



Department of Chemical Engineering		LP: CH22037 Rev. No: 00
B.E/B.Tech/M.E/M.Tech : Chemical Engineering Regulation: 2022		Date: 04.07.2024
PG Specialisation :		
Sub. Code / Sub. Name : CH22037 / Safety in Process Industries		
Unit : I		

Unit Syllabus: SAFETY IN PROCESS DESIGN AND PRESSURE SYSTEM DESIGN

Design process, conceptual design and detail design, assessment, inherently safer design- chemical reactor, types, batch reactors, reaction hazard evaluation, assessment, reactor safety, operating conditions, unit operations and equipments, utilities. Pressure system, pressure vessel design, standards and codes- pipe works and valves- heat exchangers- process machinery- over pressure protection, pressure relief devices and design, fire relief, vacuum and thermal relief, special situations, disposal- flare and vent systems- failures in pressure system.

Objective: To learn the safe Design of process equipments in chemical industries

Session No *	Topics to be covered	Ref	Teaching Aids
1	Design Process - Conceptual Design, Detail Design	T-4, Ch-11, Pg-2	PPT, Video
2	Inherently Safer Design (ISD)	T-4, Ch-11, Pg-16	PPT, Video
3	Chemical Reactors Types	T-4, Ch-11, Pg-30	PPT, Video
4	Reaction Hazard Evaluation	T-4, Ch-11, Pg-45	PPT, Video
5	Unit Operations and Equipment	T-4, Ch-11, Pg-69	PPT, Video
6	Reactor Safety and Operating Conditions	T-4, Ch-11, Pg-73	PPT, Video
7	Pressure Systems	T-4, Ch-12, Pg - 8	PPT, Video
8	Overpressure Protection	T-4, Ch-12, Pg-46	PPT, Video
9	Failures in Pressure Systems	T-4, Ch-12, Pg-80	PPT, Video

Content beyond syllabus covered (if any):

* Session duration: 50 minutes



Sub. Code / Sub. Name: **CH22037 / Safety in Process Industries**

Unit: II

Unit Syllabus: PLANT COMMISSIONING AND INSPECTION

Commissioning phases and organization, pre-commissioning documents, process commissioning, commissioning problems, post commissioning documentation Plant inspection, pressure vessel, pressure piping system, non destructive testing, pressure testing, leak testing and monitoring- plant monitoring, performance monitoring, condition, vibration, corrosion, acoustic emission-pipe line inspection.

Objective: To understand the safety considerations in plant commissioning and inspection

Session No *	Topics to be covered	Ref	Teaching Aids
10	Commissioning Phases: Preparation Phase, Pre-commissioning Phase, Performance Testing, Handover Phase	T-4, Vol 2, Ch-19, Pg- 1	PPT, Video
11	Organization, Pre-commissioning Documents Process Commissioning, Commissioning Problems, Post	T-4, Vol 2, Ch-19, Pg- 2	PPT, Video
12	Pressure Vessel Inspection	T-4, Vol 2, Ch-19, Pg- 20	PPT, Video
13	Pressure Piping System	T-4, Vol 2, Ch-19, Pg- 24	PPT, Video
14	Non-Destructive Testing (NDT)	T-4, Vol 2, Ch-19, Pg- 26	PPT, Video
15	Pressure Testing	T-4, Vol 2, Ch-19, Pg- 30	PPT, Video
16	Leak Testing and Monitoring, Performance Monitoring, Condition Monitoring,	T-4, Vol 2, Ch-19, Pg- 32,34	PPT, Video
17	Corrosion Monitoring, Acoustic Emission	T-4, Vol 2, Ch-19, Pg-45, 46	PPT, Video
18	Pipeline Inspection: n-line Inspection (ILI) External Inspection	T-4, Vol 2, Ch-19, Pg-49	PPT, Video
Content beyond syllabus covered (if any):			

* Session duration: 50 mins



Sub. Code / Sub. Name: **CH22037 / Safety in Process Industries**

Unit: III

Unit Syllabus: PLANT OPERATIONS

Operating discipline, operating procedure and inspection, format, emergency procedures- hand over and permit system- start up and shut down operation, refinery units- operation of fired heaters, driers, storage- operating activities and hazards- trip systems- exposure of personnel

Objective: To learn the safety requirements in plant operations and procedures.

Session No *	Topics to be covered	Ref	Teaching Aids
19	Operating Discipline: Definition, Components.	T-4, Vol 2, Ch-20, Pg-3	PPT, Video
20	Operating Procedure and Instructions : Operating , Instruction	T-4, Vol 2, Ch-20, Pg-3	PPT, Video
21	Emergency Procedures: Purpose, Components	T-4, Vol 2, Ch-20, Pg-7	PPT, Video
22	Handover and Permit System: Handover, Permit-to-Work (PTW) System	T-4, Vol 2, Ch-20, Pg-8	PPT, Video
23	Start-up and Shutdown Operation	T-4, Vol 2, Ch-20, Pg10	PPT, Video
24	Refinery Units Operation: Fired Heaters, Driers, Storage Units.	T-4, Vol 2, Ch-20, Pg-11	PPT, Video
25	Operating Activities and Hazards: Common Activities, Hazards	T-4, Vol 2, Ch-20, Pg - 18	PPT, Video
26	Trip Systems: Definition, Components, Purpose	T-4, Vol 2, Ch-20, Pg-20	PPT, Video
27	Exposure of Personnel: Risks, Controls, Monitoring.	T-4, Vol 2, Ch-20, Pg-21	PPT, Video

Content beyond syllabus covered (if any):

* Session duration: 50 mins



Sub. Code / Sub. Name: **CH22037 / Safety in Process Industries**
Unit: IV

Unit Syllabus: PLANT MAINTENANCE, MODIFICATION AND EMERGENCY PLANNING

Management of maintenance, hazards- preparation for maintenance, isolation, purging, cleaning, confined spaces, permit system- maintenance equipment- hot works- tank cleaning, repair and demolition- online repairs- maintenance of protective devices- modification of plant, problems/controls of modifications. Emergency planning, disaster planning, onsite emergency- offsite emergency, APELL

Objective: To understand the need for plant maintenance, modification and emergency planning

Session No *	Topics to be covered	Ref	Teaching Aids
28	Maintenance Management: Definition, Components: Hazard Management in Maintenance: Preparation for Maintenance	T-4, Vol 2, Ch-21, Pg-1	PPT, Video
29	Isolation, Purging, and Cleaning	T-4, Vol 2, Ch-21, Pg-7	PPT, Video
30	Confined Spaces: Hazards, Safety Measures.	T-4, Vol 2, Ch-21, Pg-12	PPT, Video
31	Permit System: Types of Permits, Permit Process, Hot Work Permit, Cold Work Permit, Confined Space Entry Permit	T-4, Vol 2, Ch-21, Pg-28	PPT, Video
32	Maintenance Equipment, Hot Works	T-4, Vol 2, Ch-21, Pg-33	PPT, Video
33	Tank Cleaning, Repair, and Demolition, Online Repairs	T-4, Vol 2, Ch-21, Pg-35	PPT, Video
34	Maintenance of Protective Devices: Types of Protective Devices, Maintenance Procedures., Modification of Plant	T-4, Vol 2, Ch-21, Pg-36	PPT, Video
35	Emergency Planning and Disaster Planning: Components, Onsite Emergency,	T-4, Vol 2 ,Ch-24, Pg-1	PPT, Video
36	Emergency Planning and Disaster Planning: Offsite Emergency, APELL (Awareness and Preparedness for Emergencies at Local Level)	T-4, Vol 2, Ch-24, Pg-13	PPT, Video

Content beyond syllabus covered (if any):

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Sub. Code / Sub. Name: **CH22037 / Safety in Process Industries**
Unit: V

Unit Syllabus: STORAGES

General consideration, petroleum product storages, storage tanks and vessel- storages lay out segregation, separating distance, secondary containment- venting and relief, atmospheric vent, pressure, vacuum valves, flame arrestors, fire relief- fire prevention and protection- LPG storages, pressure storages, layout, instrumentation, vapourizer, refrigerated storages- LNG storages, hydrogen storages, toxic storages, chlorine storages, ammonia storages, other chemical storages- underground storages- loading and unloading facilities- drum and cylinder storage- ware house, storage hazard assessment of LPG and LNG

Objective: To learn the general consideration in storage vessel design and operation.

Session No *	Topics to be covered	Ref	Teaching Aids
37	General Considerations for Storage: Petroleum Product Storage, Storage Tanks and Vessels, Storage Layout , Segregation and	T-4, Vol 2, Ch-22, Pg-5	PPT, Video
38	Venting: Atmospheric Vents, Pressure/Vacuum Valves, Flame Arrestors.	T-4, Vol 2, Ch-17, Pg-124	PPT, Video
39	Fire Relief: Purpose, Devices	T-4, Vol 2, Ch-16, Pg-1	PPT, Video
40	Fire Prevention and Protection	T-4, Vol 2, Ch-16, Pg-261	PPT, Video
41	Specific Storage Systems: LPG Storage, Pressure Storage, Refrigerated Storage,	T-4, Vol 2, Ch-22, Pg-21	PPT, Video
42	LNG Storage, Hydrogen Storage, Toxic Storage, Warehouse Storage	T-4, Vol 2, Ch-22, Pg-38 -	PPT, Video
43	chlorine storages, ammonia storages Other Chemical Storage,	T-4, Vol 2, Ch-22, Pg-38 -	PPT, Video
44	Underground Storage, Loading and Unloading Facilities, Drum and Cylinder Storage,	T-4, Vol 2, Ch-22, Pg-44 -	PPT, Video
45	Storage Hazard Assessment of LPG and LNG	T-4, Vol 2, Ch-22, Pg-79,83	PPT, Video

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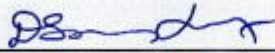

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TEXTBOOKS:

1. “Quantitative Risk Assessment in Chemical Process Industries” American Institute of Chemical Industries, Centre for Chemical Process safety.
2. Fawcett, H.h. and Wood, “Safety and Accident Prevention in Chemical Operations” Wiley inters, Second Edition.
3. GREEN, A.E., “High Risk Safety Technology”, John Wiley and Sons,. 1984.
4. Lees, F.P. “Loss Prevention in Process Industries” Butterworths and Company, Volume 1 , 1996

REFERENCES:

1. “Accident Prevention Manual for Industrial Operations” NSC, Chicago, 1982.
2. Carbide of Calcium Rules, Government of India.
3. Petroleum Act and Rules, Government of India

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Remarks *:		
Remarks *:		

* If the same lesson plan is followed in the subsequent semester/year it should be mentioned and signed by the Faculty and the HOD