

## **Engineering Economics**

### **Course Objective:**

After completing this course, students will be able to conduct simple economic studies. They will also be able to make evaluation of engineering projects and make decisions related to investment.

### **1. Introduction [3 hours]**

- 1.1.Origin of Engineering Economy
- 1.2.Principles of Engineering Economy
- 1.3.Role of Engineers in Decision Making
- 1.4.Cash Flow Diagram.

### **2. Interest and Time Value of Money [6 hours]**

- 2.1.Introduction to Time Value of Money
- 2.2.Simple Interest
- 2.3.Compound Interest
  - 2.3.1.Nominal Interest rate
  - 2.3.2.Effective Interest rate
  - 2.3.3.Continuous Compounding
- 2.4.Economic Equivalence
- 2.5.Development of Interest Formulas
  - 2.5.1.The Five Types of Cash flows
  - 2.5.2.Single Cash flow Formulas
  - 2.5.3.Uneven Payment Series
  - 2.5.4.Equal Payment Series
  - 2.5.5.Linear Gradient Series.
  - 2.5.6.Geometric Gradient Series.

### **3. Basic Methodologies of Engineering Economic Analysis [8 hours]**

- 3.1.Determining Minimum Attractive (Acceptable) Rate of Return (MARR).
- 3.2.Payback Period Method
- 3.3.Equivalent Worth Methods
  - 3.3.1.Present Worth Method
  - 3.3.2.Future Worth Method.
  - 3.3.3.Annual Worth Method.
- 3.4.Rate of Return Methods
  - 3.4.1.Internal Rate of Return Method.
  - 3.4.2.External/Modified Rate of Return Method.
- 3.5.Public Sector Economic Analysis (Benefit Cost Ratio Method).
- 3.6.Introduction to Lifecycle Costing
- 3.7.Introduction to Financial and Economic Analysis

### **4. Comparative Analysis of Alternatives [6 hours]**

- 4.1.Comparing Mutually Exclusive Alternatives having Same useful life by
  - 4.1.1.Payback Period Method and Equivalent Worth Method
  - 4.1.2.Rate of Return Methods and Benefit Cost Ratio Method
- 4.2.Comparing Mutually Exclusive Alternatives having different useful lives by
  - 4.2.1.Repeatability Assumption
  - 4.2.2.Co-terminated Assumption
  - 4.2.3.Capitalized Worth Method
- 4.3.Comparing Mutually Exclusive, Contingent and Independent Projects in Combination.

## 5. Replacement Analysis: [6 hours]

### 5.1.Fundamentals of Replacement Analysis

#### 5.1.1.Basic Concepts and Terminology

#### 5.1.2.Approaches for Comparing Defender and Challenger

### 5.2.Economic Service Life of Challenger and Defender

### 5.3.Replacement Analysis When Required Service Life is Long.

#### 5.3.1.Required Assumptions and Decision Framework

#### 5.3.2.Replacement Analysis under the Infinite Planning Horizon

#### 5.3.3.Replacement Analysis under the Finite Planning Horizon

## 6. Risk Analysis [6 hours]

### 6.1.Origin/Sources of Project Risks.

### 6.2.Methods of Describing Project Risks.

#### 6.2.1.Sensitivity Analysis

#### 6.2.2.Breakeven Analysis

#### 6.2.3.Scenario Analysis

### 6.3.Probability Concept of Economic Analysis

### 6.4.Decision Tree and Sequential Investment Decisions

## 7. Depreciation and Corporate Income Taxes [6 hours]

### 7.1.Concept and Terminology of Depreciation

### 7.2.Basic Methods of Depreciation

#### 7.2.1.Straight line method

#### 7.2.2.Declining Balance Method

#### 7.2.3.Sinking Fund Method,

#### 7.2.4.Sum of the Year Digit Method

#### 7.2.5.Modified Accelerated Cost Recovery System (MACRS)

### 7.3.Introduction to Corporate Income Tax.

### 7.4.After Tax Cash flow Estimate.

### 7.5.General Procedure for Making After Tax Economic Analysis.

## 8. Inflation and Its Impact on Project Cashflows. [4 hours]

### 8.1.Concept of Inflation.

### 8.2.Measuring Inflation

### 8.3.Equivalence Calculation Under Inflation

### 8.4.Impact of Inflation on Economic Evaluation

## Tutorials:

### 1.Assignments,

### 2.Quizzes and 1 Case study.

## References:

1.Chan S. Park, Contemporary Engineering Economics, Prentice Hall, Inc.

2.E. Paul De Garmo, William G. Sullivan and James A. Bontalini, Engineering Economy, MC Milan Publishing Company.

3.James L. Riggs, David D. Bedworth and Sabah U. Randhawa, Engineering Economics, Tata McGraw Hill Education Private Limited.