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SARVAJANIK UNIVERSITY

Sarvajanik College of Engineering and Technology

Bachelor of Technology (B.Tech)

B. Tech. Semester VII

Subject Name: Safety, Health and Environment in Chemical Industries **Subject Code:BTCH15701**

Type of course: **Open Elective**
Prerequisite: Basic knowledge ofEnvironment studies, Chemistry and Chemical processes.
Rationale: To bring in the importance and the underlying principles of health and safety associated with the chemical industry.

Teaching and Examination Scheme:

TEACHING SCHEME				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	100
3	0	0	3	60	25	15	0	0	

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.	Safety and Accident Loss Statistics, Introduction to safety, Safety in chemical mechanical and electrical fields, Hazard, Different types of Hazard, Fire, Fire Triangle, Risk, Identification techniques, mitigation, Risk Management and Hazardous Substance Rules , Nature of Accident and major disasters	04	9%
2	Material Safety Data Sheet (MSDS) and Safety Data Sheet (SDS), TREM card and Placard. Industrial Hygiene: Evaluation and Control. Good housekeeping practices	06	13%
3	Hazard & Hazard Identification: Introduction Hazard Identification Methods & HAZOP , Safety Reviews & Risk Assessment Review of Probability Theory , Event Trees: Quantitative Risk Analysis , Fault Trees: Quantitative Risk Analysis, Cause Consequence Analysis & Layer of Protection Analysis, Bow-Tie Analysis, warnings and hazard classifications, road transport & sea transport guidelines, types of insurances, onsite-off site preparations.	08	18%
4	Introduction Source ModelsSource Models for Gas , Source Models , Source Model Problems	06	13%
5	Fire and Explosions: Introduction, Flammability Characteristics, Explosion & its Classification, Fire Extinguishers	06	13%

6	Environment pollution: Air, water and solid waste management- Sources and classification, Public health aspects, Characterization, Sampling and monitoring, Control, Treatment and Disposal	08	18%
7	Government regulations related to industrial safety, State and Central regulations, ISO OSHA	07	16%

Suggested Specification table with Marks (Theory/Practical):

% Distribution of Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
25	**25**	**10**	-	-	-

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.	Crowl and Louvar,	Pearson;	3 July 2020	4th edition
2	Fundamentals of Process Safety	Victor Christopher Marshall Steve Runeman	The Institution of Chemical Engineers 978-0852954317	(1 November 2000)	-
3	What Went Wrong? Case Histories of Process Plant Disasters: How They Could Have Been Avoided	Kletz T	Lewis Publishers ISBN-10 : 1856175316 ISBN-13 : 978-1856175319	2009	5th edition

Course Outcome:

Sr. No.	CO Statement After learning this subject, students will be able to	Marks % weightage
CO-1	To understand the fundamentals of chemical process safety and hazards management	20
CO-2	To discuss the important component of the Risk Management Plan (RMP) i.e. hazards identification, hazard analysis, consequence analysis and emergency response	25
CO-3	To discuss the advancement in the field of risk assessment (both intentional and unintentional threats)	15

CO-4	Use problem solving sessions with examples to estimate Dow's Fire & Explosion Index	20
CO-5	To provide future perspective of inherently safer processes and designs for making safe chemical plants	20

Mapping with POs:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO-1	3	3	2	1	1	3	3	3	2	2	2	3	2	2	2
CO-2	3	3	2	1	1	3	3	3	2	2	2	3	2	2	1
CO-3	3	3	2	1	1	3	3	3	2	2	2	3	1	1	1
CO-4	3	3	2	1	1	3	3	3	2	2	2	2	2	2	3
CO-5	3	3	2	1	1	3	3	3	2	2	2	2	2	2	3
Rationale*	15	15	10	5	5	15	15	15	10	10	10	13	9	9	10

Rationale*: Explaining why it is matching this particular program outcome

List of Open Source/learning website: NPTEL courses related to process safety