

ChBE 4515 Chemical Process Safety (required course)

Credit: 1-0-1

Instructor: Dennis W. Hess

Text book: *“Chemical Process Safety: Fundamentals with Applications”* D. Crowl and J. Louvar Third Ed., Prentice-Hall, 2011

Catalog Description: Fundamental sources of chemical hazards and degree of risk. Process design and hazard avoidance are used to reduce risk.

Prerequisites: Chemical Process Principles (ChBE 2100), Thermodynamics I (ChBE 2130), Numerical Methods (ChBE 2120), Thermodynamics II (ChBE 3120), Transport Phenomena I (ChBE 3200), Transport Phenomena II (ChBE 3210), Kinetics and Reactor Design (ChBE 4200), Differential Equations (Math 2403), all courses with a minimum grade of “C”.

Objectives: Specific outcomes of instruction. This course introduces basic concepts relating to chemical hazards, risk, and ethics. The interaction and trade-offs of these concepts are stressed in order to establish approaches to selection and evaluation of processes and their implementation into small and large scale plants/laboratories. Quantitative analyses of chemical releases and dispersion using thermodynamic, transport, and reaction/reactor considerations are used to develop an appreciation for and understanding of chemical incidents and the possible consequences to plant facilities, workers, and the general public. Examples of problems that can occur with inadequate process design, improper process modification, and disregard for ethical decision making are discussed using numerous case studies. Explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.

Learning Outcomes: By the end of this course, a student should be able to:

1. Develop an awareness of safety culture (Student Outcomes: f, j, l)
2. Evaluate effect of toxicants and other hazards (Student Outcomes: h, j)
3. Quantitatively analyze release and dispersion rates of liquids and vapors (Student Outcomes: a, b, e, h, j, k)
4. Analyze fire and explosion hazards (Student Outcomes: b, c, e, h)
5. Integrate safety concepts into chemical process design (Student Outcomes: a, c, e, f, h, j)

6. Recognize the role that ethics plays in process design and operation (Student Outcomes: c, e, f, h, j)
7. Perform hazard identification, risk assessment (Student Outcomes: c, e, f, h, j)

Topical Outline

1. Accident process/loss statistics, inherent safety, safety culture, ethics
2. Toxicology
3. Industrial hygiene
4. Source models
5. Toxin release and dispersion
6. Fires and explosions
7. Relief and safety devices
8. Hazard identification and risk analysis
9. Case studies

Prepared by Dennis Hess