Engineering Economy (Engineering Economics)

What is Engineering Economy: It is the part of economics concerned with the use and application of economic principles in studying and analyzing engineering projects or decisions.
It includes the analysis of the cost factors of a project including bank interests arranged on borrowing money and the depreciation of the machines and tools of the project and comparing them with the benefits and revenues expected from the project to provide reasons to justify the decision to implement this project.
It also includes the analysis of alternatives toselect the best and most efficient alternative for an owner or investor (person, company, society, etc.).

Objectives of Engineering Economy

1. Finding the most suitable and efficient projects in terms of design capacity
2. Using locally available materials
3. Developing technical personnel
4. Reducing maintenance costs
5. Reducing operating costs while maintaining quality
6. Optimizing the use of capital (better use of capital)

Project FinancingMethods

There are several methods to fund a project:
1. Private financing (or through shares)
2. A loan with a simple or compound interest
3. Through an annual investment plan for a country (state)

Relationship betweenEconomicsand Engineering

Engineers are considered the main element in conducting feasibility studies, and because the engineers are familiar with the economic, computational, and administrative works in addition to their basic engineering tasks, they become more qualified than any other people within the groups working on those studies to give the right opinion to choose projects that have the highest chances of success compared to other available alternatives.Therefore, one of the main objectives is to get the mostefficient use for the resources and energy which can depend on the financial efficiency to use it as an indicator ofthe success or weakness of the project.

References

1-ألاقتصاد الهندسي - أي رئول ديكارمو، جون اركندا
2- Engineering Economics – James L. Riggs
3- Engineering Economics Analysis – Donald G. Newnan

$$Efficiency = \frac{Output}{Input} * 100$$

When the equation is used between basic resources and energy, the engineer will realize that this ratio will never exceed (100%), but the objective is to work to increase this ratio as maximum as possible.

For a construction or industrial project, the efficiency required to achieve this project in addition to performance efficiency is financial efficiency, where the degree of efficiency is measured based on its monetary value as follows:

$$Financial\ Efficiency\ = \frac{Income\ (Revenue)}{Total\quad Cost} * 100$$

Must notice that financial efficiency should exceed the ratio (100%) to achieve profits otherwise there will be a loss.

From this ratio, we can measure the efficiency and then calculate the annual rate of return for invested capital as shown below:

$$Rate\ of\ Return = \frac{Annual\quad Net\quad Profit}{Capital\quad Invested} * 100$$

This equation is a commonly usedequation to find the investment efficiency score of a project:

$$Annual\ Net\ Profit\ = Total\ Revenue - Total\ Cost$$

Non-Momentary Values

There are factors affecting the course of the economic study (economic feasibility) of a project that cannot be ignored because they ultimately determine the success or failure of the project,such as:

1. Economical laws
2. General commercial terms (conditions)
3. Social and human values
4. People's goals and tastes
5. The desire or unwillingness of consumers

Human Factor

It is considered one of the most essential elements in the success of the project. The high productivity of the worker reduces costs and increases profits.

Profit and its impact on business: For any commercial work, capitalmust be available to invest in the commercial work.There are several sources of capital as mentioned

previously.It is expected that achieving profits depends mainly on performance efficiency and optimal utilization of the project.

$$Profit = Total\ Return\ (Revenue) - Total\ Cost$$

$P_b = G - (O + M + D + I)$profit before tax
$P_a = G - (O + M + D + I + T)$profit after tax

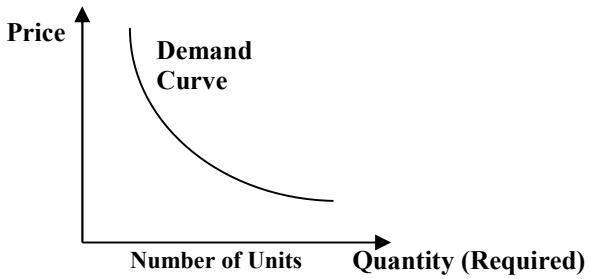
Where:
G= Total Return (Revenue)
O= Operation
M= Maintenance
D= Depreciation
I= Interest
T= Tax

Supply–Demand Law

A law organizes the relationship between supply and demand. Every produced good (product) is controlled by this law under free competition.

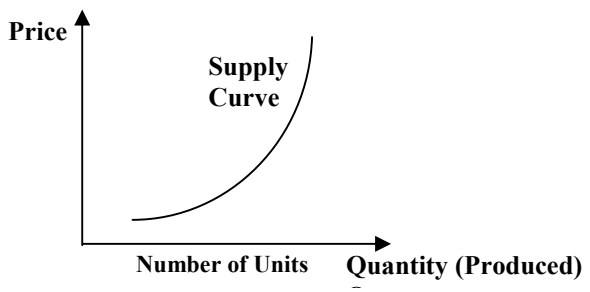
Demand

It is the ability of a person to purchase a specific need (a product, a good, etc.) at a specific price.When the price increases, the person's ability to purchase the number of units he/she can buy decreases, and conversely, when the price decreases, the number of units purchased will increase by a certain percentage.



Supply

It is the number of units produced that a producer couldsupply in the market.
When the price increases, the producer increases production in order to maximize profits, and conversely, when the price decreases, the producer reduces production.



This graph is as desired by the producer.