a mortgage,
- ❑ consider life insurance, or start your own company.

❑ Among other things, you should be able to use it to compare the financial advantages of going to graduate school versus starting work immediately.

Introduction (cont'd...)

- Example: Buying a car
 - Alternatives:
 - \$18,000 now, or
 - \$600 per month for 3 years (= \$21,600 total)
 - Which is better?
 - It depends!
 - Issue: how much is *money now* worth compared to *money in the future*?
 - Leads to idea of *Time value of money!*

Introduction (cont'd...)

- ❑ We can locate Engineering Economics among several related disciplines. Firstly, it is needed to complete engineering itself; without an economic background, most engineering problems are trivial.
- ❑ For example, the problem of **air pollution** could easily be solved by giving everyone an **electric car**.
- ❑ It is only when we add the economic constraint that electric cars are too expensive for most people that the real engineering begins.

Chapter 1: Making Economic Decisions

❑ **Decision making** is a broad topic, for it is a major aspect of everyday human existence.

❑ There are lots of problems in the world:

1) Simple Problems

- ❑ Should I pay or use credit?
- ❑ Do I buy a semester parking pass or use the parking meters?
- ❑ Shall we replace a burned-out motor?
- ❑ If we use three crates of an item a week, how many crates should we buy at a time?

Making Economic Decisions (cont'd...)

2) **Intermediate Problems** (mainly economic)

- Which equipment should be selected for a new assembly line?
- Which materials should be used as roofing, siding, and structural support for a new building?
- Which printing press should be purchased? A low cost press requiring three operators, or a more expensive one needing only two operators?

3) **Complex Problems** (mixture of economic, political, and social)

- The decision of Mercedes Benz to build an automobile assembly plant in Tuscaloosa, Alabama.
- Setting the annual budget for a corporation.

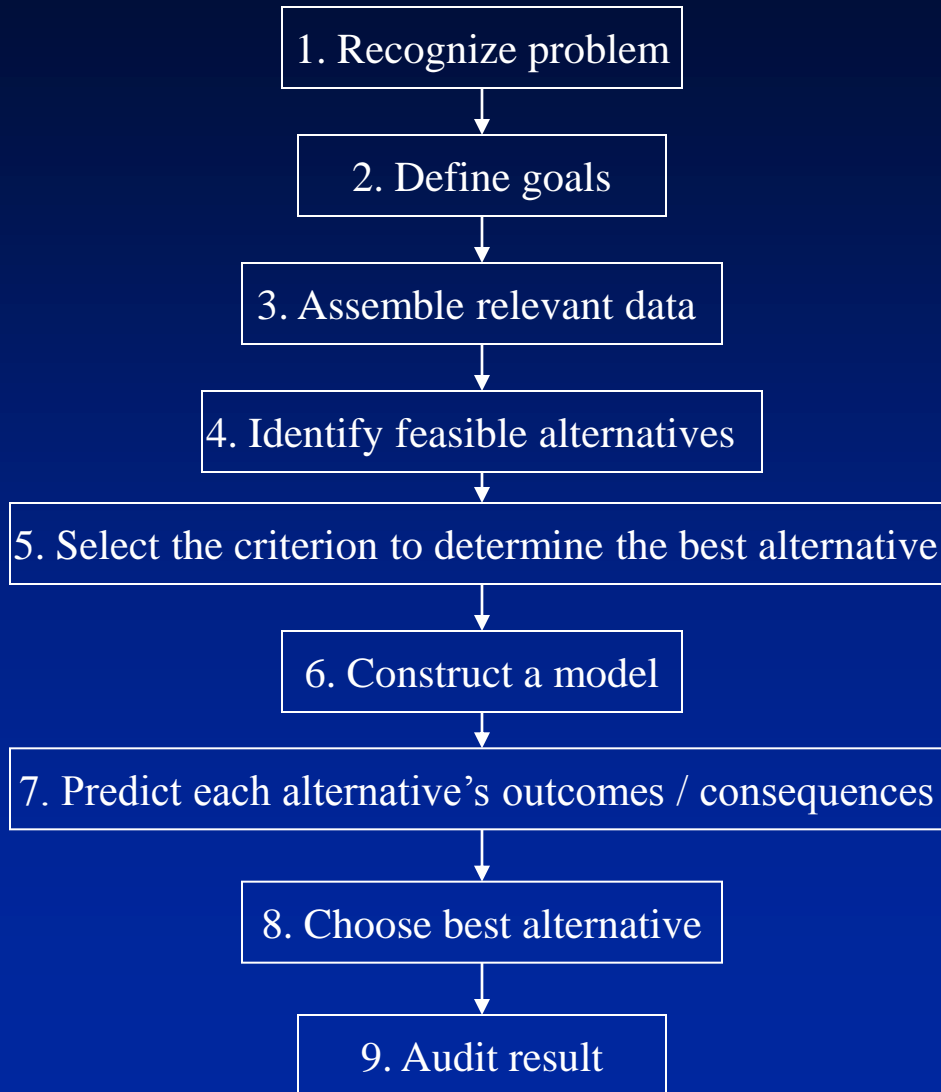
The Role of Engineering Economic Analysis

- ❑ For the medium and economic parts of the complex problems, use Engineering Economic Analysis. Why?
 - ❑ Sufficiently important to warrant the effort,
 - ❑ Cannot be worked in one's head – information needs to be organized including the consequences of different decisions, and
 - ❑ The problem has economic aspects that are important decisions.

Examples of Engineering Economic Analysis

- ❑ Which engineering projects are worthwhile?
- ❑ Which engineering projects should have a higher priority?
- ❑ How the engineering project should be designed?
- ❑ How to achieve long-term financial goals?
- ❑ How to compare different ways to finance purchases?
- ❑ How to make short and long-term investment decisions?

Rational Decision Making



Rational Decision Making (cont'd...)

- Step 5: Select the criterion to determine the best alternatives:

Category	Economic Criterion
Fixed Input	
Fixed Output	
Neither input no output fixed	

Rational Decision Making (cont'd...)

□ Examples

□ You have \$300 to buy clothes for the start of school.

(_____)

□ An automobile battery is needed. Batteries are available at different prices, and although each will provide the energy to start the vehicle, their useful lives are different.

(_____)

□ You wish to purchase a new car with no optional equipment

(_____)

Example I

A machine part is manufactured at a unit cost of 40c for material and 15c for direct labor. An investment of \$500,000 in tooling is required. The order calls for three million pieces. Half-way through the order, a new method of manufacturing can be put into effect, which will reduce the unit costs to 34c for material and 10c for direct labor – but it will require \$100,000 for additional tooling. What, if any, should be done?

Example II

A firm is planning to manufacture a new product. The sales department estimates that the quantity that can be sold depends on the selling price. As the selling price increased, the quantity that can be sold decreases. Numerically they estimate

$$P = \$35.00 - 0.02 Q$$

Where P = selling price per unit

Q = Quantity sold per year

On the other hand, the management estimates that the average cost of manufacturing and selling the product will decrease as the quantity sold increases. They estimate

$$C = \$4.00Q + \$8000, \text{ where } C = \text{cost to produce and sell } Q \text{ per year.}$$

The firm's management wishes to produce and sell the products at the rate that will maximize profit, that is, where income minus cost is a maximum. What quantity should they plan to produce and sell each year?

Homework # 01 (Practice Problems)

1-18	1-27	1-31	1-32
1-36	1-37	1-39	1-41