# CHEMICAL PROCESS SAFETY

**Course Code: 13CH2105**

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**Course outcomes:**

On successful completion of the course, the student should be able to

CO1 : Recognize the importance of safety and loss prevention in the present day complex chemical process industry.

CO2 : Identify different toxicants, effects and their elimination pathways. Assess the hazard of fire and explosion by familiarity with properties of materials, nature of fire and explosion process and procedures to reduce fire and explosion hazards.

CO3 : Assess the of possible hazards by using different techniques like check list, HAZOP, Fault Trees.

CO4 : Formulate methods to control process within safe operating regions by designing relief systems

CO5 : Identify the emergencies. Prepare & plan emergency control programme.

**UNIT-I**

**Introduction**: Importance of process safety with examples of major accidents; which might cover chemical, petroleum & petroleum chemical Industrial

**Process Hazards**: Temperature & Pressure flow, level deviation on process Hazard, such as explosions, Toxic release, fires, rupture.

**Ignition Sources**: Flames, Hot surfaces, static electricity, and the like Explosions: Confined & Unconfined explosions, BLEVES, Dust Explosions.

**UNIT-II**

**Material Hazards**: **Flammability**: Flammability Characteristics of Liquid and Vapour, Dependence on Temperature estimation of Flammability, Flammability diagram.

**Toxicity:** Toxicology- How toxicants enter biological organisms, elimation by biological organisms, effect of toxicants on biological organism, Brief Toxilogical study, Threshold limit values, Permissible exposure limits, Reaction Hazards.

**Burning Characteristics**: Flash Point, Fire Point Auto ignitions, Temperature LFL, UFL, Flash point determination, Material Properties of Benzene, methyl alcohol, Ethyl Alcohol, Ethylene Oxide, Caprolactam, Acetone, Acetic Acid, Phenol, Acrylonitrile, Polyprolene, Poly Vinyl Chloride, Gasoline and their Hazards.

**UNIT-III**

**Hazard Analysis**: Check – lists, fault trees, cause – consequence diagrams, HAZOP and other methods of study. Dow procedures for safety assessment.

**Safety Devices**: Relief valves and Rupture disks Explosive relief, flare systems

**UNIT-IV**

**Design to Prevent Fire & Explosions:** Inerting, Control of Static Electricity, ventilation, explosion proof equipment and instruments, Sprinkler systems, miscellaneous design features for preventing fires and explosions

**UNIT-V**

**Emergency Preparedness and Planning:** Typical emergency Plan, On-Site and Off Site Plans, Emergency Control Programme, Individual responsibility during emergency.

**TEXTBOOKS:**

1. Dainel A. Crowe and Louvar J.F, *"Chemical process Safety"* PHI Series, 2002.

2. Sanders R Q, *"Chemical process safety"*, PHI, Elsevier science, 2004.

**REFERENCES**

1. Dawande S.D, *"Chemical Hazards and Safety",* Denette & Co, 2007.

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