

GANPAT UNIVERSITY				
FACULTY OF DIPLOMA ENGINEERING				
Programme	Diploma in Chemical Engineering			
Semester	IV	Version	1.0.0.0	
Effective from Academic Year	2026-27	Effective for the batch Admitted in	July 2025	
Subject code	1CH4102	Subject Name	Petroleum Refinery Operations	

### I. TEACHING-LEARNING AND ASSESSMENT SCHEME

Course Type	Course Code	Learning Scheme						Assessment Scheme										
		Actual Contact Hrs./Week			SLH	NLH	Credits	Theory				Practical			Based on SL		Total Marks	
		CL	TL	LL				FA-TH	SA-TH	TOTAL		FA-PR	SA-PR	TOTAL		SLA		
		MAX	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MAX	MAX	MIN	MAX	MIN				
DSC	1CH4102	3	-	2	3	8	4	40	60	100	40	30	20	50	20	20		8

<b>Abbreviation:</b>	CL- Classroom Learning	TL - Tutorial Learning	LL - Laboratory Learning
	SLH - Self Learning Hours	NLH - Notional Learning Hours	SLA - Self Learning Assessment
	FA - Formative Assessment (Term work +Mid Sem Exam +Attendance)		SA - Summative Assessment

### II. PRE-REQUISITES

None

### III. INDUSTRY /EMPLOYER EXPECTED OUTCOMES

Industry and employers expect refinery technicians to understand core refinery operations, crude distillation and treatment fundamentals, identify and troubleshoot refining process issues, ensure safe and efficient handling of petroleum products, and apply environmentally responsible practices in refinery operations and product quality management through various teaching learning experiences.

### IV. COURSE LEARNING OUTCOMES

At the end of the course, students will be able to achieve the following course learning outcomes:

**CO1:** Understand the fundamentals of crude oil evaluation, dehydration–desalting, and distillation operations (ADU and VDU) in petroleum refineries.

**CO2:** Apply appropriate treatment techniques for LPG, LNG, gasoline, kerosene, and lube oil to improve product quality.

**CO3:** Explain major refinery unit processes including cracking, visbreaking, coking, reforming, hydrocracking, hydrotreating, isomerization, and alkylation.

**CO4:** Understand the structure, raw materials, major products, and industrial relevance of the petrochemical industry.

### V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT:

Name of Unit	Theory Learning outcomes (TLO's) aligned to CO's	Learning Content mapped with Theory Learning outcomes (TLO's)&CO's	Marks	Hours
<b>Unit-1 Fractionation of Petroleum</b>	<b>TLO1.1</b> Explain Indian refinery scenario <b>TLO1.2</b> Explain evaluation of crude oil <b>TLO1.3</b> Discuss characterization of products <b>TLO1.4</b> Explain dehydration <b>TLO1.5</b> Describe desalting & heating <b>TLO1.6</b> Describe ADU operation <b>TLO1.7</b> Discuss VDU topping <b>TLO1.8</b> Explain gasoline blending	<b>1.1</b> Indian refinery operations scenario. <b>1.2</b> Crude oil evaluation <b>1.3</b> product characterization. <b>1.4</b> Dehydration, <b>1.5</b> Desalting & crude heating. <b>1.6</b> ADU (Atmospheric Distillation Unit). <b>1.7</b> VDU (Vacuum Distillation Unit). <b>1.8</b> Importance of gasoline blending.	<b>13</b>	<b>12</b>

<b>Unit-2 Treatment Techniques</b>	<b>TLO2.1</b> Explain treatment of LPG <b>TLO2.2</b> Explain treatment of LNG <b>TLO2.3</b> Sweetening Operation of Gases <b>TLO2.4</b> Describe treatment of gasoline <b>TLO2.5</b> Explain treatment of kerosene <b>TLO2.6</b> Discuss treatment of Lube purification of wax	<b>2.1</b> LPG treatment techniques. <b>2.2</b> LNG treatment and purification. <b>2.3</b> Sweetening operations of gases <b>2.4</b> Treatment of gasoline, kerosene, and lube oil purification. <b>2.5</b> Treatment of kerosene <b>2.6</b> Treatment of Lube purification of wax	<b>15</b>	<b>10</b>
<b>Unit-3 Unit processes in Refineries</b>	<b>TLO3.1</b> Explain Cracking, Thermal cracking – Coking, visbreaking <b>TLO3.2</b> Describe Catalytic cracking - Fluidized bed Catalytic Cracking <b>TLO3.3</b> Comparison between thermal and Catalytic cracking <b>TLO3.4</b> Discuss Hydrocracking <b>TLO3.5</b> Explain Hydro treating <b>TLO3.6</b> Describe Reforming <b>TLO3.7</b> Explain Isomerization, Alkylation	<b>3.1</b> thermal cracking, visbreaking & coking. <b>3.2</b> catalytic cracking processes (FCC). <b>3.3</b> Thermal vs catalytic cracking. <b>3.4</b> Hydrocracking & hydro treating. <b>3.5</b> Reforming, isomerization & alkylation. <b>3.6</b> : Reforming <b>3.7</b> Isomerization, Alkylation	<b>20</b>	<b>15</b>
<b>Unit-4 Introduction of Petrochemical Industry</b>	<b>TLO4.1</b> Definition, History of Petrochemical industry <b>TLO4.2</b> Discuss Major Petrochemical industries and their producers in India <b>TLO4.3</b> Explain Raw materials for Petrochemicals, Characteristics of Petrochemical Industry.	<b>4.1</b> Definition and history of petrochemical industry. <b>4.2</b> Identify major petrochemical industries and producers in India. <b>4.3</b> Raw materials & characteristics of petrochemical industry.	<b>12</b>	<b>08</b>

#### VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICALS

SR. NO	PRACTICAL/LABORATORY LEARNING OUTCOME(LLO)	PRACTICAL TITLES	RELEVANT COs
1	<b>LLO1.1:</b> To determine ASTM distillation characteristics of petroleum products.	To study about ASTM distillation.	CO1
2	<b>LLO 2.1:</b> To determine the smoke point of kerosene.	To study about smoke point of kerosene.	CO2
3	<b>LLO 3.1:</b> To determine the aniline point of a petroleum fuel.	To study about aniline point of a petroleum fuel.	CO2
4	<b>LLO 4.1:</b> To determine the kinematic viscosity using Saybolt viscometer.	To study about kinematic viscosity using Saybolt viscometer.	CO3
5	<b>LLO 5.1:</b> To determine the kinematic viscosity using Redwood viscometer.	To study kinematic viscosity using Redwood viscometer.	CO2
6	<b>LLO 6.1:</b> To determine the cloud and pour point of petroleum oils.	To study about cloud and pour point of petroleum oils.	CO2
7	<b>LLO 6.1:</b> To determine the flash and fire point of petroleum product.	To study about flash and fire point of petroleum product.	CO3

**VII. SUGGESTED MICRO PROJECT / ASSIGNMENTS / ACTIVITIES FOR SELF LEARNING / SKILL DEVELOPMENT (SELF LEARNING)**

- Watch refinery documentaries (ADU/VDU/FCC).
- Prepare a model of ADU or VDU using chart/software.
- Debate/Presentation: Thermal vs Catalytic Cracking.
- Prepare mass balance sheet of crude distillation.
- Mini project: Refinery flow diagram (Crude to products).

**VIII. LIST OF INSTRUMENTS / EQUIPMENT / TRAINER BOARD**

1	ASTM distillation setup.
2	smoke point apparatus.
3	aniline point apparatus.
4	Saybolt viscometer.
5	Redwood viscometer.
6	cloud and pour point apparatus.
7	flash and fire point apparatus.

**IX. LIST OF REFERENCE BOOKS**

Sr. No.	TITLE	AUTHOR	PUBLICATION
1	Modern Petroleum Refining Processes	B.K. Bhaskar Rao	Oxford & IBH
2	A Text on Petrochemicals	B.K. Bhaskar Rao	Khanna Publishers
3	Advanced Petroleum Refining	G.N. Sarkar	Khanna Publishers

**X. LINK OF LEARNING WEB RESOURCE**

1	<a href="https://nptel.ac.in/courses/103104154">https://nptel.ac.in/courses/103104154</a>
2	<a href="https://www.spe.org/en/education">https://www.spe.org/en/education</a>
3	<a href="https://nptel.ac.in/courses/103103206">https://nptel.ac.in/courses/103103206</a>

**XI. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE**

Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	Fractionation of Petroleum	CO1	08	04	04	05	13
2	Treatment Techniques	CO2	10	04	05	05	14
3	Unit processes in Refineries	CO3	15	05	05	08	18
4	Introduction of Petrochemical Industry	CO4	12	05	05	05	15
Grand Total			45	18	19	23	60

**XII. COs AND POs AND PSOs MAPPING**

Course outcome (COs)	Programme Outcomes (POs)							Programme Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	2	2	1	2	2	3	2	1
CO2	2	3	2	2	1	2	2	3	3	1
CO3	2	3	3	2	1	2	2	3	3	2
CO4	2	2	2	1	1	2	2	2	1	1

**Legends:** -3- High      2-Moderate/Medium      1-Slight/Low      0-None