

GANPAT UNIVERSITY				
FACULTY OF DIPLOMA ENGINEERING				
Programme	Diploma in Chemical Engineering / Petrochemical Technology			
Semester	II	Version	1.0.0.0	
Effective from Academic Year	2025-26	Effective for the batch Admitted in	JULY 2025	
Course code	1CH2101	Course Name	Industrial Sustainability	

L.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	
		CL	TL	LL				FA-TH	SA-TH	TOTAL		FA-PR	SA-PR	TOTAL		SLA	
								MAX	MAX	MAX	MIN	MAX	MAX	MAX	MIN	MAX	MIN
DSC	1CH2101	3	-	-	5	8	4	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				
Not required				
III. INDUSTRY /EMPLOYER EXPECTED OUTCOMES				
Industry and employers expect chemical and petrochemical engineers to gain fundamental knowledge of sustainable industrial practices, resource & waste management skills, environmental regulations, green technologies and eco-friendly practices in industry and society.				
IV. COURSE LEARNING OUTCOMES				
At the end of the course, students will be able to achieve the following course learning outcomes: CO1: Understand the concepts of industrial sustainability CO2: Apply the principles of resource efficiency CO3: Demonstrate effective industrial waste management by implementing 3Rs CO4: Interpret environmental governance frameworks, regulations, and green practices				
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: Fundamentals of Industrial Sustainability	TLO1.1 History and Evolution of Sustainability Concepts TLO1.2 Case Studies on Successful Industrial Sustainability Practices TLO1.3 UN Sustainable Development Goals (SDGs) and Their Relevance to India TLO1.4 Concept of Sustainability and Industrial Relevance TLO1.5 Sustainable Development Goals (SDGs) and Industry TLO1.6 Sustainable vs. Unsustainable Industrial Practices	1.1 Explain the evolution of sustainability concepts in an industrial context. 1.2 Differentiate between sustainable and unsustainable industrial practices. 1.3 Analyze case studies of successful sustainability practices. 1.4 Relate UN Sustainable Development Goals (SDGs) to industrial operations, with emphasis on India. 1.5 Demonstrate the industrial relevance of sustainability in modern production systems.	12	10

Unit 2: Resource Efficiency in Chemical and Petrochemical Industries	TLO2.1 Introduction to Life Cycle Assessment (LCA) TLO2.2 Digital Tools for Monitoring Industrial Resource Use (SCADA, IoT Basics) TLO2.3 Efficient Utilization of Water, Energy, and Raw Materials TLO2.4 Concepts of Input–Output Analysis in Industrial Operations TLO2.5 Industrial Symbiosis and Cleaner Production	2.1 Apply the concept of Life Cycle Assessment (LCA) to industrial processes. 2.2 Utilize digital tools (SCADA, IoT) for monitoring resource efficiency. 2.3 Identify methods for efficient utilization of water, energy, and raw materials. 2.4 Explain Input–Output analysis in industrial operations. 2.5 Evaluate practices of industrial symbiosis and cleaner production.	15	11
Unit 3: Industrial Waste Management and Circular Economy	TLO3.1 Types and Sources of Industrial Waste TLO3.2 3Rs in Industrial Context: Reduce, Reuse, Recycle TLO3.3 Basics of Waste Segregation and Safe Handling TLO3.4 Resource Recovery from Waste: Heat, Water, Materials TLO3.5 Circular Economy: Closed Loop Thinking	3.1 Classify types and sources of industrial waste. 3.2 Apply 3Rs (Reduce, Reuse, Recycle) in an industrial context. 3.3 Demonstrate the importance of waste segregation and safe handling. 3.4 Analyze methods of resource recovery (heat, water, materials) from waste. 3.5 Explain the concept of circular economy and its role in closed-loop industrial systems.	16	12
Unit 4: Environmental Governance and Green Practices	TLO4.1 Environmental Impact Assessment (EIA) Process Overview TLO4.2 Role of NGOs and Citizen Participation in Environmental Protection TLO4.3 Introduction to ESG (Environmental, Social, Governance) Standards in Industries TLO4.4 Overview of Indian Environmental Regulations (Air, Water, Hazardous Waste) TLO4.5 Role of Pollution Control Boards (CPCB, SPCB) TLO4.6 Use of Eco-Friendly Products in Industries TLO4.7 Examples of Renewable Energy Use in Indian Industries	4.1 Summarize the Environmental Impact Assessment (EIA) process for industries. 4.2 Explain the role of NGOs and citizens in environmental protection. 4.3 Interpret ESG (Environmental, Social, Governance) standards in industry. 4.4 Describe major Indian environmental regulations (Air, Water, Hazardous Waste). 4.5 Discuss the functions of CPCB and SPCB in pollution control. 4.6 Promote the use of eco-friendly products in industries. 4.7 Provide examples of renewable energy applications in Indian industries.	17	12

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

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| <ul style="list-style-type: none"> • Video lectures or industry documentaries • Demonstrate segregation of solid waste in campus/hostel and propose a recycling model. • Debate/Presentation: “Sustainable vs. Unsustainable Industrial Practices” with real-world examples. |
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Mini projects

- Conduct a mock audit (energy/water/raw materials) in the college laboratory or a local small-scale unit, and suggest improvements.
- Design a model/system for converting industrial solid waste into useful products (e.g., fly ash bricks, plastic recycling).
- Invite industry expert or alumni talk

VII. LIST OF REFERENCE BOOKS

Sr. No.	Title	Author	Publication
1	Textbook of Environmental Studies	Dr. Erach Bharucha,	UGC
2	Environmental Chemistry	A.K. De	New Age International.
3	Environmental Science and Engineering	Dr. P. Meenakshi	Tata McGraw Hill
4	Waste Management	R.K. Garg	Khanna Publishers

VIII. LINK OF LEARNING WEB RESOURCE

1	https://onlinecourses.nptel.ac.in/noc21_mg85/preview
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XI. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE

Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	Fundamentals of Industrial Sustainability	CO1	10	4	6	2	12
2	Resource Efficiency in Chemical and Petrochemical Industries	CO2	11	5	7	3	15
3	Industrial Waste Management and Circular Economy	CO3	12	5	7	4	16
4	Environmental Governance and Green Practices	CO4	12	5	8	4	17
Grand Total			45	19	28	13	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	1	0	3	0	2	2	2	1
CO2	2	3	2	2	3	1	2	3	2	1
CO3	2	3	3	2	3	2	2	3	3	1
CO4	2	2	2	1	3	2	3	2	3	2
Legends: - 3- High 2-Moderate/Medium 1-Slight/Low 0-None										