**1. ChE 312 - Chemical Process Safety**

**2. Credits and contact hours**

 3-0-3 (3 lecture hr/wk – 0 lab hr/wk – 3 course credits)

**3. Course Coordinator or Instructor:** Thomas Devine

**4. Textbook**

 Daniel A. Crowl and J. F. Louvar, *Chemical Process Safety, Fundamentals with Applications,* 3rd ed., Prentice Hall, 2011. 723 pages. ISBN-13: 978-0-13-138226-8

**5. Specific course information**

 **a. Description:**

This course is intended to provide an overview of the principles and practices used in the Chemical Processing Industry to assess and manage process safety. Both the technical components of Process Safety engineering and the Process Safety management system component will be studied. Practical aspects and challenges related to process safety concepts that occur in industry will be highlighted during the course

 **b. Prerequisites:** none

 **Co-requisites:** none

 **c.** **Required**

**6. Specific goals for the course**

 **a. Course Objectives:**

1. Provide students with the knowledge to understand the basic principles of process safety and process safety management and the knowledge that “safe and risk” are relative terms.

2. Teach students some of the technical approaches used in process safety to evaluate potential consequences of deviations as well as the awareness of process safety management requirements-internal and external

3. Make students aware of the importance of process safety in the “real world” and the impact it has on them, their colleagues, their company and surrounding communities

**b.** See Actions and Student Learnings (next page)

**7. Topics**

1. *Course overview/Process Safety Overview; PSM/RBPS/OSHA PSM Acronyms*
2. *Chemical reactivity hazards/Process Safety laboratory*
3. *Relief system concepts*
4. *Process Safety Information*
5. *Hazard Identification and Risk Analysis*
6. *Fires and Explosions*
7. *Mitigation/prevention of fire and explosion*
8. *Combustible dusts*
9. *Risk assessment concepts*
10. *Toxicology/Industrial Hygiene/Regulatory Concerns*
11. *Source models/dispersion modeling/ Facility siting*

**ChE 312 Process Safety - Actions and Outcomes**

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| **Strategies and Actions** | **Student Learnings** |
| Introduce basic definitions and properties of process safety and process safety management used in their study | Students can correctly define process safety major components and PSM systems and components |
| Introduce the concept of Process Safety Information (PSI) is and how it is utilized | Students learn to identify the components of PSI and can explain how it is obtained and utilized |
| Introduce the differences and characteristics to use to differentiate between “inherently safe”, “safe” and “risk” | Students learn about risk in terms of frequency and consequences and use risk to define safety levels.  |
| Introduce different process hazard analysis (PHA) and risk assessment techniques (LOPA) | Students can identify and explain most common PHA and risk assessment techniques |
| Introduce the basic hazards and consequences of toxic materials | Students learn to identify most of the basic toxicology terms and concepts that can impact workers in the chemical industry |
| Analyze the loss of containment (LOC) issue and apply the source models used to evaluate the impact of LOC | Students can identify between compressible and incompressible fluids and calculate critical pressure and flows for compressible fluids. |
| Introduce the requirements for fires to occur and what different types of fires/dust fires are possible. | Students can describe the fire triangle and list different types of fires |
| Introduce explosions and identify requirements for different types of explosions also understand overpressure from explosions.  | Students can describe the explosion pentagon and list different types of explosions. Can differentiate between deflagration and detonation and be able to calculate safe distance from overpressure development |
| Introduce combustible dusts and combustible dust hazard characteristics | Students can define what a combustible dust is and is familiar with most of the hazardous property definitions and their application |
| Develop a basic knowledge of the principles of relief sizing | Students understand the basic concept of relief system design and that vapor, liquid and two-phase flow systems are possible. |