

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		
Course code	1CH4104	Course Name	Process Plant 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	MAX	MIN		
DSC	1CH2404	3	-	0	1	4	2	40	60	100	40	-	-	-	-	20	8	120

Abbreviation:	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 chemical engineers to gain fundamental knowledge of basic plant operations.

IV. COURSE LEARNING OUTCOMES

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

CO1: To acquire the knowledge for handling solid, liquid and gaseous phase chemicals.

CO2: To explore current techniques in plant maintenance

CO3: To identify the energy saving possibilities in process Industries.

CO4: To know the types of corrosion and methods of controlling the corrosion

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
Unit 1: Storage and Handling of Chemicals	<p>TLO1.1. Students will understand storage of solids.</p> <p>TLO1.2 Students will understand storage of liquids.</p> <p>TLO1.3 Students will understand container materials, insulation for high intermediate, low and subzero temperatures.</p> <p>TLO1.4 Students will understand tank supports. storage of gases, gas holders – storage in pressure vessels</p>	<p>1.1 Storage of Solids - Piles, Bins, Silos and Hoppers - angle of repose - Mass flow and Funnel flow - Factors influencing the flow of solids.</p> <p>1.2 Storage of Liquids – Storage tanks- Atmospheric and pressure tanks- tanks with fixed and floating roofs – Elevated tanks – Underground tanks</p> <p>1.3 Container materials, insulation for high, intermediate, low and subzero temperatures including Cryogenic storages, Calibration of Tanks</p> <p>1.4 Storage of gases – Gas holders- Storage in pressure vessels, Bottles and pipe lines. Chemicals handling physical state and characteristics of chemicals.</p>	20	15

<p>Unit 2: Plant Maintenance</p>	<p>TLO2.1 Students will understand objectives and importance of plant maintenance. TLO2.2. Students will understand duties, responsibilities and functions of maintenance department TLO2.3 Students will know about the types of maintenance. TLO2.4 Students will understand maintenance of equipment onstream. TLO2.5 Students will understand standard data for maintenance</p>	<p>2.1 Objectives and importance of plant maintenance 2.2 Duties, responsibilities and functions of maintenance department 2.3 Types of maintenance: predictive, preventive, break down & shut down maintenance, Total productive maintenance, Plant maintenance schedule 2.4 Maintenance of equipment on stream - fittings, pipes and lines, valves, boilers, heat exchangers, batch reactors. 2.5 Standard data for maintenance and failure analysis</p>	<p>15</p>	<p>10</p>
<p>Unit 3: Energy Management</p>	<p>TLO 3.1 Students will understand needs of energy conservation in process industry TLO 3.2 Students will understand energy conservation methods TLO 3.3 Students will understand simple problem in SEC energy optimization TLO 3.4 Students will understand forecasting energy requirement TLO 3.5 Students will understand waste heat recovery from stack gas and boilers - Use of refractory and insulating materials for energy savings TLO 3.6 Students will understand energy efficient motors and pumps - Energy efficiency in thermal utilities</p>	<p>3.1 Needs of energy conservation in process industry 3.2 Energy conservation methods - estimation of energy consumption - Specific Energy consumption (SEC) 3.3 Simple problem in SEC energy optimization –energy audit in existing plant 3.4 Forecasting energy requirement - Replacement of conventional fuels with alternative fuels 3.5 Waste heat recovery from stack gas and boilers - Use of refractory and insulating materials for energy savings 3.6 Energy efficient motors and pumps - Energy efficiency in thermal utilities - cooling tower, heat exchangers, distillation column.</p>	<p>15</p>	<p>10</p>
<p>Unit 4: Corrosion</p>	<p>TLO4.1 Students will understand corrosion TLO4.2 Students will understand different types of corrosion TLO4.3 Students will understand galvanic series - Factors influencing corrosion TLO4.4 Students will understand measurement of corrosion</p>	<p>4.1 Definition of corrosion 4.2 Types of corrosion – uniform, galvanic, crevice, pitting, inter-granular, selective leaching, erosion, stress 4.3 Factors influencing corrosion 4.4 Measurement of corrosion Methods of Corrosion control – cathodic protection, anodic protection, surface coatings</p>	<p>10</p>	<p>10</p>

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

- Case study - Given an operational corrosion problem in pipelines resulting in leakage, students propose possible causes and corrective actions.
- Industrial Visit - Prepare a short report based on an industrial visit or virtual plant walkthrough, focusing on unit operations, safety practices, and operator responsibilities.

VII. LIST OF REFERENCE BOOKS

Sr. No.	Title	Author	Publication
1.	Environmental pollution control engineering	C.S. Rao	Second edition Wiley Eastern Limited
2.	Process energy conservation	Richard Greene	McGraw Hill Publication, New York
3.	Industrial safety Handbook	William Handley	Second edition - McGraw Hill book company(UK) Ltd.

VIII. LINK OF LEARNING WEB RESOURCE

1	https://nptel.ac.in/courses/103107211
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IX. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE

Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	Storage and Handling of Chemicals	CO1	15	4	12	4	20
2	Plant Maintenance	CO2	10	3	8	4	15
3	Energy Management	CO3	10	3	8	4	15
4	Corrosion	CO4	10	2	6	2	10
Grand Total			45	12	34	14	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	2	1	2	1	1	2	1	2	2	2
CO2	2	2	3	2	1	2	2	1	1	2
CO3	2	1	2	2	2	2	1	2	2	2
CO4	3	2	2	2	2	2	2	1	2	3

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