CHEMICAL PLANT DESIGN AND ECONOMICS

Course Code: 19CH1119

L	T	P	C
2	0	0	2

Course Outcomes: At the end of the Course, the Student will be able to

CO1: Recognize the economic implications involved in developing a plant design project.

CO2: Analyze variety of designs for a process by securing all pertinent information through different sources.

CO3: Identify the importance of capital Investment, Interest rate and its types.

CO4: Apply the principles of accounting for successful plant design

CO5: Calculate different investment alternatives, in terms of their profitability to choose the most economical among them.

UNIT-I **6 Lectures**

Introduction, Process Design development, Types of designs, comparison of different processes by technical factors, raw materials, by-products, plant location, equipment, time factor and process considerations.

Learning Outcomes: After the completion of the Unit I, the student will be able to

1. Explain the general design considerations including safety and Hazard treatment for process plants(L2)
2. Analyse the significance of project development parameters.(L4)
3. Explain the importance of technical factors, raw materials and plant location. (L2)

UNIT-II **8 Lectures**

General design considerations, Cost and asset accounting. Cash flow for industrial operations

Learning Outcomes: After the completion of the Unit II, the student will be able to

1. Outline costs involved in process Industries (L4)
2. Analyse the cash flow for industrial operations. (L4)
3. Evaluate different types of costs involved in process Industries.(L5)

UNIT-III **12 Lectures**

Cash flow for industrial operations, factors affecting investment and production cost, capital investments, estimation of capital investments, cost indices, cost factors in capital investment. Organizations for presenting capital investment: estimates by compartmentalization, estimation of total product of cost direction, production costs, fixed charges, plant overhead costs, financing.

Interest and investment cost, types of interests, nominal and effective interest rates, continuous interest, present worth and discount, annuities, cost due to interest on investment, source of capital.

Learning Outcomes: After the completion of the Unit III, the student will be able to

1. Evaluate product cost based on various costs involved in process industries.(L5)
2. Classify different types of interest.(L4)
3. Evaluate net present worth and discount annuities.(L5)

UNIT-IV **10 Lectures**

Taxes and insurances, type of taxes: federal income taxes, insurance-types of insurance, self insurance.

Depreciation: types of depreciation, service life, salvage value, present value, methods for determining depreciation, single unit and group depreciation

Learning Outcomes: After the completion of the Unit IV, the student will be able to

1. Explain different types of taxes.(L2)
2. Calculate the depreciation using various methods.(L3)
3. Evaluate net present asset value.(L5)

UNIT-V **14 Lectures**

Profitability, alternative investments and replacements: Profitability standards, discounted cash flow, capitalized cost, pay out period, alternative investments, analysis with small investment increments and replacements.

Optimum design and design strategy, incremental cost, general procedure for determining optimum condition, comparison of graphical and analytical methods, optimum production rates, semi continuous cyclic operation, fluid dynamics, mass transfer.

Learning Outcomes: After the completion of the Unit V, the student will be able to

1. Analyse alternate investments along with the reason for replacements and replacement policy.(L4)
2. Evaluate Payout time based on cash flow and income.(L5)
3. Explain the various design strategies including optimization of independent variables.(L2)

Text Book:

Peters. M.S. and Timmerhaus, K.D., "Plant Design and Economics for Chemical engineering", 4th Edition, McGraw Hill, Singapore, 1991.

References:

1. Schweyer. H.E., "Process Engineering Economics", McGraw Hill, 1st edition, New York, 1955.
2. Edgar T.F. and Himmelblau D.M., "Optimization of Chemical Processes" 2nd edition, McGraw Hill, International editions, Chemical Engineering series, 2001.