ENGINEERING ECONOMICS

ENCE 307

Lecture : 3 **Year : III**
Tutorial : 1 **Part : I**
Practical : 0

Course Objectives:
The objective of this course is to provide concept of economic principles and the economic environment at the project, firm, societal, and national levels, enabling them to analyze cause-and-effect relationships. The course aims to equip students with the ability to apply economic theories and tools for project selection, equipment replacement, property valuation, and price variation. By the end of the course, students will be able to evaluate alternatives and make informed, economically sound decisions in engineering and business contexts.

1 Introduction (2 hours)

1.1 Micro, macro and engineering economics (History, fundamental principle and application)
1.2 Terminology related to engineering economics
1.3 Economic decision and role of engineers in decision making
1.4 Cash flow and cash flow diagram

2 Market Economics (3 hours)

2.1 Market, demand, supply and relationship
2.2 Elasticity, application of elasticity and government policies
2.3 Externality and market inefficiency
2.4 Market failure and firm behavior

3 Cost (8 hours)

3.1 Cost classification
  3.1.1 Total, average, fixed, variable, and marginal costs
  3.1.2 Direct, indirect, and standard costs
  3.1.3 Cash versus book cost, manufacturing and non-manufacturing cost
  3.1.4 Sunk cost, opportunity cost, element of cost, life-cycle cost
3.2 Cost estimation and control

4 Time Value of Money (6 hours)

4.1 Money (Type, functions and time value of money)
4.2 Simple and compound interests (Nominal, effective and continuous compounding)

4.3 Economic equivalence
4.4 Cash flow types (Single, uniform, linear gradient, geometric gradient and irregular)

5 Methods of Economic Analysis (12 hours)

5.1 Capital budgeting
5.2 Minimum attractive rate of return (MARR)
5.3 Economic analysis of single and multiple projects
  5.3.1 Payback period (Simple and discounted)
  5.3.2 Equivalent worth (Net present, annual, future and capitalized)
  5.3.3 Rate of return (Internal and external)
  5.3.4 Public Sector economic analysis (Benefit cost analysis)
  5.3.5 Financial and economic analysis
5.4 Weighted average cost of capital (WACC)
5.5 Repeatability assumption and co-Terminated assumptions
5.6 Multiple investment project alternatives (Dependent, independent and contingent)

6 Replacement Analysis (5 hours)

6.1 Replacement strategies (Asset life and selection of challengers over defenders)
6.2 Economic service life of an asset
6.3 Replacement strategy for asset (Project with finite and infinite planning horizon)

7 Risk Analysis (5 hours)

7.1 Origin of risk in projects
7.2 Risk analysis of projects (Sensitivity, breakeven and scenario analyses)
7.3 Decision tree

8 Depreciation and Taxes (5 hours)

8.1 Concept and terminology
8.2 Depreciation calculation (Straight line, declining balance, sinking fund, sum of the year digit and modified accelerated cost recovery methods)
8.3 Tax and corporate income tax
8.4 Economic analysis (After-tax cash flow)

9 Measurement of Nation Income (5 hours)

9.1 Gross domestic product (Components, real and nominal gross domestic product)
9.2 Unemployment (Measurement, job search, minimum wage law)

9.3 Inflation
- 9.3.1 Causes, effects and measurement of inflation
- 9.3.2 Constant and current cash flow
- 9.3.3 Equivalence calculation under inflation
- 9.3.4 Inflation controlling measures

9.4 Real and nominal exchange rates, fiscal budget and monetary policy

9.5 Financial statement

Tutorial **(15 hours)**

1. Cash flow diagram construction, apply and analyze it for different projects
2. Problems related to market equilibrium, elasticity, and government policies
3. Exercises on calculating interests, and analyze cash flows with economic equivalence
4. Application of capital budgeting techniques for given cash flows
5. Selection of best replacement strategies and also, apply risk analysis for real case
6. Computation of after-Tax cash flow for economic analysis
7. Calculation and analysis of gross domestic product, performing equivalence calculations under different inflation scenarios, analyze real and nominal exchange rates
8. Calculation of price variation and price escalation
9. Summarize the fiscal budget

Final Exam

The questions will cover all the chapters in the syllabus. The evaluation scheme will be as indicated in the table below:

Chapter	Hours	Mark distribution*
1	2	3
2	3	5
3	2	3
4	6	8
5	12	16
6	5	6
7	5	6
8	5	8
9	5	5
Total	**45**	**60**

* There may be minor deviation in marks distribution.

References

1. Mankiw, N. G. (2017). Principles of economics (8th ed.). Cengage Learning.
2. Park C.S. (2016). Contemporary Engineering Economics: Prentice Hall, Inc.
3. McConnell, C. R., Brue, S. L., Flynn, S. M. (2020). Economics: Principles, problems, and policies (22nd ed.). McGraw-Hill Education.