

ChE 4863 Environment, Health, and Safety in Chemical Processes

Catalog Description: Technical fundamentals of chemical process safety including toxicology and industrial hygiene, vapor and liquid releases and dispersion modeling, flammability characterization, fire and explosion prevention, relief and explosion venting, hazard identification and risk assessment, spill response and remediation. Prerequisite: Senior standing in chemical engineering or permission of instructor.

Textbook: Crowl and Louvar, "Chemical Process Safety: Fundamentals with Application", 3rd Edition and supplemental handouts, OSHA 29 CFR 1910, EPA Title 40 Part 68

Course Goals/Objectives: By the end of the course, the student will be able to 1) relate EPA and OSHA regulations, toxicology, industrial hygiene, source models, dispersion models, flammability, reactivity, fires and fire prevention, explosions and explosion prevention, electrostatics, pressure relief systems, runaway reactions, and risk analysis as they apply to chemical process safety, and be able to solve corresponding problems; 2) relate the nature of the accident process and methods used in accident investigation, inherently safer design strategies, P&ID HAZOP analysis, and the various strategies and governmental regulations relevant to process safety management; 3) collect and analyze literature data for determining flash points, flammability limits, runaway reaction potential, designing pressure relief systems (API 521), and for characterizing dust explosions and electrostatic charge accumulation and discharge; and 4) relate basic spill response and remediation to include activated sludge waste water treatment, landfarming of organic wastes, landfills, and spill impacts to groundwater.

Prerequisites by Topic: Stoichiometry, basic thermodynamics; heat transfer, mass transfer organic chemistry, fluid mechanics, basic reactor design

Major Topics Covered in the Course: Toxicology and industrial hygiene, vapor and liquid releases and dispersion modeling, flammability characterization, fire and explosion prevention, relief and explosion venting, reactive hazards, accident prevention, hazard identification and risk assessment, spill response and remediation, safety and environmental regulations.

Class/Laboratory Schedule: Three (3) 50-minute lectures per week for 14 weeks

	A. Apply Math and Science	B. Design/Conduct/Analyze Experiments	C. Design Process with constraints	D. Multi-disciplinary teams	E. Identify/Formulate/Solve engineering problems	F. Professional and ethical responsibility	G. Communicate effectively	H. Understand impact of engineering solutions	I. Life-long learning	J. Contemporary issues	K. Modern engineering skills/ tools
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Objectives											
1. Relate EPA and OSHA regulations, toxicology, industrial hygiene, source models, dispersion models, flammability, reactivity, fires and fire prevention, explosions and explosion prevention, electrostatics, pressure relief systems, runaway reactions, and risk analysis as they apply to chemical process safety, and be able to solve corresponding problems.	X				X	X		X			
2. Relate the nature of the accident process and methods used in accident investigation, inherently safer design strategies, P&ID HAZOP analysis, and the various strategies and governmental regulations relevant to process safety management.	X	X	X			X		X		X	
3. Collect and analyze literature data for determining flash points, flammability limits, runaway reaction potential, designing pressure relief systems (API 521), and for characterizing dust explosions and electrostatic charge accumulation and discharge.	X		X		X			X	X		X
4. Relate basic spill response and remediation to include activated sludge waste water treatment, landfarming of organic wastes, landfills, and spill impacts to groundwater.	X	X	X		X			X		X	X