

Al-Mustaqbal University College  
Chem. Eng. Petroleum Industries Dept.

**Engineering Economics**  
4<sup>th</sup> Stage

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**2020-2021**

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Lecture 1

<b>Course Code</b>	<b>CHE 414</b>	<b>Credit hr.</b>				<b>Credits</b>
<b>Course Title</b>	<b>Chemical Engineering Economics</b>					
<b>Year / Term</b>	<b>Fourth Year / 1<sup>st</sup> Semester</b>	<b>Theoretical</b>	<b>Practical</b>	<b>Tutorial</b>	<b>Total</b>	
<b>Specialization</b>		<b>2</b>	<b>0</b>	<b>1</b>	<b>3</b>	

## Syllabus

**Outline and basic relationships for accounting costs , Revenues and Profits .**

**1- Estimation of Capital Costs.**

Rapid estimation, Factorial method Cost index , Computer tools for cost estimation , Location and design factors .

**2- Estimation of Purchased Cost for Common Chemical Processes Equipment .**

**3- Estimation of Production Costs and Revenues**

Utilities, Consumable materials, Waste – Disposal and Labor costs, By – product revenues

**4- Depreciation Calculation Methods**

Straight – line and Declining – balance methods.

**5- Economic Evaluation of Projects**

### Grades

60% final exam- Mid exam 20% , 20% activities

### Activity Categories

Quizzes ( inside and outside lecture times), student reaction in lectures (questions and answers), attendance, reports, group leader skills.

### **References:**

- Peters M X, Timmerhaus K.D.2003, PLANT DESIGN AND ECONOMICS FOR CHEMICAL ENGINEERS, 5<sup>th</sup> Ed. McGraw-Hill, Inc.
- Panneerselvam R. 2012, Engineering Economics, PHI Learning Private Limited, New Delhi.
- Couper J.R, 2003, PROCESS ENGINEERING ECONOMICS, Marcel Dekker, Inc. USA.

# ENGINEERING ECONOMICS

## Introduction

Economics is the science that deals with the production and consumption of goods and services and the distribution and rendering of these for human welfare. Engineering economics deals with the methods that enable one to take economic decisions towards minimizing costs and/or maximizing benefits to business organizations.

The following are the economic goals.

- A high level of employment
- Price stability
- Efficiency
- An equitable distribution of income
- Growth

Some of the above goals are interdependent. The economic goals are not always complementary; in many cases they are in conflict. For example, any move to have a significant reduction in unemployment will lead to an increase in inflation (a general increase in prices and fall in the purchasing value of money). Every business enterprise must make profit in order to survive, therefore, they need to make economy studies before taking decisions.

Chemical engineers in the performance of their jobs will employ economics in the preparation of capital cost estimates, operating expense estimates,

profitability analyses including the time value of money, feasibility studies, and to perform sensitivity and uncertainty analysis considering many alternatives. To move up the management ladder, they must have a working knowledge of balance sheets, income statements, and financial analysis of a corporate venture.

$$\text{Economic efficiency (\%)} = \frac{\text{Output}}{\text{Input}} \times 100 = \frac{\text{Worth}}{\text{Cost}} \times 100$$

‘Worth’ is the annual revenue generated by way of operating the business and ‘cost’ is the total annual expenses incurred in carrying out the business. For the survival and growth of any business, the economic efficiency should be more than 100%.

Economic efficiency is also called ‘**productivity**’. *Simultaneous increase in output and decrease in input*. Let us assume that there are advanced automated technologies like robots and automated guided vehicle system (AGVS), available in the market which can be employed in the organization we are interested in. If we employ these modern tools, then:

\_ There will be a drastic reduction in the operation cost. Initially, the cost on equipment would be very high. But, in the long run, the reduction in the operation cost would break-even the high initial investment and offer more savings on the input. These advanced facilities would help in producing more products because they do not experience fatigue. The increased production will yield more revenue. In this example, in the long run, there is an increase in the

revenue and a decrease in the input. Hence, the productivity ratio will increase at a faster rate.

## Accounting costs, Revenues and Profits

### Accounting Costs

The costs associated with running a business clearly depend on the type of business that you are running, but generally speaking, we can probably name a few of the costs any business has to deal with at some point in time. There is the cost of **labor** — someone has to get paid for doing work, after all, and even if it's just you running your business, you obviously need to make money. There's **equipment** or **materials**— since you are selling something, you either need materials to make your product or equipment to create the content you sell. All of these costs are called **accounting costs**. **Accounting costs are those costs that have a specific monetary (related to money) value you need to pay in order to receive the associated benefit.**

**Revenue** is often referred to as the top line because it sits at the top of the income statement. **The revenue number is the income a company generates before any expenses are taken out.**

For example, with a baby toy retailer, the money it makes from selling toys before accounting for any expenses is its revenue (sales). If the company also has income from investments or a subsidiary company, that income is not

considered revenue; it does not come from the sale of toys. Additional income streams and various types of expenses are accounted for separately.

## **Profit**

Also referred to as the bottom line, profit is referred to as [net income](#) on the income statement. There are variations of profit on the income statement that are used to analyze the performance of a company.

However, there are other profit margins in between the top line (revenue) and bottom line (net profit); the term "Profit" may emerge in the context of [gross profit](#) and operating profit. These are steps on the way to net profit.

Gross profit is **revenue** minus the **cost of goods sold (COGS)**, which are the direct costs attributable to the production of the goods sold in a company. This amount includes the **cost of the materials** used in creating the good along with the **direct labor costs** used to produce the good.

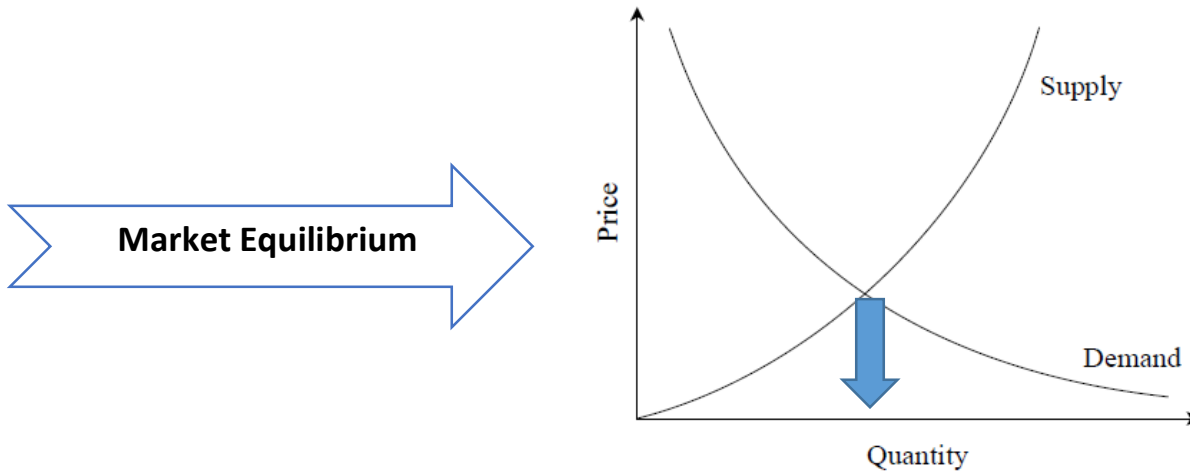
**Gross Profit= Revenue – Production Cost or (COGS)**

**Profit = Sales – (Fixed cost + Variable costs)**

**Net Profit = Gross Profit – Taxes**

Operating profit is gross profit minus all other fixed and variable expenses associated with operating the business, such as rent, utilities, and payroll.

**Capital cost= Fixed capital cost+ Working capital cost + Land cost**



**A demand curve** is almost always downward-sloping, reflecting the willingness of **consumers** to purchase more of the commodity (goods) **at lower price** levels.

**A supply curve** is usually upward-sloping, reflecting the willingness of **producers** to sell more of the commodity they produce in a market with **higher prices**.

In equilibrium the quantity of a good supplied by producers equals the quantity demanded by consumers.