JECRC Foundation

JAIPUR ENGINEERING COLLEGE AND RESEARCH CENTRE

JAIPUR ENGINEERING COLLEGE AND RESEARCH CENTER

Class – VI A & B
Subject – Construction Technology & Equipment
Ch – 2 (Engineering Economy)
Presented by – Shivangni Khandelwal (Assistant Professor)

VISSION AND MISSION OF INSTITUTE

VISION

To become a renewed center of outcome based learning, and work towards academic, professional, culture and social enrichment of the lives of inviduals and communities.

MISSION

Focus on evaluation of learning outcomes and motivate students to inculcate research Aptitude by project based learning. Identify, based on informed perception of Indian, Regional and global needs, areas of focus and provide platform to gain knowledge and solutions. Offer opportunities for interaction between academia and industry. Develop human potential to its fullest extent so that intellectually capable and imaginatively gifted leaders can emerge in a range of professions.

VISSION AND MISSION OF DEPARTMENT

VISION

To become a role model in the field of Civil Engineering for the sustainable development of the society.

MISSION

1)To provide outcome base education.

2)To create a learning environment conducive for achieving academic excellence.

3)To prepare civil engineers for the society with high ethical values

CONTENTS (TO BE COVERED)

- **ENGINEERING ECONOMICS**

  RESOURCES

  WHY DO ENGINEERS NEED TO LEARN ABOUT ECONOMICS?

  WHAT IS ENGINEERING ECONOMICS?

  HOW ENGINEERING IS COMPOSED OF PHYSICAL AND ECONOMIC COMPONENTS

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- **COST ANALYSIS**
- **BREAKEVEN ANALYSIS**

  BREAK – EVEN POINT

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CONTENTS (TO BE COVERED)

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CONCLUSION

- **DEPRECIATION**
- **DEPLETION**
- **REFERENCES**

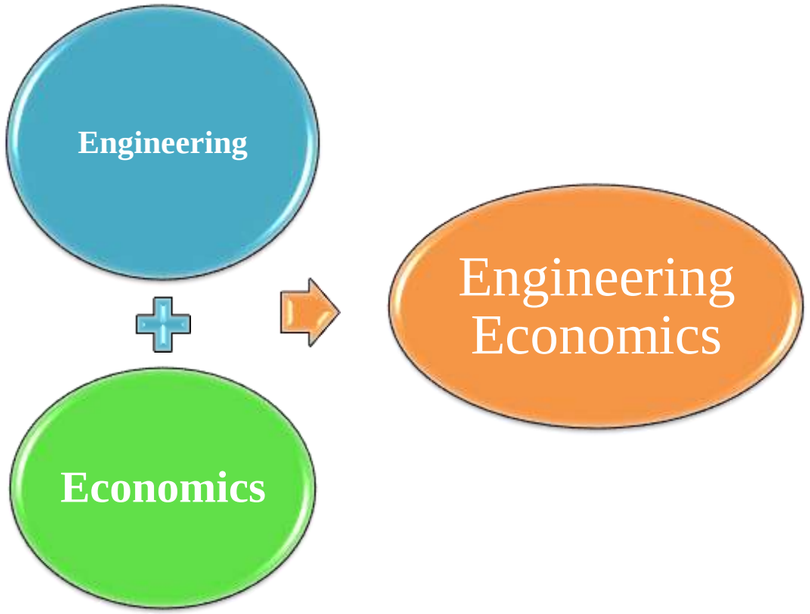
SYLLABUS

S NO.	CONTENT
1	**Introduction:** Objective, scope and outcome of the course.
2	**Engineering Economy:** Principle of Engineering Economy, Minimum cost point analysis, Breakeven point analysis, Depreciation and depletion
3	**Safety in construction:** Causes, classification, cost and measurement of an accident, safety programme for construction, protective equipment, accident report, safety measure: (a) For storage and handling of building materials. (b) Construction of elements of a building (c) In demolition of buildings; Safety lacuna in Indian scenario. Fire safety provisions as per NBC.
4	**Construction Planning:** Need of construction planning, Constructional Resources, construction team, stages in construction, preparation of construction schedule, Job layout, inspection and quality control; **Materials Management**: Objective and functions of material management
5	**Construction Equipment and Management:** Earth Moving Equipment-Bull dozers tractor pulled scrapers Power shovels Draglines clamshells; cranes; Hoes, Trenching machine types Hauling Equipment; Drilling, Blasting and Tunneling Equipment; Pile Driving Equipment

COURSE OUTCOME

CO 1	To understand the concept of Engineering Economy, Depreciation and Depletion.
CO 2	To understand safety in construction.
CO 3	To understand need of construction planning and objective of material management.
CO 4	To understand the various technology and equipment involved in construction.

ENGINEERING ECONOMICS



What is Economics ?

social science of how limited resources are used to satisfy unlimited human wants

What is Engineering ?

Engineering is the application of scientific, economic, social, and practical knowledge, in order to design, build, and maintain structures, machines, devices, systems, and materials

RESOURCES

LAND OR NATURAL RESOURCES

All gifts of nature, such as: water, air, minerals, sunshine, plant and tree growth, as well as the land itself which is applied to the production process.

LABOR

The efforts, skills, and knowledge of people which are applied to the production process.

CAPITAL

Real Capital (Physical Capital)

Tools, buildings, machinery -- things which have been produced which are used in further production

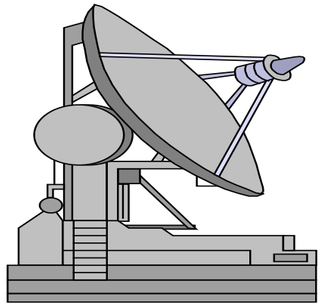
Financial Capital

Assets and money which are used in the production process

Human Capital

Education and training applied to labor in the production process.

Engineering Economics, previously known as engineering economy, is a subset of economics for application to engineering projects.



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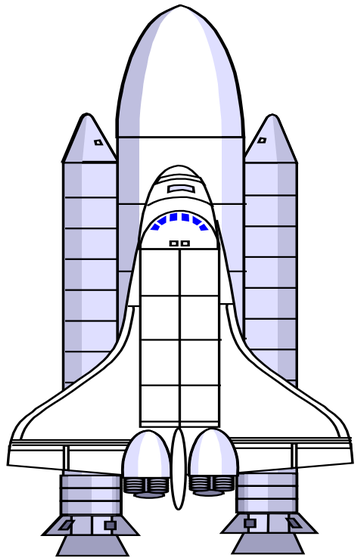

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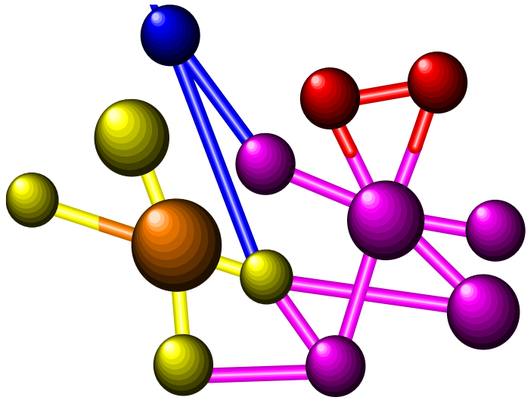

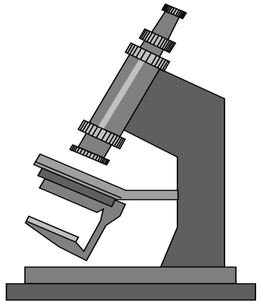

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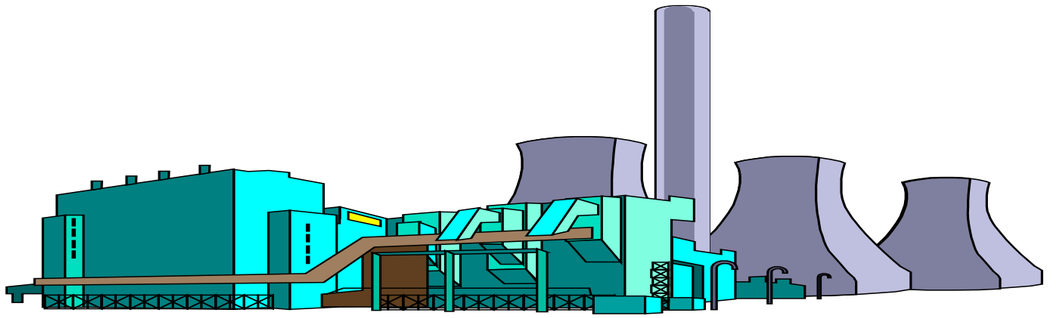


WHY DO ENGINEERS NEED TO LEARN ABOUT ECONOMICS?

- Ages ago, the most significant barriers to engineers were technological. The things that engineers wanted to do, they simply did not yet know how to do, or hadn't yet developed the tools to do. There are certainly many more challenges like this which face present-day engineers
  - *Natural resources (from which we must build things) are becoming more scarce and more expensive*
  - *Negative side-effects of engineering innovations (such as air pollution from automobiles)*
- Engineers must decide if the benefits of a project exceed its costs, and must make this comparison in a unified framework. The framework within which to make this comparison is the field of engineering economics, which strives to answer exactly these questions, and perhaps more.

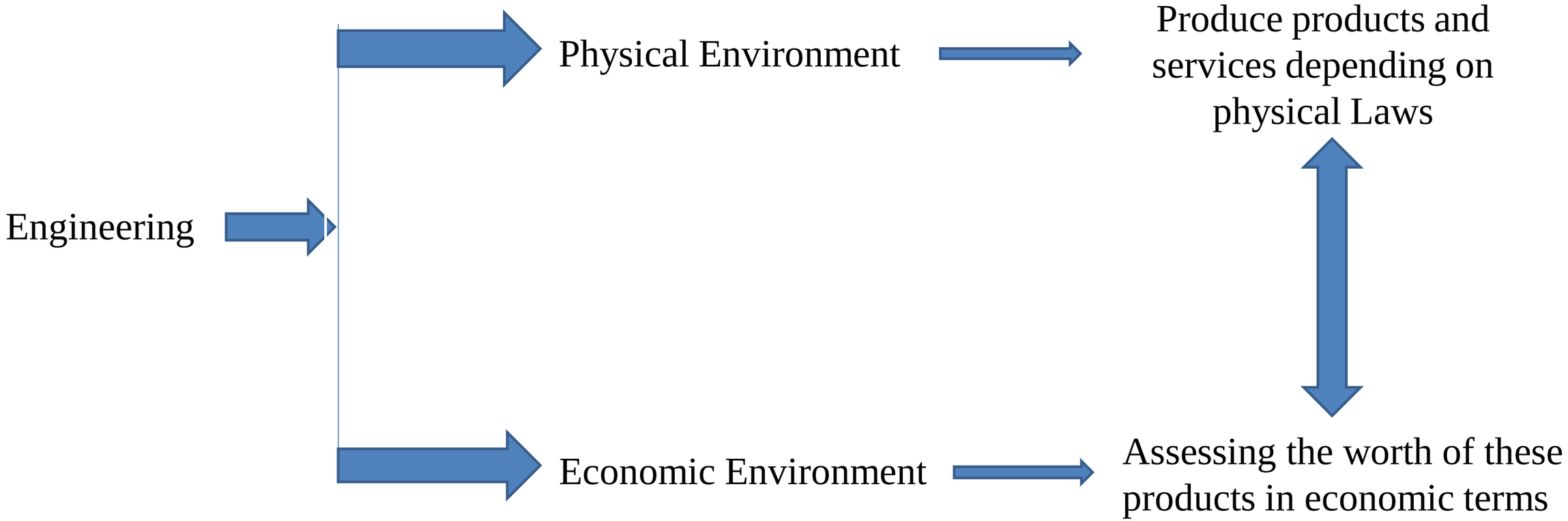
WHAT IS ENGINEERING ECONOMICS?

- Engineering Economics is about making decisions.

- Engineering Economics assesses the appropriateness of a given project, estimates its value, and justifies it from an engineering standpoint.

- Engineering Economics is the application of economic techniques to the evaluation of design and engineering alternatives.

HOW ENGINEERING IS COMPOSED OF PHYSICAL AND ECONOMIC COMPONENTS



PRINCIPLES OF ENGINEERING ECONOMY

1. Develop the Alternatives
   Creativity and innovation are essential to the process
   The alternatives need to be identified and then defined for subsequent analysis
   Consider the status quo, but do not focus on it(i.e., doing nothing)
2. Focus on the Differences
   Only the differences among alternatives are relevant to comparison and decision
3. Use a Consistent Viewpoint (perspective)
4. Use a Common Unit of Measure
   Use it for enumerating as many possible outcomes as possible, since it simplifies the analysis of alternatives
5. Consider All Relevant Criteria
   Consider both those that can be measured in monetary terms and "non-monetary" criteria
6. Make Uncertainty Explicit
7. Revisit Your Decisions: compare initial projected outcomes with actual results achieved

COST ANALYSIS

- Cost analysis assumes a great significance in all major business decisions because the term ‘cost’ has different meaning under different settings and is subject to varying interpretations.

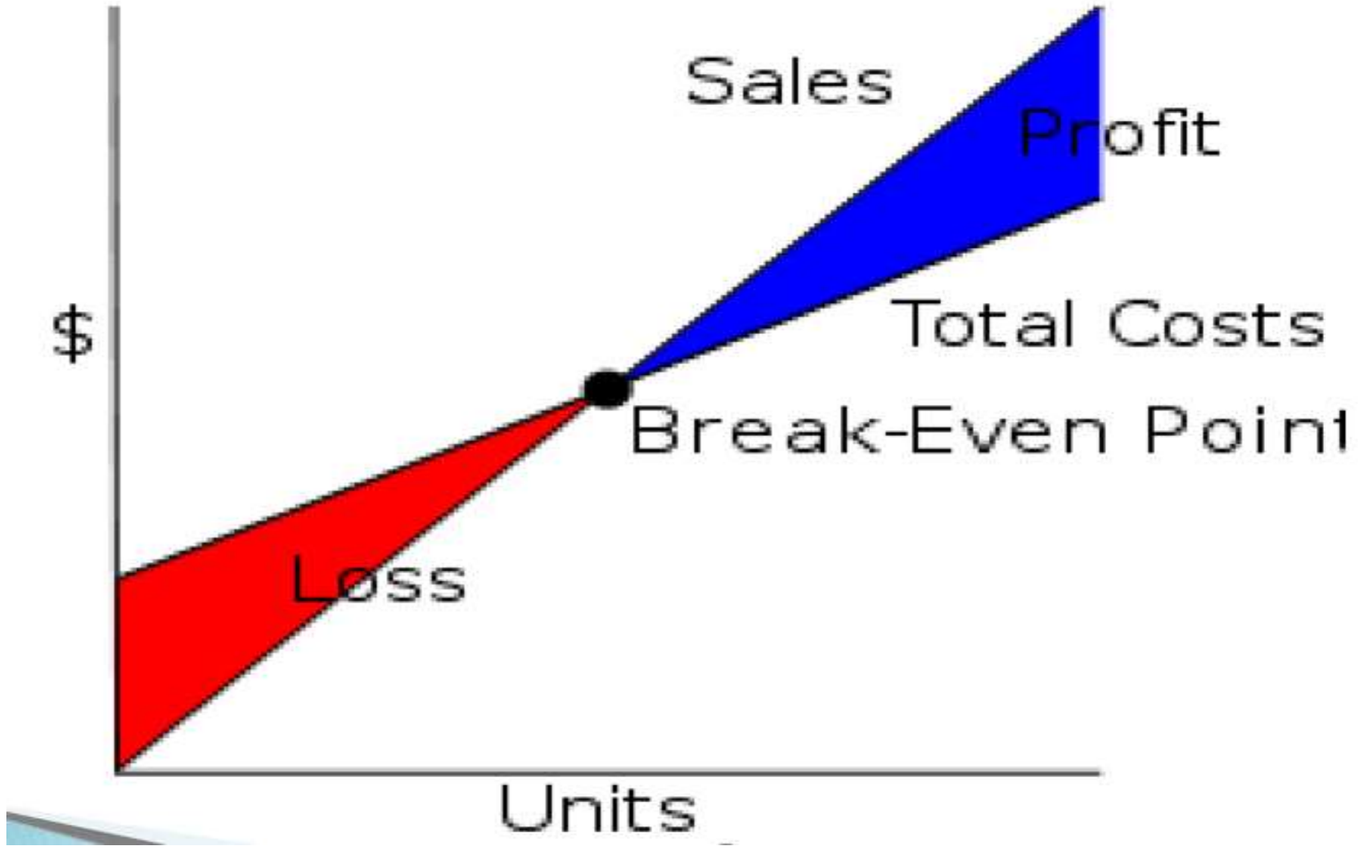
- The analysis cost is an important factor in almost all business analysis and business decision making like :-

a) locating the weak points in the production management.
b) Minimizing the cost.
c) Finding the optimum level of output
d) Determining price and dealers; margins.
e) Estimating or projecting the cost of operation.

BREAKEVEN ANALYSIS

- A breakeven analysis is used to determine how much sales volume your business needs to start making a profit.
- The breakeven analysis is especially useful when you're developing a pricing strategy, either as part of a marketing plan or a business plan.
- In economics & business, specifically cost accounting, the break-even point (BEP) is the point at which cost or expenses and revenue are equal: there is no net loss or gain, and one has "broken even".
- Total cost = Total revenue = B.E.P.

BREAK – EVEN POINT



BREAK EVEN ANALYSIS

In order to calculate how profitable a product will be, we must firstly look at the Costs Price and Revenue involved.

There are two basic types of costs a company incurs.

- Variable Costs
- Fixed Costs

Variable costs are costs that change with changes in production levels or sales.
Examples include: Costs of materials used in the production of the goods.

Fixed costs remain roughly the same regardless of sales/output levels. Examples include: Rent, Insurance and Wages

Unit Price:
The amount of money charged to the customer for each unit of a product or service.

Total Cost:
The sum of the fixed cost and total variable cost for any given level of production.
(Fixed Cost + Total Variable Cost)

Total Variable Cost:
The product of expected unit sales and variable unit cost.
(Expected Unit Sales * Variable Unit Cost)

Total Revenue:
The product of expected unit sales and unit price.
(Expected Unit Sales * Unit Price)

Profit/ loss:
The monetary gain or loss resulting from revenues after subtracting all associated costs.
(Total Revenue - Total Costs)

ASSUMPTIONS

1. All elements of cost i.e. production, administration and selling distribution can be divided into fixed and variable components.
2. Variable costs remain constant per unit of output.
3. Fixed cost remain constant at all volume of output.
4. Selling price per unit remains unchanged or constant at all levels of output.
5. Volume of production is the only factor that influences cost.
6. There will be no change in the general price level.
7. There is one product and in case of multi product, the sales remain constant.

COMPUTATION

- The break-even point (in terms of Unit Sales (X)) can be directly computed in terms of Total Revenue (TR) and Total Costs (TC) as:

$$
\begin{aligned}
TR &= TC \\
P \times X &= TFC + V \times X \\
P \times X - V \times X &= TFC \\
(P - V) \times X &= TFC \\
X &= \frac{TFC}{P - V}
\end{aligned}
$$

Here;
TFC is Total Fixed Costs,
P is Unit Sale Price, and
V is Unit Variable Cost

- The quantity (P – V) is of interest in its own right, and is called the Unit Contribution Margin (C): it is the marginal profit per unit, or alternatively the portion of each sale that contributes to Fixed Costs

EXAMPLE

For example, suppose that your fixed costs for producing 100,000 product were 30,000 Rs a year.

- Your variable costs are 2.20 Rs materials, 4.00 R.s labor, and 0.80 Rs overhead, for a total of 7.00 R.s per unit.
- If you choose a selling price of 12.00 Rs for each product, then:
- BEP= TFC/P-V
- 30,000(TFC) divided by [12.00(P) - 7.00(V)] equals 6000 units.

This is the number of products that have to be sold at a selling price of 12.00 Rs before your business will start to make a profit.

EXAMPLE

For example, if it costs R.s. 50 to produce a pen, and there are fixed costs of R.s.1,000, the break-even point for selling the widgets would be:

- If selling for R.s. 100: 20 Widgets (Calculated as 1000/(100-50)=20)
- If selling for $200: 20 Widgets (Calculated as 1000/(200-50)=6.7)

From this we can make out that the company should sell products at higher price to reach BEP faster.

MARGIN OF SAFETY

Margin of safety represents the strength of the business. It enables a business to know what is the exact amount it has gained or lost and whether they are over or below the break even point.

- Margin of safety = (current output - breakeven output)

OR

- Margin o safety = actual sales – BEP sales
- Margin of safety% = (current output - breakeven output)/current output × 100

USES OF BREAK EVEVN POINT

1. Helpful in deciding the minimum quantity of sales
2. Helpful in the determination of tender price.
3. Helpful in examining effects upon organization’s profitability.
4. Helpful in deciding about the substitution of new plants.
5. Helpful in sales price and quantity.
6. Helpful in determining marginal cost.

LIMITATIONS

1. Break-even analysis is only a supply side (costs only) analysis, as it tells you nothing about what sales are actually likely to be for the product at these various prices.

2. It assumes that fixed costs (FC) are constant

3. It assumes average variable costs are constant per unit of output, at least in the range of likely quantities of sales.

4. It assumes that the quantity of goods produced is equal to the quantity of goods sold (i.e., there is no change in the quantity of goods held in inventory at the beginning of the period and the quantity of goods held in inventory at the end of the period.

5. In multi-product companies, it assumes that the relative proportions of each product sold and produced are constant.

CONCLUSION

- A company should determine its break even point before selling its products.
- In order to know how price your product, you first have to know how to calculate breakeven point.
- Break-even analysis is a supply side analysis; that is it only analyzes the costs of the sales.
- It does not analyze how demand may be affected at different price levels.

DEPRECIATION

- Depreciation is the decrease in value of the asset over time, through wear, deterioration or obsolescence.
- Obsolescence occur when the asset is no longer technologically superior to available alternatives.
- Book Value is the difference between its original costs and the total amount of depreciation that has been charged to date.
- Market Value is the amount of money that could be obtained for the asset if it were sold in the market.

DEPLETION

Depletion is applicable to natural recourses which when removed can not be re-purchased as can a machine or building.

Depletion is based on the level of activity or usage, not time as in depreciation.

The depletion charge is calculated as follows:

$$d_m = \frac{Initial\ investment}{Resource\ capacity}$$

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Thank you!

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