



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Diploma Engineering

Level: Diploma

Branch: Chemical Engineering

Subject Code: DI04005011

Subject Name: Chemical Process Technology-II

w.e.f. Academic Year:	2025-26
Semester:	4th
Category of the Course:	PCC

Prerequisite:	Foundational knowledge of chemical engineering calculations, unit operations, and unit processes is required.
Rationale:	The importance of this subject arises from the need of providing comprehensive and balanced understanding of essential link between chemistry and the chemical industry. It is vital to develop simple but meaningful flow diagram for each chemical product which a student can understand. This course develops skill for arranging and understanding treatment, reaction and separation steps in a flow diagram for variety of chemicals including natural products, pulp and paper product, fuel and industrial gases, fermentation products, pharmaceuticals, pesticides and many other products. Diploma holders utilize this skill to read and recognize each step of process flow diagrams during their job. The area of job may be production, R and D, design, technical services, project development, sales and marketing etc.

Course Outcome:

After Completion of the Course, Student will able to:

No.	Course Outcomes	RBT Level
01	Explain the classification and properties of various chemicals.	R/U
02	Apply concept of the manufacturing processes of various chemicals with neat sketch to operate chemical plant.	A
03	Identify major engineering problems encountered in manufacturing processes.	R/U
04	Suggest applications of various chemicals.	R/U/A

*Revised Bloom's Taxonomy (RBT)



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Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+(PR/2)	Assessment Pattern and Marks				Total Marks
L	T	PR		C	Theory		Tutorial/Practical	
			ESE (E)		PA(M)	PA(I)	ESE (V)	
3	0	2	4	70	30	20	30	150

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
Unit-I (NATURAL PRODUCT INDUSTRIES)	1.1 Definition of oil and fat 1.2 Physical properties of oil 1.3 Define and classify Carbohydrates 1.4 Manufacture of 1.4.1 Vegetable oil 1.4.2 Hydrogenated product of oil 1.4.3 Sugar from sugar-cane 1.4.4 Starch from maize 1.4.5 Dextrin from starch 1.5 Chemicals from sea 1.6 Production of bromine from sea water	10	26% (18Marks)
Unit-II (PULP AND PAPER PRODUCTS)	2.1 Define Pulp and paper 2.2 Methods of pulp production 2.3 Sulfate (Kraft) pulp process 2.4 Manufacture of paper by Fourdrinier machine 2.5 Major engineering problems of paper manufacturing	06	13% (09Marks)
Unit-III (FUEL AND INDUSTRIAL GASES)	3.1 Fuels: types, sources, uses 3.2 Important industrial gases: types, sources, uses 3.3 Production of fuel gases 3.3.1 Producer gas 3.3.2 Water gas 3.3.3 Coke oven gas 3.3.4 Natural gas	07	14% (10Marks)
Unit-IV (FERMENTA TION INDUSTRIES)	4.1 Define and classify fermentation 4.2 Manufacture of 4.2.1 Ethyl alcohol by fermentation 4.2.2 Lactic acid from corn sugar 4.2.3 Citric acid from molasses 4.2.4 Vinegar by Frings' method	08	17% (12Marks)



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Unit-V (PHARMACEUTICALS)	5.1 Define and Classify pharmaceuticals as per use (with examples) 5.2 Important Drugs 5.2.1 Anesthetic 5.2.2 Analgesic 5.2.3 Anti-malarial 5.2.4 Anti-TB drugs 5.2.5 Antibiotics 5.2.6. Vitamins 5.3 Manufacturing of 5.3.1 Antibiotics, 5.3.2 Aspirin 5.3.3 Paracetamol	08	17% (12Marks)
Unit -VI (PESTICIDES)	6.1 Define and classify pesticides 6.2 Pesticide formulation 6.3 Manufacturing process of 6.3.1 Methyl bromide 6.3.2 2-4 Dichloro phenoxy acetic acid 6.3.3 Benzene Hexachloride (BHC)	06	13% (09Marks)
Total		45	100% (70Marks)

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in%)					
R Level	U Level	A Level	N Level	E Level	C Level
24	52	24	-	-	-

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (asper Revised Bloom's Taxonomy)

Note: This specification table provides general guidelines to assist students for their learning and to teachers to teach and question paper designers/setters to formulate test items/questions to assess the attainment of the UOs. The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may slightly vary from above table.



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Suggested Course Practical List:

Sr. No.	Practical Outcomes (PrOs)	UnitNo.
1	Find out Acid value of oil	1
2	Find out Iodine value of oil	1
3	Preparation of starch from maize	1
4	Preparation of vegetable oil from seed	1
5	Preparation of glycerin	1
6	Find out NaCl content in sea water	1
7	Preparation of pulp from bamboo	2
8	Find out volatile matter content in fuel	3
9	Find out ash content in fuel	3
10	Preparation of alcohol	4
11	Preparation of citric acid	4
12	Preparation of vinegar	4
13	Preparation of Aspirin	6
14	Preparation of paracetamol	6
15	Prepare formulation of given pesticide	7

Note

- More **Practical Exercises** can be designed and offered by the respective course teacher to develop the industry-relevant skills/outcomes to match the COs. The above table is only a suggestive list. Course teacher can select any 14 practical.
- The **following are some sample** 'Process' and 'Product' related skills (more may be added/deleted depending on the course) with approximate percentage weightage that occur in the above listed **Practical Exercises** of this course required which are embedded in the Cos and ultimately the competency.

Sr. No.	Sample Performance Indicators for the PrOs	Weightage in% (Approximate)
1	Prepare experimental setup accurately.	10
2	Use apparatus for precise measurements.	20
3	Practice and adapt good and safe measuring techniques.	10
4	Good Record keeping of the observations accurately.	20
5	Interpret the results and their conclusion.	20



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6	Prepare Report in prescribed format	10
7	Viva-Voce	10
Total		100

Suggested Activities for Students:

Other than the classroom and laboratory learning, the following are the suggested student- related *co-curricular* activities which can be undertaken to accelerate the attainment of the various out comes in this course: Students should perform the following activities in group and prepare small reports of about 5 pages for each activity. They should also collect/record physical evidence such as photographs/videos of the activities for their (student's) portfolio which will be useful for their placement interviews:

- Prepare a Power Point presentation or animation showing different types of chemical manufacturing Process
- Prepare a model of different chemical product flow diagram
- Preparation of tables showing the difference between Organic and Inorganic Compounds.
- Market survey of different Chemical product and compare their physical and chemical properties.
- Library survey regarding polymers and fertilizers indifferent industries.
- Collect different polymers and prepare the chart/Power Point based on their type, properties, and uses.

References/Suggested Learning Resources:

(a) Books:

Sr. No.	Title of Book	Author	Publication with the place, year and ISBN
1	Outlines of Chemical Technology, 3rd edition	M. Gopala Rao, Marshall Sitting	Affiliated East West Press (Pvt) Ltd- New Delhi
2	Shreve's Chemical Process Industries, 5th edition	Austin G.T.	McGraw Hill publication- New Delhi
3	Chemical Technology - Vol. I and II, 2nd edition	G.N. Pandey and Shukla	Vani Books Company-Hyderabad
4	A Text Book on Petrochemicals, 2nd edition	Rao B.K. B.	Khanna Publishers- New Delhi



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(b) Open sources of software and website:

- (1) <http://www.epa.gov/sectors/sectorinfo/sectorprofiles/chemical.html>
- (2) www.emis.vito.be/sites/default/Bref_cement_and_lime_production.pdf
- (3) www.docbrown.info/page04/Mextract.htm
- (4) <http://www.goiit.com/posts/show/0/content-general-principles-of-extraction-of-metals-804401.htm>
- (5) <http://www.contentshoppe.com/images/eLearning/sample2.swf>
- (6) <http://www.petrochemistry.net/coal-chemicals.html>
- (7) <http://www.auroma.in/propertiescoal.pdf>
