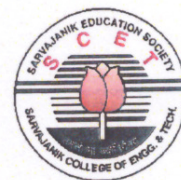




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Sarvajanic College of Engineering and Technology



Bachelor of Technology (B.Tech)

B E III Year: SEM-VII

Subject Name: Chemical Engg Plant Design and Economics **Subject Code:** BTCH13704

Type of course: Professional Core Courses

Prerequisite: Basic Calculations in Chemical Engineering, Fluid flow operation, Unit process and Chemical technology

Rationale: This course is required for the future professional career where it deals with economics involved in the process industries and in design work since applied economics and plant design is directly related to the practical application of chemical engineering principles.

Teaching Scheme:

TEACHING SCHEME				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	
2	0	0	2	60	15	25	0	0	100

CA1: Continuous Assessment (assignments/projects/open book tests/closed book tests) **CA2:** Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems **TEE:** Term End Examination **TEP:** Term End Practical Exam (Performance and viva on practical skills learned in course) **CA3:** Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course

Contents:

Sr. No.	Topics	Teaching Hrs	Module %Weightage
1.	Introduction: Basic considerations in chemical engineering plant design, optimization and feasibility of plant design.	2	6
2.	Process design aspects and Selection of process equipments: Selection of process-factors affecting process selection. Types of project design, Importance of Laboratory development pilot plant, safety factors, types of flow diagrams. Standard versus special equipment-material of construction for process equipments, selection criteria, and specification sheets.	3	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	4	12
4.	Plant location and layout: Factors affecting plant location, factors in planning layouts, principles of plant layout, use of scale models	3	10
5.	Cost estimation: Cash flow and cumulative cash position for industrial operations, 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.	4	12



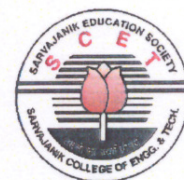
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6.	Estimation of total product cost Estimation of total product cost: manufacturing cost, general expenses, Manufacturing cost: direct production cost, fixed charges, plant overhead cost.	3	10
7.	Depreciation: Types of depreciation, Method for determining 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	3	10
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.	3	10
9.	Project Conception to Commissioning: milestones, Project execution as conglomeration of technical and non technical activities, contractual details. Contract: Meaning, contents, Types of contract. Lumpsum Turnkey (LSTK), Eng, Procurement and Construction (EPC), Eng, Procurement and Construction Management (EPCM). Mergers and Acquisitions Reading of Balance Sheets and evaluation of Techno-commercial Project Reports.	3	10
10.	Project management: Planning of project schedule by BAR CHART, Inventory control scheduling a project using CPM/PERT methods.	3	10

Suggested Specification Table with Marks (Theory):

%Distribution of Theory Marks for paper setting					
R Level	U Level	A Level	N Level	E Level	C Level
15	25	25	25	10	00

Legends: R: Remembrance; U: Understanding; A: Application; N: Analyze; 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.

Text books:

Sr. No.	Title of book /article	Author(s)	Publisher and details like ISBN	Year of publication	Publication Edition
1.	Plant Design and Economics for Chemical Engineers	Peters, Max S., K.D. Timmerhaus and R.E. West	McGraw-Hill International Editions (Chemical Engineering Series)	2003	5 th
2.	Chemical Project Economics	Mahajani, V.V	Macmillan Indian Ltd., New Delhi, India	3 rd	2005
3.	Process Plant Layout and Piping Design	Bausbacher E. and Hunt R.	Prentice Hall Publication	1993	1 st





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Reference books:

Sr. No.	Title of book /article	Author(s)	Publisher and details like ISBN	Year of publication	Publication Edition
1.	Chemical Engineering plant design	F.C. Vilbrandt & C.E. Dryden	McGraw Hill (New York)	1959	4 th
2.	Process Plant and Equipment Cost Estimation	Kharbanda O.P.	Macmillan Indian Ltd., New Delhi, India	2005	3 rd
3.	Industrial Engineering and Management	O. P. Khanna,	Dhanpat Rai & Sons	1985	7 th

Course outcomes: Students should be able to

Sr. No.	CO Statement After learning this subject, students will be able to	Marks % weightage
CO-1	Learn basic economic concept, to understand and apply this concepts in the project works undertaken and to chemical engineering situation by solving problem.	15
CO-2	Carry out the primary techno-economic feasibility of project and Select appropriate process for a project.	20
CO-3	Select and evaluate the impact of process auxiliaries and process utilities on the cost of project.	15
CO-4	Evaluate the project cost including capital investment, product cost, breakeven point, depreciation cost for equipment and the total project cost.	20
CO-5	Analyse profitability of the project based on the given alternate investment and replacement.	20
CO-6	Estimate and control the duration of project based on scheduling using PERT/CPM technique to achieve various milestones related to project concept to commissioning.	10

Mapping with POs:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO-1	3	3	2	3	2	1	2	2	3	3	2	3	2	2	3
CO-2	3	3	2	3	2	1	2	2	3	3	2	3	3	2	3
CO-3	3	3	3	3	2	1	2	2	3	3	2	3	2	2	3
CO-4	3	3	2	3	2	1	2	2	3	3	2	3	2	1	3
CO-5	3	3	3	3	2	1	2	2	3	3	2	3	2	2	3
CO-6	2	2	2	3	2	1	2	2	3	3	2	3	2	1	3
Rational e*	17	17	14	18	12	6	12	12	18	18	12	18	13	10	18

Rationale*: Explaining why it is matching this particular program outcome

List of Open learning website: <https://nptel.ac.in/courses/103105166>



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