GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Diploma Engineering

Level: Diploma

Branch: Chemical Engineering

Subject Code: DI04005071

Subject Name: Petroleum Refining and Petroleum Technology

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

Prerequisite:	Student should have knowledge regarding Unit Operations and basics of Chemical Process Technology
Rationale:	India ranks among the top five refining nations globally and Petrochemicals, Derived primarily from hydrocarbons such as natural gas and crude oil, these chemical compounds are the building blocks of countless products and industries. A diploma chemical engineer has to apply relevant concepts to operations, equipment, safety protocols and environment considerations in refineries and petrochemical industries. A diploma chemical engineer need to be equipped with necessary skills and knowledge to work in petroleum refining and petrochemical plants, quality testing laboratories and related fields. This course is designed to develop such competency and skills.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Identify properties of crude petroleum and petroleum products	U, A
02	Explain fractionation of crude petroleum and treatment techniques	R, U
03	Apply refinery processes to maximize desired petro products	R, U, A
04	Explain manufacturing processes of petrochemicals	R, U

**Revised Bloom's Taxonomy (RBT)*

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
				Theory		Tutorial / Practical		
L	T	PR	C	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 Basics of Petroleum and Refinery	1.1 Occurrence of petroleum 1.2 Composition of Petroleum 1.3 Classification of Petroleum 1.4 Types of Refineries 1.5 Refinery processes 1.5.1 Physical Changes 1.5.2 Chemical Changes 1.6 Refinery Products	04	11
Unit– II Fractionation of Petroleum	2.1 Primary treatment of crude (a) Dehydration and Desalting of crude oil (b) Pipe still heaters 2.2 Atmospheric distillation of crude 2.3 Vacuum distillation of crude residue 2.4 Physical properties of petroleum products and its measurements: (a) Petrol (b) Diesel (c) Kerosene (d) Lubricant oil (e) CNG and LPG (f) Grease	9	16
Unit– III Refinery Processes	3.1 Cracking (a) Purpose of cracking (b) Effect of temperature and pressure on Cracking (c) Cracking methods i. Thermal Cracking: Visbreaking, Delayed Coking and Fluid Coking ii. Catalytic Cracking iii. Fluidized Bed Catalytic Cracking iv. Hydrocracking (d) Compare thermal and catalytic cracking 3.2 Reforming (a) Purpose of reforming (b) Platforming 3.3 Hydrotreating	10	20
Unit– IV Treatment	4.1 Purposes and methods of sulfur removal 4.2 Methods of sulfur removal	11	24

Techniques	(a) Doctor's sweetening (b) Catalytic desulfurization (c) MEROX treatment 4.3 Treatment of Kerosene by liquid SO_2 extraction 4.4 Solvent extraction processes (a) Furfural extraction method (b) Phenol extraction method 4.5 Purpose of dewaxing 4.6 Dewaxing Techniques (a) Dewaxing without solvent (b) Dewaxing with solvent i. Ketone dewaxing		
Unit – V Petrochemicals	5.1 Basics of petrochemicals: Definition, Classification and feedstocks for petrochemicals 5.2 Manufacturing of important C1 compounds (a) Methanol (b) Formaldehyde 5.3 Manufacturing of important C2 compounds (a) Vinyl chloride (b) Ethylene oxide 5.4 Manufacturing of important C3 compounds (a) Propylene oxide 5.5 Chemicals from aromatics (a) Manufacture of LAB	11	29
	Total	**45**	**100**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
27	24	19	---------	_____	_____

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

References/Suggested Learning Resources:

(a) Books:

S.No.	Title of Book	Author	Publication with place, year and ISBN
1	Modern Petroleum refining Processes	B. K. Bhaskar Rao	Oxford and IBH, 2007

2	Outlines of chemical Technology	M. Gopala Rao, Marshall Sitting	3rd Edition East-West Press Pvt. Ltd, Delhi
3	Shreve's Chemical Process Industries	Austin G.T.	McGraw Hill publication – New Delhi, 5th edition
4	A Text on Petrochemicals	B. K. Bhaskar Rao	2nd Edition, Khanna Publishers, Delhi, 1998
5	Petroleum Refinery Engineering	W. L. Nelson	McGraw Hill, New York, 1958

(b) Open-source software and website:

1. https://onlinecourses.nptel.ac.in/noc23_ch64
2. https://www.e-education.psu.edu/fsc432/content/overview-refinery-products-and-processes
3. http://www.setlab.com/resources/refining/solvent-extraction-dewaxing/#1498503459530-b4e0a336-25dd
4. https://thepetrosolutions.com/solvent-extraction-process-in-petroleum-oil-refinery/
5. https://www.e-education.psu.edu/fsc432/content/dewaxing
6. https://thepetrosolutions.com/thermal-cracking-process-in-oil-refinery/
7. MIT Open course lecture available on Internet etc…
8. National Digital Library of India

Suggested Practical List:

Sr. No.	Practical/Exercise (Course Outcomes in Psychomotor Domain according to NBA Terminology)	Approx. Hrs Required
1	Prepare a detail chart of modern refinery	2
2	Prepare a detail chart of petrochemical products	2
3	Determine flash point of petroleum product by Penskey Martin method.	2
4	Determine fire point of petroleum product by Penskey Martin method.	2
5	Measure softening point of petroleum product.	2
6	Measure Aniline point of petroleum product.	2
7	Determine penetration number of Grease.	2
8	Determine Carbon residue by Ram's bottom method.	2
9	Determine Carbon residue by conradson method	2
10	Measure smoke point of kerosene.	2
11	Measure cloud point of given petroleum product.	2

12	Measures pour point of given petroleum product.	2
13	Measure initial & final boiling point of petroleum product.	2
14	Measure Viscosity of lube oil by Redwood /Saybolt/Engler	2

Suggested Activities for Students:

1. Assignments
2. Technical Quiz/MCQ Test
3. Course/topic-based presentation
4. Market survey of various petrochemical products of different manufacturers and their comparison based on their specification, composition and cost
5. Preparation of non-working models/demo models of various ADU, VDU, Cracking units etc.
6. Preparation of power-point slides, which include videos, animations of various refining operations and processes

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