

## VI CHE476 Chemical Process Safety

### Course Outline

- **Title:** Chemical Process Safety
- **Code Number:** CHE 476
- **Semester:** 7<sup>th</sup>
- **Credit Hours:** 01
- **Pre-requisites course requirements/ skills:** CHE 111, CHE 129
- **Learning Outcomes:**

Upon successful completion of the course, the students will be able to

1. Discuss the occupational health and safety hazards, their types and sources at work place.
2. Examine and assess the risk of all routines and non-routine activities at work place and apply control measures to reduce the risk.
3. Discuss the safety management system and legal framework for occupational health and safety.

- **Contents**

#### **Unit I: Introduction**

- 1.1 Concepts Definitions, Safety Program
- 1.2 Types of accidents, Causes, direct and indirect effects of accidents
- 1.3 Role of safety consideration in chemical process
- 1.4 Inherent Safety

#### **Unit II: Toxicology**

- 2.1 Toxicology
- 2.2 Effect of toxicants on biological organism
- 2.3 Toxicology studies
- 2.4 Dose vs response

#### **Unit III: Hazards Identification**

- 3.1 HAZOP study.
- 3.2 Safety review and other related methods
- 3.3 Safety audits
- 3.4 Process hazards checklist and hazards surveys

#### **Unit IV: Fire and Explosion**

- 4.1 Fire triangle and fire explosion

4.2 Safety control mechanism

**Unit V: Risk Assessment**

5.1 Review of probability theory in respect of failures, coincidences etc. leading to unsafe situations

5.2 Fault tree analysis

**Unit VI: Reliefs**

6.1 Relief concept

6.2 Location of relief

6.3 Relief types and characteristics

6.4 Relief for thermal expansion of process fluids

6.5 Venting, spring operated and disc relief

- **Teaching-learning Strategies**

The teaching and learning strategy has been designed on the understanding of concepts and the ability to critically analyze and apply the learned content through lectures, discussion, activities, case studies using computer, multi-media and writing board instructional aids.

Lectures: 1 hours per week

- **Assignments- Types and Number with calendar**

A minimum of two assignments to be submitted before the written exam of final term

- **Assessment and Examinations**

Sr. No.	Elements	Weightage	Details
1.	Midterm Assessment	35%	Written examination at the mid-point of the semester.

2.	Formative Assessment	25%	It includes: classroom participation, attendance and assignments.
3.	Final Assessment	40%	Written examination at the end of semester.

- **Textbooks and Reference books**

1. Crowl, D. A., Louvar J. F. (2019), "Chemical process safety: Fundamentals with applications", 4th Edition, Pearson.
2. Pandya, C. L. (1991), "Hazards in Chemical Units". Oxford ISH.
3. Grimaldi, J. H., Simonds, R. H. (1990), "Safety Management", 5th Edition, AITBS.
4. Sanders, R. E. (2015), "Chemical process safety: Learning from case histories". Butterworth-Heinemann.
5. Sofronas, A. (2006), "Analytical troubleshooting of process machinery and pressure vessels: Including Real-World Case Studies", Wiley
6. Jardine, A. K. S., Tsang, A. H. C (2005), "Maintenance, replacement and reliability", CRC.
7. Hyatt, N. (2003), "Guidelines for process hazard analysis hazard identification, and risk analysis", CRC.
8. Dhillon, B. S. (2006), "Maintainability maintenance and reliability for engineers", CRC.
9. Glendon, A. I., Sharon, G. C. (2006). "Human safety and risk management", 2nd Edition, CRC.