

### **3. Engineering Economic Analysis**

Engineering Economics is a specific knowledge area of economics focused on engineering projects. Industrial engineers need to understand economic viability of any potential problem solution.

#### **3.1. Value and Utility**

- 3.1.1. Understand the difference between value and utility in economics
- 3.1.2. Understand relationship between value and utility and its importance in economics

#### **3.2. Classification of Cost**

- 3.2.1. Understand costs to properly compare engineering alternatives
- 3.2.2. First cost
- 3.2.3. Fixed and variable cost
- 3.2.4. Incremental and marginal cost
- 3.2.5. Sunk cost

#### **3.3. Interest and Interest Formulas**

- 3.3.1. Time value of money
- 3.3.2. Equivalence involving interest

#### **3.4. Cash Flow Analysis**

- 3.4.1. Present worth
- 3.4.2. Annual equivalent
- 3.4.3. Future worth
- 3.4.4. Capitalized worth
- 3.4.5. Benefit-cost ratio
- 3.4.6. Payback periods
  - 3.4.6.1. Payback period
  - 3.4.6.2. Discounted payback period
- 3.4.7. Rate of returns
  - 3.4.7.1. Internal rate of return
  - 3.4.7.2. External rate of return

#### **3.5. Financial Decision Making Among Alternatives**

- 3.5.1. Proposal types
- 3.5.2. Decision criteria for alternatives
- 3.5.3. Decision criteria under limited funds
- 3.5.4. Methods
  - 3.5.4.1. Ranking methods
    - 3.5.4.1.1. Present worth
    - 3.5.4.1.2. Annual worth
    - 3.5.4.1.3. Future worth
    - 3.5.4.1.4. Capitalized worth

- 3.5.4.2. Incremental method
  - 3.5.4.2.1. Internal rate of return (IRR)
  - 3.5.4.2.2. External rate of return (ERR)
  - 3.5.4.2.3. Benefit-cost ratio
- 3.6. Replacement Analysis**
  - 3.6.1. Decision criteria for making replacement decisions
  - 3.6.2. Determining the economic life of an asset
- 3.7. Break-Even and Minimum Cost Analysis**
  - 3.7.1. Evaluating two alternatives
  - 3.7.2. Evaluating multiple alternatives
- 3.8. Evaluation of Public Activities**
  - 3.8.1. General welfare of public interests
  - 3.8.2. Financing public activities
  - 3.8.3. Benefit-cost analysis
  - 3.8.4. Identifying benefits, dis-benefits, and cost
- 3.9. Accounting and Cost Accounting**
  - 3.9.1. General accounting
  - 3.9.2. Cost accounting
  - 3.9.3. Allocation of overhead
- 3.10. Depreciation and Depreciation Accounting**
  - 3.10.1. Types of depreciation
  - 3.10.2. Consuming assets
  - 3.10.3. Depreciation methodologies
  - 3.10.4. Depletion
  - 3.10.5. Capital recovery
- 3.11. Income Taxes in Economic Analysis**
  - 3.11.1. Profit and income taxes
  - 3.11.2. Individual income taxes
  - 3.11.3. Corporate income taxes
  - 3.11.4. Depreciation and income taxes
  - 3.11.5. Depletion and income taxes
- 3.12. Estimating Economic Elements**
  - 3.12.1. Cost estimating methods
  - 3.12.2. Service life estimation
  - 3.12.3. Judgment in estimating
- 3.13. Estimates and Decision Making**
  - 3.13.1. Estimating economic benefits
  - 3.13.2. Judgments in estimating

### **3.14. Decision Making Involving Risk**

- 3.14.1. Probabilistic methods related to decision making
- 3.14.2. Decision trees

### **3.15. Decision Making Under Uncertainty**

- 3.15.1. Methods related to decision making in the absence of meaningful data
- 3.15.2. Payoff matrix
- 3.15.3. Laplace rule
- 3.15.4. Maximin and maximax rules
- 3.15.5. Hurwicz rule
- 3.15.6. Minimax regret rule

### **3.16. Analysis of Construction and Production Operations**

- 3.16.1. Critical path (see Operations Engineering & Management knowledge area)
- 3.16.2. Geographic location
- 3.16.3. Economic operation of equipment
- 3.16.4. Variable demand

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*Fundamentals of Engineering Economic Analysis*. White, John A., Grasman, Kellie S., Case, Kenneth E., Needy, Kim L., and Pratt, David B. Wiley, 1<sup>st</sup> Edition. 2013.

*Contemporary Engineering Economics*. Park, Chan S. Pearson, 6<sup>th</sup> Edition. 2015.

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