

Lecture 1

Introduction to Engineering Economics and Finance

Why Is Engineering Economics Important?

- **Engineers DESIGN things and perform PROJECTS**
- **Therefore, engineers must be concerned with the economic aspects of designs that they recommend, and projects that they perform**
- **What can go wrong when we don't have the concepts of engineering economics?**

What Kinds of Questions Can Engineering Economics Answer?

- ◆ **Engineering economics is needed for many kinds of decision making**
 - Example: Buying a car
 - ◆ Alternatives:
 - \$18,000 now, or
 - \$600 per month for 3 years
 - ◆ Which is better?

Engineering Economics Helps Make Cash Flow Comparisons!

- 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!*

Key Concept: *Time Value of Money*

◆ **Would you rather have:**

- \$100 today, or
- \$100 a year from now?

Time Value of Money

◆ Would you rather have:

- \$100 today, or
- \$100 a year from now?

◆ Basic assumption:

- Given a fixed amount of money, and
- A choice of having it now or in the future,

◆ Most people would prefer to have it sooner rather than later

Time Value of Money

◆ **Basic assumption:**

- Given a fixed amount of money, and
- A choice of having it now or in the future,
- Most people would prefer to have it sooner

◆ **Reasons:**

- _____ ?
- _____ ?
- _____ ?
- _____ ?

Time Value of Money

◆ **Basic assumption:**

- Given a fixed amount of money, and
- A choice of having it now or in the future,
- Most people would prefer to have it sooner rather than later

◆ **This assumption is not universally satisfied:**

- E.g., saving money for graduate school

◆ **But it is nearly universal, especially in business**

Time Value of Money

◆ One consequence of the time value of money:

- Suppose you are willing to exchange a certain amount now for some other amount later
- Then the later amount has to be _____?

Time Value of Money

- The time value of money centers around the idea of an interest rate (if projecting into the future):
 - Or, equivalently, a discount rate (if rolling back to the present)

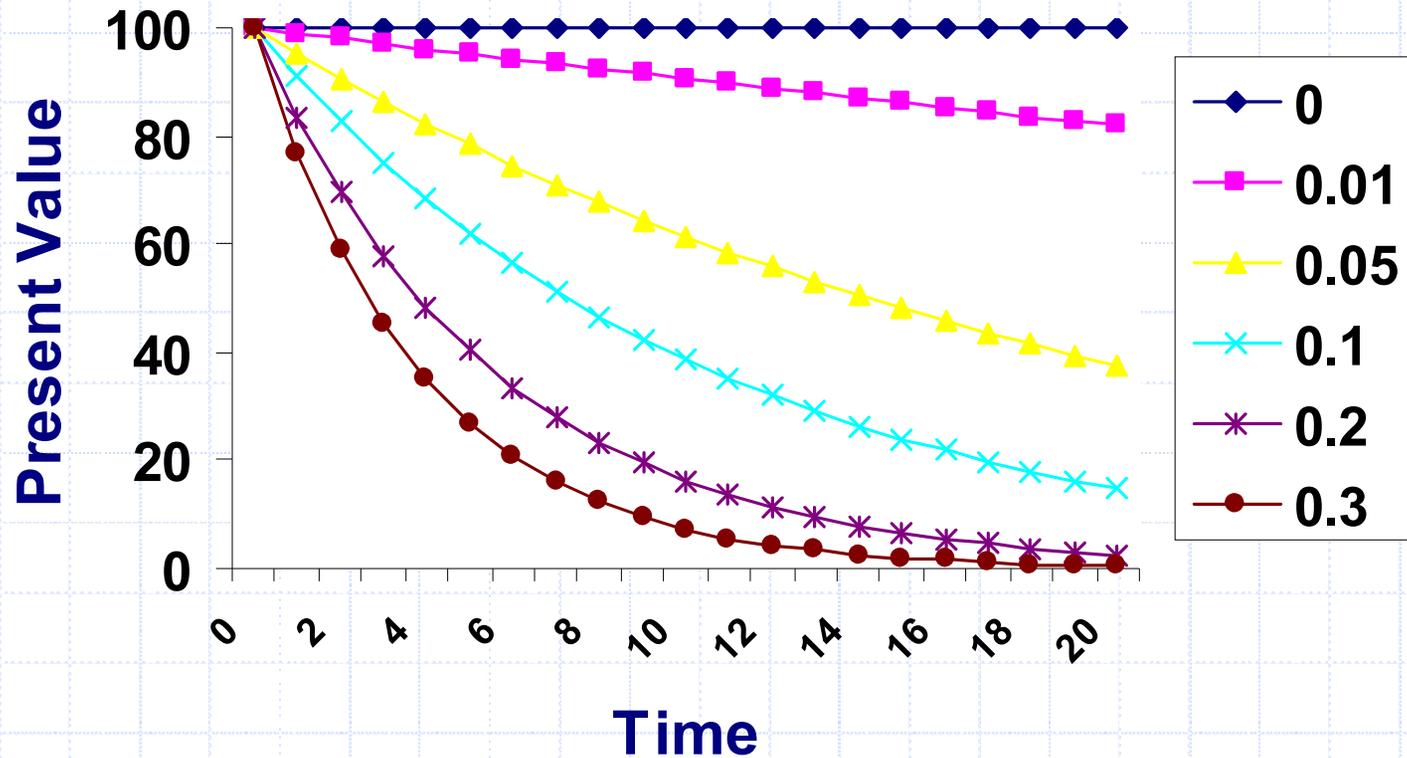
Time value of money deals with changes in the value of money over some period of time (due to investment opportunities, uncertainty, etc.)

This is the single most important concept in engineering economics!

What Does This Mean for Us?

- ◆ **In this course, we will learn methods to:**
 - *Compare different cash flows over time*
- ◆ **Using the *interest rate* or *discount rate*:**
 - How much more a dollar today is worth,
 - Compared to a dollar in one year
- ◆ **For example, if the interest rate is 5%:**
 - \$1 today is worth as much as \$1.05 next year

Illustration of Discounting



What Kinds of Questions Can Engineering Economics Answer?

- It will help you make **good decisions**:
 - In your professional life
 - (Regardless of whether you go into the private or public sector)
 - *And in your personal life!*
- Knowledge of engineering economics will have a significant impact on you **personally!**

What Kinds of Questions Can Engineering Economics Answer?

**ENGINEERING ECONOMICS INVOLVES:
FORMULATING, ESTIMATING, AND
EVALUATING ECONOMIC OUTCOMES
WHEN CHOICES OR ALTERNATIVES ARE
AVAILABLE**

How Does It Do This?

**BY USING SPECIFIC
MATHEMATICAL RELATIONSHIPS
TO COMPARE THE CASH FLOWS OF THE
DIFFERENT ALTERNATIVES
(typically using **spreadsheets**)**

Where Does Engineering Economics Fit?

Here is an approach to **problem-solving**:

- **Understand the problem**
- **Collect all relevant data/information**
- **Define the feasible alternatives**
- **Evaluate each alternative**
- **Select the “best” alternative**
- **Implement and monitor the decision**

Where Does Engineering Economics Fit?

1. Understand the Problem
2. Collect all relevant data/information (*difficult!*)
3. Define the feasible alternatives
4. Evaluate each alternative
5. Select the "best" alternative
6. Implement and monitor

This is the major role of engineering economics

Where Do I Get the Data?

- Engineering economics is based mainly on estimates of ***future*** costs and benefits:
 - So it has to deal with **risk and uncertainty**
- The costs, benefits, and other parameters are typically **unknown**, and can **vary over time**:
 - The values of these parameters will dictate a particular numerical outcome
 - **And therefore a particular decision!**
- ***Sensitivity analysis*** can be used to explore how the decision changes as our estimates change

What If I Don't Like the Answers?

- Remember:
 - **"Tools"** don't make decisions
 - **People** make decisions, based on *values*
- Engineering economics is just a set of tools:
 - It can **help** in decision making
 - But *it won't make the decision for you*
- Which alternative is **"best"** is up to you!