THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING

Chemical Process Safety

CBE 4755

Credit Hours:
2.00 - 2.00

Course Levels:
Undergraduate (1000-5000 level)

Course Components:
Lecture

Course Description:
Consideration of process safety concepts and application in the chemical process industry.

Prerequisites and Co-requisites:
Prereq: 3422 or 3521, and enrollment in CBE or EngPhysics major; or Grad standing; or permission of instructor.

Course Goals / Objectives:
- Become familiar with the process safety issues found in a chemical plant environment
- Become familiar with the range of process safety ethical issues which commingle personal safety and environment protection with enterprise success
- Understand the nature, causes and prevention of major loss events
- Become familiar with process hazard analysis (PHA) methods and tools
- Become familiar with government regulations related to process safety
- Introduce consequence analysis methodology and worst-case estimation assumptions
- Become knowledged in deciphering the anatomy of an incident through PHA and incident case studies
- Understand the importance of process safety management

Course Topics:

- Process Safety Culture: introduction to process safety, code of engineering ethics, pillars of process safety management, tolerable vs acceptable risks, anatomy of an incident
- Chemical Hygiene and toxicology
- Consequence Analysis: source model, hazard material dispersion, flammability and explosions, chemical reactivity, and consequence prevent and mitigation strategies
- Process Hazard Identification and Analysis: introduction to methodologies including checklist, inherent safety review, failure model and effects analysis
- what-if hazardous operation (HAZOP) analysis, guided-word HAZOP analysis, management of change, and pre-startup safety review
- Inductive and Deductive Risk Analysis: failure probability concepts, fault tree analysis, event tree analysis, layers of protection analysis and bow-tie concept
- Process safety incident case studies: runaway reactions (e.g. T2), dust explosions (e.g. AL Solutions, Inc.), inherent safety risk, layers of protection/swiss cheese analogy, direct and indirect consequence severity (e.g. Bhopal)
- safeguard redundancy (e.g. utility such as Fukushima Daiichi), vapor cloud explosion and startup analysis (e.g. BP Texas City), anatomy of an incident and environmental impacts (e.g. Deepwater Horizon)
- Introduction to plant design specifications: components of a front end engineering design package including mechanical design and control specification, piping & instrumentation diagrams (P&ID)
- Pressure vessel and piping standardized mechanical design methodology and certification requirements, determination of maximum allowable working pressure and temperature (MAWP and MAWT)

Designation:
Required