

GANPAT UNIVERSITY				
FACULTY OF DIPLOMA ENGINEERING				
Programme	Diploma in Chemical Engineering / Petrochemical Technology			
Semester	III	Version	1.0.0.0	
Effective from Academic Year	2026-27	Effective for the batch Admitted in	July 2025	
Subject code	1CH3103	Subject Name	Chemical Plant Utility	

## I. TEACHING-LEARNING AND ASSESSMENT SCHEME

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	MIN	MAX	MIN	MAX	MIN				
DSC	1CH3103	3	-	0	0	4	3	40	60	100	40	-	-	-	-		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

Basic knowledge of chemistry and physics fundamentals.

## III. INDUSTRY /EMPLOYER EXPECTED OUTCOMES

To enable students to understand and apply utility systems used in chemical plants

## IV. COURSE LEARNING OUTCOMES

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

**CO1.** Select and apply appropriate methods for water treatment including softening and purification for chemical plant utilities.

**CO2.** Explain construction and working of steam generators, boilers, air compressors and inert gas utility systems.

**CO3.** Explain refrigeration systems, internal combustion engines and turbines used for utility services in chemical plants.

**CO4.** Apply concepts of energy efficiency, green technology and safe operation for effective utilization of plant utility systems.

## 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 Water as a Basic Utility</b>	<p><b>TLO 1.1</b> Identify role of utilities in chemical plants.</p> <p><b>TLO 1.2</b> Identify sources and cost of water.</p> <p><b>TLO 1.3</b> Differentiate hard and soft water.</p> <p><b>TLO 1.4</b> Explain boiler feed and DM water.</p> <p><b>TLO 1.5</b> Compare water softening methods.</p> <p><b>TLO 1.6</b> Explain purification and green technologies.</p>	<p><b>1.1</b> Utilities</p> <p><b>1.2</b> Sources and cost of water</p> <p><b>1.3</b> Hard/soft water</p> <p><b>1.4</b> Boiler feed water</p> <p><b>1.5</b> Softening methods</p> <p><b>1.6</b> Purification and green Technologies</p>	<b>14</b>	<b>11</b>

<b>UNIT – 2 Steam, Air &amp; Inert Gases</b>	<b>TLO 2.1</b> Explain use of steam, air and inert gases. <b>TLO 2.2</b> Describe properties of steam and cost <b>TLO 2.3</b> Explain steam generators. <b>TLO 2.4</b> Identify boiler selection factors. <b>TLO 2.5</b> Explain boiler mountings and accessories. <b>TLO 2.6</b> Explain compressors <b>TLO 2.7</b> Explain inert gases	<b>2.1</b> Use of steam, air and inert gases. <b>2.2</b> Steam properties and cost <b>2.3</b> Steam generators <b>2.4</b> Boiler selection <b>2.5</b> Mountings <b>2.6</b> Compressors <b>2.7</b> Inert gases	<b>16</b>	<b>12</b>
<b>Unit–3 Refrigeration</b>	<b>TLO 3.1</b> Explain principle of refrigeration. <b>TLO 3.2</b> Classify refrigeration methods. <b>TLO 3.3</b> Explain ice and evaporative refrigeration. <b>TLO 3.4</b> Describe vapor compression system. <b>TLO 3.5</b> Explain ton of refrigeration. <b>TLO 3.6</b> Differentiate refrigerants.	<b>3.1</b> Refrigeration principles <b>3.2</b> Refrigeration methods <b>3.3</b> Ice & evaporative refrigeration <b>3.4</b> Vapor compression <b>3.5</b> Tonnes of refrigeration <b>3.6</b> Refrigerant difference	<b>10</b>	<b>08</b>
<b>Unit–4 Internal Combustion Engine</b>	<b>TLO 4.1</b> Explain IC engine cycles. <b>TLO 4.2</b> Differentiate two and four stroke engines. <b>TLO 4.3</b> Explain SI and CI engines. <b>TLO 4.4</b> Explain ignition systems. <b>TLO 4.5</b> Explain injection and governing. <b>TLO 4.6</b> Identify IC engine applications.	<b>4.1</b> IC engine cycles <b>4.2</b> Two/four stroke <b>4.3</b> SI & CI engines <b>4.4</b> Ignition <b>4.5</b> Injection <b>4.6</b> IC engine applications	<b>12</b>	<b>09</b>
<b>Unit–5 Turbines</b>	<b>TLO 5.1</b> Explain turbine theory. <b>TLO 5.2</b> Differentiate impulse and reaction turbines. <b>TLO 5.3</b> Explain steam turbines. <b>TLO 5.4</b> Explain gas turbines. <b>TLO 5.5</b> Explain bleeding. <b>TLO 5.6</b> Explain reheating.	<b>5.1</b> Turbine theory <b>5.2</b> Impulse and reaction turbines <b>5.3</b> Steam turbines <b>5.4</b> Gas turbines <b>5.5</b> Bleeding and <b>5.6</b> Reheating	<b>08</b>	<b>05</b>

#### **VI. LIST OF INSTRUMENTS / EQUIPMENT / TRAINER BOARD**

<b>1</b>	Models of belt drive, chain drive, rope drive, and gear drive.
<b>2</b>	Setup of arc and gas welding.
<b>3</b>	Cut section/models of boilers.
<b>4</b>	Cut section/models of boiler mountings and accessories.
<b>5</b>	Setup of water turbine.

#### **VII. LIST OF REFERENCE BOOKS**

<b>SR.N O</b>	<b>TITLE</b>	<b>AUTHOR</b>	<b>PUBLICATION</b>
<b>1</b>	Chemical Plant Utilities	Sathiya Moorthy & Manickam	Lambert Academic Publishing, India
<b>2</b>	Plant Utilities	D. B. Dhone	Nirali Prakashan, India
<b>3</b>	Unit Operations of	McCabe, Smith & Harriott	McGraw Hill, 7th Edition

	Chemical Engineering		
4	Power Plant Engineering	P. K. Nag	McGraw Hill Education, India
5	Refrigeration and Air Conditioning	R. S. Khurmi & J. K. Gupta	S. Chand Publication
6	Boilers and Steam Engineering	T. D. Eastop & A. McConkey	Pearson Education
7	Gas Turbines and Jet Propulsion	V. Ganesan	McGraw Hill Education
8	IC Engines	V. Ganesan	Tata McGraw Hill

### VIII. LINK OF LEARNING WEB RESOURCE

1	<a href="https://nptel.ac.in/">https://nptel.ac.in/</a>
2	<a href="https://vlab.co.in/">https://vlab.co.in/</a>
3	<a href="https://www.howstuffworks.com/">https://www.howstuffworks.com/</a>
4	<a href="https://en.wikipedia.org/wiki/Boiler">https://en.wikipedia.org/wiki/Boiler</a>

### IX. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE

Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	Water as a Basic Utility	CO1	11	6	4	4	14
2	Steam, Air and Inert Gases	CO2	12	6	6	4	16
3	Refrigeration	CO3	08	3	4	10	10
4	Internal Combustion Engine	CO3	09	4	4	4	12
5	Turbines	CO3,CO4	05	2	3	3	08
		Grand Total	45	21	21	25	60

### X. 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	3	2	2	1	1	3	2	2
CO2	3	2	2	2	2	1	1	3	3	2
CO3	3	2	2	2	2	1	1	3	3	2
CO4	3	3	2	3	2	2	1	3	3	2

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