



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering Syllabus

Subject Code : 3154405

Subject Name : Chemical Process Plant Design and Economics

WEF Academic Year :	2021-22
Semester :	5
Category of the Course :	Humanities and Social Science

Prerequisite : Basic Concepts of material and energy balance, unit process and operations, and chemical technology.

Rationale : This program integrates the principles of engineering and economics, specifically focusing on chemical process and plant design. It emphasizes the decision making process involved in creating and evaluating chemical processes and their options. The course aims to encourage chemical engineers to synergize fundamental technical knowledge from their prior studies with real-world economic considerations, business methodologies, organizational insights, as well as safety, environmental, and sociological concerns. The ultimate goal is to enable the design of comprehensive and interconnected chemical process plants.

Course Scheme :

Teaching Scheme			Total Credits	Assessment Pattern and Marks				Total Marks
L	T	PR	C	Theory		Practical		
				ESE (E)	PA(M)	ESE (V)	PA (I)	
3	0	0	3	70	30	0	0	100

Course Content :

Sr. No.	Course Content	No. of Hours	% of Weightage
1	Introduction and Process design aspects : Basic design, optimization, selection of process-factors affecting process selection. Types of project design, Importance of Laboratory development pilot plant, safety factors, types of flow diagrams.	6	12
2	Selection of process equipments : Standard versus special equipment-material of construction for process equipments, selection criteria, and specification sheets.	4	10
3	Process auxiliaries and Process utilities : Piping design, layout, and supports for piping insulations. Pipe fittings, types of valves, selection of valves, process control and instrumentation control system design. Process water, boiler feed water, water treatment, waste treatment and disposal, disposal, steam, oil heating system, chilling plant, compressed air and vacuum.	7	16



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4	Plant location and layout : Factors affecting plant location, factors in planning layouts, principles of plant layout, Unit plot plan, vertical and horizontal lay out.	4	10
5	Cost estimation : Cash flow and cumulative factors affecting estimation of investment and production cost, breakeven point and its significance, total capital investment, fixed and working capital investment & their estimations, type of estimates, cost indexes, method for estimating capital investment. Simple and compound interest.	7	16
6	Estimation of total product cost : manufacturing cost, general expenses, Manufacturing cost: direct production cost, fixed charges, plant overhead cost.	5	12
7	Depreciation : Types of depreciation, Method for determining depreciation: straight line method, decline balance method, sum of the year digit method, shrinking fund method etc., single unit and group depreciation, adjustment of depreciation account, evaluation of depreciation methods	6	12
8	Profitability, alternative investments and replacement : Methods for profitability evaluation, Evaluation of Break Even Point, % rate of return, Practical factors in alternative investment and replacement Studies.	6	12

Reference Book :

1. Smith, R., Chemical Process: Design and Integration, John Wiley and Sons, West Sussex, UK (2005).
2. Peters, Max S., K.D. Timmerhaus and R.E. West, Plant Design and Economics for Chemical Engineers (5th Ed), McGraw-Hill International Editions (Chemical Engineering Series), New York, USA (2003).
3. Coulson and Richardson's Chemical Engineering, Vol. 6: Chemical Engineering Design. By R.K. Sinnott, Butterworth-Heinemann, Oxford, 3rd, Ed., 1999, 1994.

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