

GUJARAT TECHNOLOGICAL UNIVERSITY

CHEMICAL ENGINEERING (05)

CHEMICAL PROCESS INDUSTRIES –II

SUBJECT CODE: 2140506

B.E. 4th SEMESTER

Type of course: Chemical Engineering.

Prerequisite: Basic Concept of Chemistry.

Rationale: The main objective of this subject is to study the basics of chemical processes take place in chemical industries and allied industries such as pharmaceuticals, dyes, etc. This subject provides knowledge regarding to the basic aspects of manufacturing of various chemicals.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P		Theory Marks			Practical Marks			
			ESE (E)	PA (M)		ESE (V)		PA (I)		
PA	ALA	ESE		OEP						
3	0	2	5	70	20	10	20	10	20	150

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1	Dyes and Intermediates: Classification of dyes according to constitution and application, various dyes such as Azo dyes, Anthroquione dyes, Triamyl dyes, dispersed dyes, Miscellaneous dyes such as azine, oxazines, thiazines, thiazoles, nitro dyes etc. Various dye intermediates and its manufacturing based on unit processes, Manufacturing Processes of Chrome blue black, H-acid, Koch acid, Vinyl sulphone, Wet dyes, Nitro benzene, Aniline, etc..	14	26
2	Drugs and Pharmaceuticals: Classification of various drugs and pharmaceuticals, Introduction of Antibiotics such as penicillin, streptomycin, erythromycin, Introduction of vitamins, Manufacturing processes of Aspirin, Vitamin-C, Insulin, Ascorbic acid, Barbitol & Phenol Barbitol.	14	26
3	Sugar, Paints, Pigments: Manufacturing of Sugar, Paints, different types of pigments such as white, blue, red, yellow, green, brown, etc. Varnishes, Industrial Coatings, printing inks, Polishes etc.	14	26
4	Fermentation industries : Industrial alcohol, absolute alcohol, beers, wines and liquors, Manufacturing of Butyl alcohol & Citric acid by Fermentation	12	22

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks				
R Level	U Level	A Level	N Level	E Level
20	20	20	10	0

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate 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. Shreve's Chemical Process Industries", George T. Austin, McGraw Hill Publication, 5th edition
2. "DRYDENS outlines of chemical technology for the 21st century", M Gopalarao & Marshal Sitting, pub East-West Press, 3rd edition

Course Outcome: After learning the course the students should be able:

1. To build a basic knowledge of the process carried out in chemical industry.
2. To review the practical importance and relevance of process takes place in chemical industry.
3. To be able to utilize the technological methods in problem solving in process plant.
4. To study about the salient features of the processes.
5. To build a bridge between theoretical and practical concepts used in industry.

List of Experiments and Open Ended Projects:

Minimum **5** practicals to be performed and remaining time should be allotted to open-ended projects / study reports / latest outcomes in technology study:-

1. In the beginning of the academic term, faculties will have to allot their students at least one Open-ended Project / Study Report / Latest outcome in technology.
2. Literature survey including patents and research papers of fundamental process
 - Design based small project **or**
 - Study report based on latest scientific development **or**
 - Technology study report/ modeling/ simulation/collection report **or**
 - Computer based simulation/ web based application/ analysis presentations of basic concept field which may help them in chemical engineering.
3. These can be done in a group containing maximum **three** students in each.
4. Faculties should cultivate problem based project to enhance the basic mental and technical level of students.
5. Evaluation should be done on **approach of the student on his/her efforts** (not on completion) to study the design module of given task.
6. In the semester student should perform **minimum 5** set of experiments and complete **one small open ended dedicated project** based on engineering applications. This project along with any performed experiment should be **EVALUATED BY EXTERNAL EXAMINER.**

PRACTICALS (ANY FIVE):

1.	To synthesis aspirin from salicylic acid.
2.	To determine % of vitamin – C in the given tablet.
3	Estimation of sulphamethoxazole in the given sample.
4.	Preparation of phenyl azo – β – Naphthol from aniline.
5.	Preparation of nitro benzene from benzene.
6.	To prepare mordant yellow dye.
7.	Preparation of fast green o dye. (dinitroso resorcinol)
8.	Preparation of disperse dye.
9.	To estimate the amount of diazepam in the given solution by non – aqueous titration method.
10.	Estimation of Cephalaxin in the given sample.

11.	Estimation of benzyl penicillin in the given sample.
12.	To study Alcohol Fermentation by <i>Saccharomyces cereviceae</i> (Baker's Yeast).
13.	Fermentative production of citric acid using the fungi <i>Aspergillus niger</i> .

Major Equipments:

Muffle Furnace, Laboratory Oven etc...

Open Ended Project fields:-

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

Some suggested projects are listed below:

- Preparation of various dyes and intermediate at laboratory scale and carry out its cost analysis.
- Pharmaceutical Product profile and its manufacturing process like aspirin, Cephalaxin, etc...

List of Open Source Software/learning website:

- 1) Literature available in any laboratory manual of Chemical Process Industries.
- 2) NPTEL
- 4) MIT Open course lecture available on Internet etc...

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – 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. The best three works should submit to GTU.