



**SECOND-YEAR DIPLOMA CHEMICAL ENGINEERING SYLLABUS**

**Semester: 4<sup>TH</sup>**

**Course Code: 002206405**

**Type of Course: PCC-8**

**Course Name: Safety and Pollution Control in Chemical Industry**

**Course Prerequisites:** In the race of becoming an economic powerhouse without compromising safety and environmental degradation is utmost priority for all stakeholders. Better Industrial safety and pollution control in chemical industries leads to improve in reputation, work culture and safe and smooth run of plant without breakdown which leads to economic growth. Chemical engineer plays an important role in industrial safety and pollution control. This course deals with basic concepts and methods for industrial safety and pollution control.

**COURSE OBJECTIVE(S):**

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences: Use principles of safety & pollution control to operate plant safely, and control pollution within permissible limits in chemical industries.

**TEACHING & EXAMINATION SCHEME:**

Teaching Scheme (Hrs/Week)				Examination Scheme					
Theory	Tutorial	Practical	Credit	SEE		CA			Total
				Th	Pr	MSE	PLE	LA	
3	0	0	3	60	00	20	20	00	100

SEE: Semester End Examination; CA: Continuous Assessment; Th: Theory; Pr: Practical; MSE: Mid Semester Examination; PLE: Participatory Learning Experience; LA: Laboratory Assessment

TOTAL Theory Hours: No. of Th. and Tut. Hrs/Week\*15 = 45

**COURSE CONTENT(S):**

Unit No.	Content	Hours	Weightage (%)
1	<b>Unit - I Introduction to Industrial Safety and pollution control</b> 1.1 Importance of Industrial Safety and pollution control 1.2 Significant Industrial Disaster: Bhopal gas tragedy 1.3 terminologies: (a) Safety ( b) Pollution (c) Exposure (d)Severity (e) Probability (f) Hazard (g) Risk (h) Accident (i) Unsafe Act and Unsafe Condition (j) Near miss (k) Aspect and Impact 1.4 Overview of Indian and International Safety, health and Environmental Standards and Laws Air and Water quality specifications by GPCB or CPCB	05	10
2	<b>Unit - II Hazards and Their Control</b> 2.1 Describe Chemical industrial Hazards a. Chemical hazard b. Electrical hazard c. Mechanical hazard	12	30



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	<p>d. Biological hazard e. Radiation hazard 2.2 Classification of Chemical hazard 2.3 Occupational diseases and their causes 2.4 Hazard control hierarchy a. Elimination b. Substitution c. Engineering Controls Ventilation and lighting, Enclosure, Isolation d. Administrative Controls Work permit system, Lock Out Tag Out (LOTO) Management, Drills and table top exercises, Good Housekeeping- 5S, Color codes and symbols for safety in chemical plants e. Personal Protective Equipments (PPEs) 2.5 Fire hazards &amp; their causes 2.6 Fire Triangle and Fire Extinguishment method 2.7 Classes of fire and respective suitable firefighting equipment 2.8 Fire extinguisher operation: PASS 2.9 MSDS</p>		
3	<p><b>Unit - III Hazard Identification and Risk Assessment</b> 3.1 List out various Hazard Identification methods : 3.2 Explain Hazard Identification Method: Hazard Operability Study (HAZOP) 3.3 List out various Risk Assessment Methods 3.4 Explain Risk Assessment method: ETA and FTA</p>	04	10
4	<p><b>Unit - IV Air Pollution Control</b> 4.1 Air Pollution Pollutants, and its sources 4.2 Particulate control equipments Gravity Settling Chamber, Cyclone separator, Fabric Filter, Wet Scrubber and Electrostatic Precipitator 4.3 Thermal incineration, stack 4.4 Methods for control of Sulfur dioxide emission a. Extraction of sulfur from fuels: Hydrodesulphurization of coal b. Desulphurization of flue gases by Wet processes (wet scrubbing methods) 4.5 Methods for control of Nitrogen Oxides a. Modification of operating condition b. Modification of design condition</p>	07	10
5	<p><b>Unit - V Water Pollution Control</b> 5.1 Water Pollution Pollutants, and its sources 5.2 characteristics of water DO, BOD, COD, VM, Suspended Matter (turbidity), TDS, Ph 5.3 Waste water treatment method (a) Primary treatment i. Pretreatment ii. Sedimentation iii. Floatation (b) Secondary treatment</p>	13	30



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	i. Aerobic process ii. Anaerobic process: Activated sludge process iii. trickling filter 5.4 Suspended solids treatment methods a. Micro straining b. Coagulation c. Filtration 5.5 Dissolved solids and treatment methods a. Ion exchange b. Reverse Osmosis 5.6 Chemical oxidation/Disinfection 5.7 Thickening, Digestion, Conditioning, Dewatering, Oxidation and ultimate sludge removal 5.8 Effluent treatment plant- ETP		
6	<b>Unit - IV Solid Waste Management</b> 6.1 solid waste classification 6.2 Methods of solid waste disposal a. Open Dumping b. Sanitary Land filling c. Incineration d. Compositing e. Reuse, recovery and recycling 6.3 Public Health aspects	04	10
	<b>TOTAL</b>	45	100%

**Text Book(s):**

Title of the Book	Author(s)	Publication
Environmental Pollution and Control in Chemical Process Industries	<a href="#">S.C. Bhatia</a>	Khanna Publishers-2001
Pollution Control in Chemical and Allied Industries	N. Hanley	CBS Publishers & Distributors-2010

**Reference Book(s):**

Title of the Book	Author(s)	Publication
Environmental Pollution control	C. S. Rao	New age international Pvt. Limited, 2nd edition
Pollution Control in Process Industries	S. P. Mahajan	Tata Mc GrawHill
Industrial Safety and Environment	Anupama Prashar Pratibha Bansa	S.K.Kataria & Sons

**Web Material Link(s):**

- a) <https://ndl.iitkgp.ac.in/>
- b) <https://www.vlab.co.in/>
- c) <https://www.osha.gov/>



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- d) <https://labour.gov.in/industrial-safety-health>
- e) <https://www.iso.org/popular-standards.html>
- f) <https://ndma.gov.in/>
- g) <https://www.csb.gov/videos/>
- h) <https://www.oisd.gov.in>
- i) <https://cpcb.nic.in/>
- j) <https://gpcb.gujarat.gov.in/>
- k) <https://www.accuweather.com/>
- l) <https://unfccc.int>

**Equivalent/Corresponding Course on NPTEL (SWAYAM):**

**NPTEL course on**

<https://nptel.ac.in/>

**COURSE EVALUATION:**

Sr. No.	Activity	Marks	Weightage
1	Semester End Examination (External Th)	60	60%
2	Internal Examination	40	40%
2(a)	Mid Semester Examination	20	50%
2(b)	Attendance	10	25%
2(c)	Assessment Types (Any One from 2(c).1 to 2(c).7)	10	25%
2(c).1	Subject (Course) based Mini-Project		
2(c).2	Industry/Site Visit & Report		
2(c).3	Assignment		
2(c).4	Seminar		
2(c).5	Case Study		
2(c).6	Surprise Class Quiz		
2(c).7	Design Exercise		
2(c).7	Presentation		
2(d)	Practical (if Applicable)		

\* For 4Credit Subjects

1 Credit = 25 Marks

Theory: 3 Credits = 75 Marks

Practical: 1Credit = 25Marks

SEE Evaluation will be of 100 marks and converted to 50 Marks (75 Th + 25 Pr)

CA Evaluation will be of 100 Marks and converted to 50 Marks. (75 Th + 25 Pr)



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**Distribution of Marks for Theory Evaluation as per Bloom's Taxonomy Level:**

Level	Remember	Understand	Apply	Analyze	Evaluate	Create
% Weightage	12%	27%	31%	10%	10%	10%

**COURSE OUTCOMES:** *(in the range of 4 to 6)*

CO1	Understand basic concepts of Environment, Health & Safety.
CO2	Apply hazard control method in chemical industries.
CO3	Discuss hazard identification method & Risk assessment method.
CO4	Apply pollution control methods in chemical industries