



SARVAJANIK
UNIVERSITY

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SARVAJANIK UNIVERSITY
Sarvajani College of Engineering and Technology
Surat.



Bachelor of Technology (B.Tech)

B. Tech. Semester IV

Subject Code: BTCH13402

Subject Name: Chemical Process safety & Waste Management

Type of course: Professional Core Courses (PCC)

Prerequisite: Environmental Sciences

Rationale: This course offers basic understanding of Safety in chemical industries and Waste management and different techniques of it.

Teaching and Examination Scheme:

TEACHING SCHEME				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	150
2	0	2	3	60	25	15	30	20	

CA1: Continuous Assessment (assignments/projects/open book tests/closed book tests **CA2:** Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems **TEE:** Term End Examination **TEP:** Term End Practical Exam (Performance and viva on practical skills learned in course) **CA3:** Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage (%)
1.	Inherent safety; Major disasters of chemical industries, Safe industrial practices, Need for safety, introduction to Material Safety Data Sheet (MSDS), SDS, GHS, TREMcard and Placard, Sources of exposure, exposure evaluation, exposure-hazard control, Concept of TLV-TWA, TLV-STEL and TLV-C, LD 50 and LC 50. Fire and explosion: types of fire, detonation and deflagration, UVCE and BLEVE, Fire extinguishers, Safety by design sizing of specific devices such as, safety release valves, vents, flare systems; Instrumentation for safety - specific devices such as alarms, interlocks, shutdown systems, Hazard Identification Checklist procedure, Preliminary hazard analysis, What if analysis, Hazard and operability (HAZOP) studies, Hazard analysis techniques: Fault tree analysis, Event tree analysis, General outline of DOW index, warnings and hazard classifications, road transport & sea transport guidelines, types of insurances, onsite- off site preparations, personal protective equipment,	12	40



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2.	Air pollution: Air pollutants: sources (specific pollutants), effects, and sampling of Air pollutants. Control of gaseous and particulate air pollutants. Sources of Noise pollution and effect and control.	5	15
3.	Water pollution: sources and classification of water pollutants, Physico-chemical characterization of wastewater, water quality standards, Industrial water pollution management: Wastewater treatment processes; Pre-treatment, primary and secondary Treatment processes. Advanced wastewater treatment processes.	7	23
4.	Solid waste management: sources and classification, public health aspects, methods of collection, potential methods of disposal: sanitary landfill, incineration, composting, recovery and recycling	3	12
5.	Water and air act, hazardous waste handling & management act, environmental impact assessment, environmental audit and safety audit	3	10

Suggested Specification table with Marks (Theory/Practical):

% Distribution of Marks					
R Level	U Level	A Level	N Level	E Level	C Level
30	30	15	15	10	00

Legends: R: Remembrance, U: Understanding; A: Application, N: Analyze, E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Text Books:

Sr. No.	Title of book /article	Author(s)	Publisher and details like ISBN	Year of publication	Publication Edition
1	Chemical Process Safety: Fundamentals with Applications.	Daniel Crowl and Joseph Louvar,	Pearson Prentice Hall;	2020	4th edition
2	Environmental Pollution Control Engineering	C.S.Rao	New Age International Publishers, New Delhi.	2018	3 rd edition

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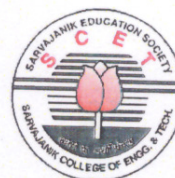




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3	Wastewater Engineering: Treatment & Reuse	Metcalf and Eddy	McGraw Hill Publication	2017	Indian edition
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Course Outcome:

Sr. No.	CO Statement After learning this subject, students will be able to	Marks % weightage
CO-1	Understand Importance of safety regulatory requirement and methods achieve it	20
CO-2	Identify various hazards in Chemical industry and minimize it	20
CO-3	Categorize different types of pollution caused due to industrialization	15
CO-4	Control various types of pollution by applying various control devices	35
CO-5	Understand the rules and regulations of pollution and its control	10

Mapping with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS O1	PSO 2	PSO3
CO-1	3	3	2	3	3	2	3	3	2	2	2	3	2	3	3
CO-2	3	3	2	1	1	3	3	3	3	2	2	3	2	3	3
CO-3	3	3	3	3	2	2	3	2	2	2	2	3	1	3	3
CO-4	2	2	1	3	3	3	2	3	2	3	3	3	3	2	2
CO-5	2	1	2	1	1	3	3	3	2	2	2	2	3	2	1
Rationale*	13	12	10	11	10	13	14	14	11	11	11	14	11	13	12

LIST OF PRACTICALS:

1. Determine BOD of waste water sample.
2. Determine COD of waste water sample.
3. Determine TDS and TSS of waste water sample.
4. Determine Turbidity of waste water sample.
5. Determine Chloride content of waste water sample.
6. Determine Hardness of waste water sample.



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7. Determine alkalinity and acidity of waste water sample.
8. Study the high volume sampler
9. Study the stack monitoring kit
10. Study different types of fire extinguishers

Major Equipment:

1. High volume sampler
2. Stack monitoring kit
3. BOD incubator
4. COD digester

List of Open Source/learning website:

Students can refer to video lectures available on the websites including NPTEL
<https://nptel.ac.in/courses>

List of Open Source Software:

Students can develop their own programs for the solutions of problems. Websites: www.safetyforlife.com.au

