

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	1CH4103	Course Name	Safety in Chemical Industries		

I.TEACHING-LEARNING AND ASSESSMENT SCHEME																		
Course Type	Course Code	Learning Scheme						Assessment Scheme										Total Marks
		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	MAX	MIN	MAX	MIN	MAX	MAX	MAX	MIN	MAX	MIN				
DSC	1CH4103	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
Basic knowledge of Applied science.
III. INDUSTRY /EMPLOYER EXPECTED OUTCOMES
The aim of this course is to help the student to use personal and other safety measures applicable in chemical industries.
IV. COURSE LEARNING OUTCOMES
Students will be able to achieve & demonstrate the following COs on completion of course based learning.
CO1: Select and use appropriate personal protective equipment (PPE) for various operations in the chemical industry.
CO2: Apply fire prevention, detection, and protection systems for effective fire and explosion control in the chemical industry.
CO3: Identify and implement suitable control measures for chemical, process, and utility hazards in the chemical industry.
CO4: Apply statutory guidelines and lessons from major industrial disasters to ensure safe handling of chemicals and prevent recurrence of similar accidents.

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: Personal Protective Equipment (PPE)	TLO1.1 Describe the need and limitations of PPE. TLO1.2 Identify the appropriate Non-Respiratory Equipment. TLO1.3 Select the appropriate Respiratory Equipment. TLO1.4 Describe the procedure for selection and usage of Respirators.	1.1 Personal Protective Equipment: Need, Limitation, Types and Indian Standards related to PPE 1.2 Non-Respiratory Equipment and applications: Head & Hair Protection, Ear Protection, Face and Eye Protection 1.3 Respiratory Equipment and its applications: Classification of Respiratory Hazards, Oxygen Deficiency Protection, Gaseous Contaminants, Particulate	12	9

		Matter or Contaminants, Combination of Gaseous and Particulate Contaminants 1.4 Selection, Instruction and Training for use of Respirators		
Unit 2: Fire, Explosion and it's prevention	TLO2.1 List out different Causes of Industrial Fire. TLO2.2 Describe the classification of fire and extinguishers. TLO2.3 Suggest the appropriate Fire Prevention and Protection systems. TLO2.4 Describe the Fire emergency action drill. TLO2.5 Explain the different types of explosions.	2.1 Fire Phenomenon: Chemistry & Pyramid of Fire, Common Cause of Industrial Fire 2.2 Classification of Fire and Extinguishers: Class of Fire as per IS 15683:2018 – A, B, C, D, F, Class of Fire Extinguishers – Water, Foam, Dry powder, Carbon dioxide, Wet chemical 2.3 Fire Prevention and Protection systems: Preventive Measures, Fire Detection and Alarm Systems, Fire Suppression or Extinguishing Systems, Portable Fire Extinguishers 2.4 Fixed Fire Installations: Water spray, Foam, Automatic Fire Detection & Extinguishing System, Fire Emergency Action Plan & Drill 2.5 Explosion Phenomena: Definition of Explosion, Types of Explosions – Dust Explosion, Deflagration, Detonation, Concept of CVCE/UVCE/BLEVE	14	11
Unit 3: Hazards and Controls in Chemical Industry	TLO3.1 Explain different types of chemical hazards. TLO3.2 Describe storage & handling hazards and its control. TLO3.3 Explain process hazards and its control. TLO3.4 Describe utility hazards and its control. TLO3.5 Prepare Checklists for Routine Inspection of a Chemical factory.	3.1 Need of Safety in Chemical Industry with respect to hazards 3.2 Storage & Handling Hazards & it's Controls: Storage Vessels & their Safety Aspects, Safe Storage & Handling of Flammable liquids, gases, solids & corrosive chemicals, Safe Storage & Handling of Chlorine, Ammonia and LPG 3.3 Process Hazards and Controls: Exothermic Reactions, Pressure & Vacuum Reactions, Flammable / Explosive Reactions & Distillation, Toxic Reactions	18	14

		<p>3.4 Hazards & Controls: Hazards related to Water, Air, Steam and its control</p> <p>3.5 Checklists for Routine Inspection of a Chemical factory & Work Permits for Hazardous Work</p>		
<p>Unit 4: Safe Handling of Chemicals and Industrial Disasters (Case Studies)</p>	<p>TLO4.1 Describe the different sections of Material Safety Data Sheet.</p> <p>TLO4.2 List out precautionary measures for transportations of hazardous material.</p> <p>TLO4.3 Explain the pressure hazard and its consequences.</p> <p>TLO4.4 Describe the explosion hazard and its consequences.</p> <p>TLO4.5 Explain the toxic hazard and its consequences.</p>	<p>4.1 Safe storage and handling of chemicals: Safety in receiving, storage and handling of chemicals, Material Safety Data Sheet (MSDS) as per IS-17889: 2022</p> <p>4.2 Transportation of hazardous materials: Safety precautions for transporting hazardous/toxic/flammable/ explosive /radioactive substances by all modes</p> <p>4.3 Flixborough disaster (1974): Sequence of evidence, Identify hazards, Root cause and preventive measures</p> <p>4.4 Mexico LPG tank farm and explosion disaster (1984): Sequence of evidence, Identify hazards, Root cause and preventive measures</p> <p>4.5 Bhopal disaster (1984): Sequence of evidence, Identify hazards, Root cause and preventive measures</p>	16	11

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

- Prepare on site emergency plan for your educational building or educational campus giving details about its contents. Prepare a report on Directorate of Industrial Safety and Health (DISH) website.
- Prepare an accident report of any one industrial accident with reference to FORM NO. 21 (Prescribed under Rule 103) and FORM NO. 29(Prescribed under Rule 111).
- Prepare a Sample of Safety committee of any one industry with reference to Rule 68-F of Gujarat Factories Rules, 1963.
- Prepare the details like eligibility, qualification, duties and responsibilities of Safety Officer with reference to Safety Officer Rule 1982 & Factory Act 1948.

Note:

- The listed activities are illustrative; faculty members are encouraged to develop additional micro-projects and assignments aligned with course outcomes.
- Tasks should be assigned considering students' learning needs, strengths, and skill gaps.
- Micro-projects, when assigned, shall be undertaken as group activities, and Self-Learning Assessment (SLA) marks shall be awarded through continuous evaluation.
- For courses without a formal SLA component, these activities may be integrated into tutorials or formative/practical evaluations to enhance experiential learning.

VII. LIST OF REFERENCE BOOKS			
Sr. No.	Title	Author	Publication
1	Crowl, Daniel A, Louvar, Joseph F.	Chemical Process Safety	Prentice Hall, NJ, USA, 2002, ISBN 0-13-018176-5
2	Dr. K. U. Mistry	Fundamentals of Industrial Safety and Health	Siddhant Prakashan, Ahmedabad, Gujarat
3	Bureau of Indian Standards	IS 14489: 1998	Government of India.
4	Bureau of Indian Standards	IS 17889: 2022	Government of India.
5	Bureau of Indian Standards	IS 17893:2023	Government of India.
6	Department of Environment, Forest and wildlife	The Manufacture, Storage, and Import of Hazardous Chemical Rules, 1989	Government of India.

VIII. LINK OF LEARNING WEB RESOURCE	
1	https://onlinecourses.swyam2.ac.in/nou23_ge81/preview
2	https://onlinecourses.nptel.ac.in/noc20_mg43/preview
3	https://archive.nptel.ac.in/courses/103/106/103106071/
4	https://onlinecourses.nptel.ac.in/noc22_ch44/preview
5	https://safetyculture.com/topics/ppe-safety/
6	https://www.indiatoday.in/india/video/bhopal-gas-tragedy-a-r-ecap-2346629-2023-03-14

IX. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE							
Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	Personal Protective Equipment (PPE)	CO1	9	5	5	2	12
2	Fire, Explosion and its Prevention	CO2	11	5	6	3	14
3	Hazards and Controls in Chemical Industry	CO3	14	4	7	7	18
4	Safe Handling of Chemicals and Industrial Disasters	CO4	11	3	8	5	16
Grand Total			45	17	26	17	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	1	3	1	2	3	2	1
CO2	3	3	2	2	3	2	2	3	2	2
CO3	2	3	3	3	3	2	2	3	3	2
CO4	2	2	2	2	3	3	3	3	3	2

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