

Subject Code: 01CH0704
Subject Name: Plant Design & Project Engineering
B.Tech. Year – IV (Semester VII)

Objective: The course is intended to make students understand the overall technical and economic aspects involved in the plant designing process.

Credits Earned: 2

Course Outcomes: After completion of this course, student will be able to:

1. Understand the economic aspects of equipment selection.
2. Understand the concept of capital investment and capital returns for chemical industry.
3. Apply the concepts to design a manufacturing plant.

Pre-requisite of course: Process Equipment Design-I, Heat Transfer, Mass Transfer.

Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	CSE	Internal (I)	Viva (V)	Term work (TW)	
2	0	0	2	50	20	30	25	25	150

Contents:

Unit	Topics	Contact Hours
1	Introduction: Basic considerations in Chemical Engineering Plant design, Identification – preliminary techno-economic feasibility.	2
2	Process Design Aspects: Selection of process factors affecting process selection, Types of project design, Importance of Laboratory development pilot plant, safety factors, types of flow diagrams.	3

3	Selection of Process Equipments: Standard v/s special equipments, material of construction for process equipments, selection criteria and specification sheets.	2
4	Process Auxiliaries and Process Utilities: Piping Design, layout, supports for piping insulations. Pipe fittings, types of valves, selection of valves, process control. Process water, boiler feed water, water treatment, waste treatment and disposal, steam, oil heating system, chilling plant, compressed air and vacuum.	4
5	Plant Location & Layout: Factors affecting plant location, factors in planning layouts, principles of plant layout, use of scale models.	2
6	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
7	Estimation of Total Product Cost: Estimation of total product cost: manufacturing cost, general expenses, Manufacturing cost: direct production cost, fixed charges, plant overhead cost.	2
8	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.	4
9	Profitability, Alternative Investments and Replacements: Methods for profitability evaluation, Evaluation of Break Even Point, % rate of return, Practical factors in alternative investment and replacement Studies.	2
10	Project Management: Planning of project schedule by BAR CHART, Inventory control scheduling a project using CPM/PERT methods.	3

	Total Hours	28
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Reference Text Books:

1. Introduction to Process Engineering & Economics – Max S. Peters / Klaus Timmerhaus, McGraw Hill Publications, 2002.
2. Chemical Engineering Design- R.K. Sinnott, Butterworth Heinmann, 2004.
3. Unit Operations in Chemical Engineering- Mc Cabe, Smith, Harriott.

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
40	30	15	10	5	-

Instructional Method:

- a. The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.
- b. The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.
- c. Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.
- d. Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory

Design Based Problems (DP)/ Open Ended project (OEP):

In the beginning of the session, subject faculty will allot an OEP / DP to the students. Students will be free to choose a topic of their choice which will be relevant to the

syllabus and they will either prepare a working model/ report / presentation / poster on their topic.

Online Web Resources:

- a. <http://nptel.ac.in/courses/103103029/>
- b. <https://nptel.ac.in/courses/103103039/40>