



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3131306

Sem-III

**SUBJECT: Unit Operations and Processes
in Chemical Industries**

Type of course: Applied Science

Prerequisite: None

Rationale: In order to combat the problem of industrial pollution the first step is to understand the various chemical processes taking place in an industry. More over it will be possible to identify the sources from which pollutants are originating and their probable characteristics.

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)	
4	0	2	5	70	30	30	20	150

Content:

Sr. No.	COURSE CONTENT	Total Hrs
1.	Unit Operations: Introduction to : Absorption and stripping, Adsorption and desorption, Distillation, Evaporation, Crystallisation, Liquid- Liquid extraction	10
1	Nitrification : Manufacturing process of Nitric Acid, process flow diagram, Sources of pollution, health & safety	04
2	Amination by Reduction Aniline:- Manufacturing process , flow diagram ,Sources of pollution, health & safety	06
3	Halogenation Monochloroacetic Acid, Ethylene Chloro hydrin, Vinyl Chloride:- Manufacturing process,process flow diagram ,Sources of pollution, health & safety.	06
4	Sulfonation and sulfation. Ethanol from Ethylene:- Manufacturing process ,process flow diagram ,Sources of pollution, health & safety.	04
5	Amination by ammonolysis. Hydrogen cyanide and Urea:- Manufacturing process ,process flow diagram ,Sources of pollution, health & safety	06
6	Oxidation:- Acetic Acid:- Manufacturing process, process flow diagram ,Sources of pollution, health & safety.	06
7	Hydrogenation:- Hydrogenation of cotton seed oil:- Manufacturing process ,process flow diagram ,Sources of pollution, health & safety, Methanol from carbon monoxide and hydrogen.	04
8	Esterification:- Ethyl Acetate, Vinyl Acetate and Cellulose Acetate:-Manufacturing process ,process flow diagram ,Sources of pollution, health & safety	06
9	Hydrolysis:- Furfural, Ethanol and Phenol:- Manufacturing process ,process flow diagram ,Sources of pollution, health & safety.	4



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Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
15	15	40			

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. Unit Processes and Organic Synthesis by P.H. Groggins
2. Chemical Engineering Processes by Dryden
3. Chemical Plant Technology by Shreeves
4. McCabe Smith, "Unit Operation in Chemical Engineering" 5th ed. McGraw Hill (1985)

Course Outcomes:

Sr. No.	CO statement	Marks % Weightage
CO-1	Identify unit operations & processes of chemical engineering processes.	15
CO-2	Understand the chemical engineering processes in chemical processes.	40
CO-3	Identify the sources of pollution in chemical engineering processes.	25
CO-4	Discuss health & safety related issues of chemical engineering processes.	20

List of Practical:

1. To perform the adsorption process using different adsorbent for given sample.
2. To perform the liquid- liquid extraction for given sample.
3. To perform the practical based on evaporation

Presentation based on:

1. Identification of sources of pollution and pollution potential in the unit process of Nitrification.
2. Identification of Sources of pollution and pollution potential in the unit process of Halogenation.
3. Identification of Sources of pollution and pollution potential in the unit process of Sulfonation.
4. Identification of Sources of pollution and pollution potential in the unit process of Oxidation.
5. Identification of Sources of pollution and pollution potential in the unit process of Hydrogenation.
6. Identification of Sources of pollution and pollution potential in the unit process of Esterification.
7. Identification of Sources of pollution and pollution potential in the unit process of Hydrolysis.