# SAFETY AND HAZARD ANALYSIS

## (Professional Elective-III)

**Course Code: 15CH1131**

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### Course Outcomes :

At the end of the Course, the Student will be able to:

**CO 1** Discuss the importance of safety, loss prevention in the present day complex chemical process industry.

**CO 2** Identify different toxicants, routes by which they access biological organisms and pathways by which they can be eliminated.

**CO 3** Analyze the impact of laws and regulations in identification, evaluation and control of hazardous conditions.

**CO 4** 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.

**CO 5** Formulate methods to control process with-in safe operating regions by designing relief systems.

### UNIT-I (8 Lectures)

**INTRODUCTION:**

Safety program, Engineering ethics, Accident and loss statistics, Acceptable risk, Public perception.

**TOXICOLOGY:**

How toxicants enter biological organisms, how toxicants are eliminated from biological organisms.

### UNIT-II (6 Lectures)

**INDUSTRIAL HYGIENE:**

Government regulations, Identification, Evaluation, Control.

## UNIT-III (14 Lectures)

### FIRES AND EXPLOSIONS:

The fire triangle, Distinction between fire and explosions; Definitions, Flammability characteristics of liquids and vapors, LOC and inerting, ignition energy, Auto ignition, Auto oxidation, Adiabatic compression, Explosions.

Designs to prevent fires and explosions: Inerting, Explosion proof equipment and instruments, Ventilation, Sprinkler systems.

## UNIT-IV (14 Lectures)

### INTRODUCTION TO RELIEFS:

Relief concepts, Definitions, Location of reliefs, Relief types, Data for sizing reliefs, Relief systems.

### STATIC ELECTRICITY AND ITS CONTROL

Fundamentals of static charge, charge accumulation, electro static discharges, charge from electro static discharges, energy from electro static ignition sources.

### CONTROLLING STATIC ELECTRICITY

General design methods to prevent electro statics ignitions, relaxation, bonding and grounding. Dip pipes.

## UNIT-V (8 Lectures)

### HAZARDS IDENTIFICATION:

Process hazards checklists, Hazard surveys, Hazop safety reviews.

## TEXT BOOKS:

Crowl, D.A. and Louvar, J.F. "Chemical Process Safety (Fundamentals with applications)", 2nd Edition, Prentice Hall , 1990.

## REFERENCES:

1. Fawcet, H.H. and Wood, W.S. "Safety and Accident Prevention in Chemical Operations", 2nd Edition, John Wiley, New York, 1982.
2. Sinnot, R.K. "Coulson and Richardson's, Chemical Engineering", Vol.6, Butterworth-Heinmann Limited 1996.