GUJARAT TECHNOLOGICAL UNIVERSITY
Master of Engineering, Chemical (Computer Aided Process Design)
Subject Code - 3721616
Semester II
Subject Name: Process Plant Design and Flow sheeting

Type of course: Program Elective –IV

Prerequisite: Knowledge of Plant design and flowsheets at Under Graduate level and basic fundamentals of Chemical Engineering

Rationale: This subject deals with Process plant design including economic and optimum design associated with the entire Plant design. The subject also covers details of flow sheeting and details related to flow sheeting.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	0	3	70	30	0	0	100

Syllabus Content:

Sr. No.	Content	Total Hrs
1	Introduction, Basic concepts: Process design development and Layout of plant items General design considerations, ,	7
2	Economic aspects and Optimum design, Practical considerations in design and engineering ethics, PERT/CPM, Direct and Indirect costs, Optimum scheduling and crashing of activities	8
3	Analysis of Cost estimation Factors affecting Investment and production costs, Estimation of capital investment and total product costs, Interest, Time value of money, Taxes and Fixed charges,	9
4	Depreciation: Methods of calculating depreciation, Profitability, Alternative investments and replacements	8
5	Optimum Design and Design Strategy: Break-even analysis, Optimum production rates in plant operation, Optimum batch cycle time applied to evaporator and filter press, Economic pipe diameter, Optimum insulation thickness, Optimum cooling water flow rate and optimum distillation reflux ratio.	9
6	Flow sheeting: Introduction, Symbols, Flowsheet presentation with examples, Manual flowsheet calculation, Constrains and their applications in flowsheet calculations, Types of flow sheets, Synthesis of steady state flow sheet, Flow sheeting software.	7
7	Flowsheet applications, P & I D development, typical stages of P & I D, Applications of P & I D in design stage, Applications of P & I D in HAZOPS and Risk analysis	3

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
5	**25**	**15**	**10**	**10**	**5**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. Peters, M.A. and Timmerhaus, K.D., Plant Design and Economics for Chemical Engineers, McGraw Hill
2. Anil Kumar, Chemical Process Synthesis and Engineering Design, Tata McGraw Hill
3. Ernest E. Ludwig, Applied Process Design for Chemical and Petrochemical Plants, Vol.- I Gulf Publishing Company, Houston.
4. Ulrich, G.D., A Guide to Chemical Engineering Process Design and Economics, John Wiley & Sons

Course Outcomes:

Sr. No.	CO statement	Marks % weightage
CO-1	Understand the Process design development and Layout of plant items	15%
CO-2	Evaluating Cost estimation Factors affecting Investment and production costs, Estimation of capital investment and total product costs	25%
CO-3	Understand depreciation, profitability, replacements studies etc.	20%
CO-4	Understand Optimum design strategy and various terms and methods associated with it	20%
CO-5	Understand the input/output structure of a flowsheet for a given manufacturing unit, Synthesize and design flowsheet sub-systems	20%

List of Open Source Software/learning website:

https://nptel.ac.in/courses/103103039/40