
Course Title : Process Safety

- **Aim:**

This course aims to familiarize students with concepts related to chemical process safety, including potential hazards in a chemical plant, how to analyze and minimize their risk, predict potential consequences of a safety incident, and safety process equipment

- **Syllabus:**

- ✓ Introduction: Teaching method, Motivation, Review of some safety disasters
- ✓ Toxicology: How toxicants enter, affect, and are eliminated from biological organisms. How to reduce their effect. Dose-response curves
- ✓ Industrial hygiene: laws and regulations, anticipation and identification of workplace hazards, evaluation of magnitude of exposure and ways to control it
- ✓ Source models: flow of gases and liquids through holes, models for leakage of gases and liquids through pipes and vessels, flashing liquid
- ✓ Toxic release and dispersion models: dispersion of toxicants away from the source, parameters affecting dispersion, steady-state and transient dispersion models.
- ✓ Toxic release and dispersion models 2: Puff and Gaussian dispersion models cont'd
- ✓ Fire and explosion: flammability of gases and liquids, unsafe conditions leading to explosion, estimation of damages from explosion
- ✓ How to prevent fire and explosion: use of inert gases (pros and cons), electrostatic ignition and methods to prevent it, ventilation, and explosion-proof equipment
- ✓ Chemical reactivity: awareness, identification, and screening of reactive chemical hazards, characterization of reactive chemical hazards using calorimeters, methods for controlling reactive chemical hazards
- ✓ Relief valves: concept of relief and its importance, types of relief and their pros and cons, relief systems, relief scenarios with process examples, relief design considerations
- ✓ Relief valve sizing: sizing methods for different phase conditions, simulation of relief using software
- ✓ Hazard identification: process hazards checklist, hazards and operability studies
- ✓ Risk assessment: review of probability theory, event and fault trees, quantitative risk analysis, layers of protection analysis
- ✓ Case histories: study and analysis of process accidents in Iran and other countries
- ✓ Design for safety: safety procedures, accident investigations, inherently safer designs

- **Reading Resources:**

Chemical Process Safety: Fundamentals with Applications, 3rd ed. Daniel A. Crowl, Joseph F. Louvar. Prentice Hall