

# GUJARAT TECHNOLOGICAL UNIVERSITY

## CHEMICAL TECHNOLOGY (36)

**SUBJECT NAME: PROJECT & PLANT ENGINEERING**

**SUBJECT CODE: 2173611**

B.E. VII<sup>th</sup> SEMESTER

**Type of Course:** Chemical Technology

**Prerequisite:** should have studied departmental fundamental chemical engineering subjects in previous semesters. Basic knowledge of chemical engineering is required.

**Rationale:** The objective of this course is to provide a means to teach undergraduate chemical technology students the basic aspects of plant engineering and economic aspect related to early implementation of projects and their current practices.

**Teaching and Examination Scheme:**

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P		Theory Marks			Practical Marks			
				ESE (E)	PA (M)		PA(V)		PA (I)	
PA		ALA	ESE		OEP					
3	0	0	3	70	20	10	0	0	0	100

L-Lectures; T-Tutorial/TeacherGuidedStudentActivity;P-Practical;C-Credit;ESE-EndSemesterExamination; PA-Progressive Assessment, ALA- Active Learning Assignment, OEP- Open Ended project

**Content:**

Sr. No.	Topic	Teaching Hours	Module Weightage (%)
01	<b>Introduction</b> Meaning of project engineering, various stages of project implementation, general overall considerations in plant design, project identification.	4	7
02	<b>Process design aspects</b> Selection of process, factors affecting process selection. Importance of laboratory development pilot plant, scale up methods, safety factors, types of flow diagrams.	4	8
03	<b>Plant location and layout</b> Factors affecting plant location, factors in planning layouts, evaluation of techno-economic feasibility report, principles of plant layout, use of scale models.	8	15
04	<b>Process equipments &amp; Process utilities</b> Standard versus special equipment-material of construction for process Equipment's, selection criteria, and specification sheets. Process water, boiler feed water, water treatment, waste treatment and disposal, disposal, steam, oil heating system, chilling plant, compressed air and vacuum	8	15
05	<b>Project and Product Cost estimation</b> Cash flow for industrial operations, cumulative cash analysis break even analysis , cost indexes: Marshall and Swift equipment cost indexes, estimating equipment costs by	14	25

	scaling, total capital investment, fixed capital and working capital, types and methods for estimation of total capital investment, estimation of equipment cost Factors involved in project cost, factors affecting investment and Production costs, utilities cost, evaluation of product cost.		
<b>06</b>	<b>Depreciation</b> Types of depreciation, service life, salvage value and present value of assets. Methods of determining depreciation like straight-line method, declining-balance method. Sum-of-the-years-digits method, sinking-fund method. Single-unit and group depreciation, evaluation of depreciation methods.	8	16
<b>07</b>	<b>Profitability, alternative investments and replacement</b> Methods for profitability evaluation, rate of return on investment, practical factors in alternative investment and replacement studies.	4	7
<b>08</b>	<b>Project management</b> Planning of project schedule by bar chart, inventory control scheduling. A project using CPM/PERT methods.	4	7

#### Suggested Specification table with Marks (Theory):

Unit No	Unit Title	Distribution of Theory Marks (%)					Total
		R Level	U Level	A Level	N Level	E Level	
1	Introduction & Process design aspects, Plant location and layout	18	3	3	3	3	30
2	Process equipment's & Process utilities	7	2	2	2	2	15
3	Project and Product Cost estimation	15	3	3	2	2	25
4	Depreciation, Profitability, alternative investments and replacement, Project management	18	3	3	3	3	30

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

#### Reference Books:

1. M.S. Peters and K. D. Timmerhaus, "Plant Design and Economics for Chemical engineers", McGraw Hill 3rd edition.
2. F.C. Vibrandt and C.E. Dryden, "Chemical Engineering Plant Design", McGraw Hill Fifth edition.
3. Chemical project economics, Mahajani V. V. and Mokashi S. M.
4. Project Planning and Control with PERT & CPM. Dr. B.C. Punmia & K.K. Khandelwal- fourth edition -2002.

#### Course Outcomes:

This course on **Project and Plant Engineering** introduces the fundamental concepts, principles and applications of project planning and evaluation.

**Open Ended Project fields:-**

**Students are free to select any area of science and technology** based on chemical technology applications to define Projects.

**Some suggested projects are listed below:**

OEPs project reports for a particular chemical product.

Feasibility report, techno-commercial reports based on the knowledge of subject.

**List of Open Source Software/learning website:**

1. NPTEL Lectures
2. Literature available on internet
3. Literature available under R&D of chemical Industries
4. Research articles
5. Delnet

**ACTIVE LEARNING ASSIGNMENTS:** Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding financial aspect of the subject – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide.