

BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI-HYDERABAD CAMPUS
SECOND SEMESTER 2018-2019
Course Handout (Part II)

Date: 07/01/2019

In addition to part-I (General Handout for all courses appended to the timetable) this portion gives further specific details regarding the course.

Course No. : CHE F413
Course Title : Process Plant Safety
Instructor in Charge : Karthik Chethan V.

1. Scope and objective of the course:

Typically, the whole world in general is inundated with inherent dangers and risks (visible/tangible and unseen) whether it is in private activities such as, driving, swimming etc. or in public branches of economic, commercial or service activity such as industries, hospitals, theaters, schools, colleges etc. Basically wherever there is the presence of humans, machinery of some kind, electricity, gadgets, appliances and various environments such as, fire, water, dust, terrain, altitude etc. dangers and risks are lurking. In response to these dangers and risks, humans have developed methods and practices to be cautious, measured and in survival mode which are both natural and learnt, barring exceptions. The safety methods and practices of humans have resulted in establishing and enforcing a large number of protocols cutting across life scenarios and environs.

Despite all this precautionary human tendencies, we have been witness to some tremendous intentional and unintentional disasters and accidents. This course is primarily aimed at understanding and investigating why we are getting it wrong and why we continue to get it wrong in terms of safety at all levels, day to day home activities, workplaces, public places etc. so that we can stop certain preventable mishaps and strive to evolve into a very consistently safe, responsible, dependable and resourceful human beings (nobody can be perfect but to have safety and responsibility at the back of one's mind at all times would not hurt). This course introduces fundamentals of stresses, diseases and hazards in industries, hygiene and safety measures and monitoring, safety equipment, risk assessment and audit and case histories. But the more important thing is to understand the nine yards of accidents and safety are learnt in a way that it is identifiable and personalized and assists one in inculcating safety characteristics into their daily activities and surrounding environs.

Course Outcomes (CO): At the completion of the course, the students will be able to conduct the following:

- CO1.** Identify hazards and diseases for monitoring and prevention in regards to physical, chemical and biological stresses in day to day and industrial environs.
- CO2.** Choose and implement suitable industrial hygiene and safety plan (with relevant equipment) for monitoring and controlling for various hazards and locations (home, workplace etc.) in day to day and industrial environs.
- CO3.** Assess risks by identifying, evaluating, documenting and reviewing for various hazards and locations in day to day and industrial environs.

Student Learning Outcomes (SLO): SLOs are outcomes (a) through (k) plus any additional outcomes that may be articulated during the course.

- (a) an ability to apply knowledge of science and engineering.
- (b) an ability to design and conduct safety demonstration experiments, as well as to analyze and interpret results.
- (c) an ability to design a safety based component, or process to meet desired needs within realistic constraints such as economic, environmental, social, ethical, health and sustainability.
- (d) an ability to function on teams.
- (e) an ability to identify, formulate, and solve engineering problems.
- (f) an understanding of professional and ethical responsibility.
- (g) an ability to communicate effectively.
- (h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- (i) a recognition of the need for, and an ability to engage in life-long learning
- (j) a knowledge of contemporary issues
- (k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

2. Text Books:

T1: Fulekar M.H. Industrial Hygiene and Chemical Safety. Publisher: I.K. International, New Delhi. 2006. Library code: 363.179, FUL-M, 11219.

Reference Books:

R1: Sanders R.E., "Chemical Process Safety: Learning from case Histories", Butterworth-Heinemann (Elsevier), Boston and New Delhi, 2005.

3. Course Plan:

Lecture No.	Topics to be covered	Learning Objectives	Chapter in Textbook
1-2	Introduction	Role of safety, Accident and loss statistics	T1
3-6	Physical and chemical stresses	To study the hazards and worker safety in regards to noise, vibration, heat, chemicals and manufacturing processes	T3 and T4
7-8	Occupational Diseases	To study afflictions that arise due to effects of physical, chemical, biological and psychological hazards	T7
9-13	Industrial hygiene	Chemical Hazards and worker safety, Identification evaluation and control of occupational conditions	T2
14-16	Personal protective equipment	Introduction, requirements, selection guidelines and study of various protective equipment	T9
17	Introduction to chemical plant safety	Chemical plant layout and legal requirements	T10

18-22	Hazardous Chemicals and Substances	Classification, storage and handling. Fire Precautions.	T11 and T12
23-25	Safety in Explosives and Pipeline Safety	Classification of explosives. Risk assessment, stress corrosion cracking, pipelines-spills.	T13 and T14
26-27	Chemical process safety	Introduction, hazardous chemical processes, reactors and reaction hazards and necessary precautionary measures	T15
28-30	Risk assessment	Risk assessment procedures and typical operational practices	T16
31-33	Hazard Identification	Hazard and operability studies	T17
34-36	Emergency preparation and Accident investigation	On-site and off-site emergency plan and infrastructure, Learning from accidents, Layered investigation, Aids for diagnosis and recommendations	T18
37-38	Safety audit	Introduction, essentials, requirements, programs and procedures	T19
39-42	Case studies of major disasters due to safety violations	Chernobyl disaster, Bhopal disaster, recent oil spills etc.	T Appendix

4. Evaluation Scheme:

Component	Duration	Weightage	Date & Time	Remarks
Assignments*	Continual Evaluation	50 %		NA
Mid-Term Exam	90 min	20%	16/3 3.30 - 5.00 PM	Open book
Comprehensive Exam.	3 hours	30 %	14/05 AN	Open book

*assignments will include some experimental/project work (25%), discussions (15%) and presentations (10%).

5. **Chamber Consultation Hour:** To be announced later. Chamber: D220

6. **Notices:** All notices related to the course will be uploaded in CMS.

7. **Make-up Policy:** Make-up will be granted for genuine cases with prior approval.

8. **Academic Honesty and Integrity Policy:** Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

Karthik Chethan V.
INSTRUCTOR-IN-CHARGE