FIRST SEMESTER 2015-2016
Course Handout (Part – II)

Date: 02/08/2016

In addition to Part –I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

Course No. : CHE F413
Course Title : Process Plant Safety

Instructor in Charge : **DR. AMIT JAIN**

Course Description:
To teach students about fundamental understanding of process and plant safety; Engineering aspects of process plant safety; Toxic releases and environmental effects; Chemical hazards and worker safety; Design and inspection of pressure vessels; Quantification of material release process; Designs to prevent fires and explosions; Storage, handling and transportation of hazardous chemicals; Relief systems and their sizing; Hazard Identification and Prevention; Risk Assessment; Accident Investigations; Case studies.

Scope and Objective:
The primary objective of this course is to encapsulate the important technical fundamentals of process plant safety for proper assessment of the risks posed by hazardous chemicals during their manufacturing, processing, treatment, packaging, storage, transportation, use and sale. The course deals with the description of concepts, principles, facts for the effective development & implementation of a strategy for prevention of serious incidents in a process plant environment. This course will provide profitable guidance in the development of industrial safety management processes.

Text Book:
Crowl, D. A., and J. F. Louvar, "Chemical Process Safety: Fundamentals with Applications", Pearson Education, Inc, India, 3rd ed., 2012.

Reference Books:
R1: Fawcett H.H. and W.S. Wood, "Safety and Accident Prevention in Chemical Operations", John Wiley & Sons, Inc., New York, 1965.
R2: Davis, M. L. and D. A. Cornwell, Introduction to Environmental Engineering", McGraw Hill, New York, 4th ed., 2009.

Reference 24×7 e-Books: http://ebooks.bits-pilani.ac.in/

R3: Sanders R.E., "Chemical Process Safety: Learning from case Histories", Butterworth-Heinemann, Boston, 3 Ed., 2005. http://library.books24x7.com/toc.aspx?bookid=25391

R4: Andrew Furness and Martin Muckett, "Introduction to Fire Safety Management", Taylor and Francis 2007 http://library.books24x7.com/toc.aspx?bookid=28115

R5: Clifton A. Ericson, "Hazard Analysis Techniques for System Safety", John Wiley & Sons, 2005 http://library.books24x7.com/toc.aspx?bookid=26025

R6: Jürgen Schmidt, "Process and Plant Safety: Applying Computational Fluid Dynamics", Wiley-VCH, 2012. http://library.books24x7.com/toc.aspx?bookid=46801#&&assetid=46801&view=toc

Course Plan:

S. No.	No. of Lectures	Topics	Learning objectives
1.	1-2	Introduction	Process Industries catastrophe & Course content discussions; Role of safety, Accident and loss statistics.
2.	3-4	Toxicological studies	Toxicological studies, Dose versus response, Models of dose: response curves, Relative toxicity, Threshold limit values.
3.	5-7	Industrial Hygiene	Chemical Hazards and worker safety, Identification, evaluation and control of occupational conditions.
4.	8-13	Source Models	Flow of liquids through a hole, a hole in a tank, pipes, Flow of vapors through holes, pipes, Flashing liquids, Environmental monitoring.
5.	14-15	Dispersion Models & Toxic Releases	Meteorological effects on dispersion, Dispersion models: assumptions, emission calculations; Pasquill-Gifford Model; Toxic release mitigation.
6.	16-21	Fires & Explosions	Flammability characteristics, MOC, Detonation and deflagration, Confined explosions, VCE, BLEVE, Blast damage due to overpressure, Energy of mechanical and Chemical explosions.
7.	22-27	Designs to Prevent Fires and Explosions	Inerting, Controlling static electricity, Sprinkler systems.
8.	28-30	Introduction to Reliefs	Relief concepts, Definitions, Location of reliefs, Relief types, scenarios and systems

9.	31-32	Hazard Identification	Checklists, F & EI, HAZOP, Safety reviews
10.	33-40	Risk Assessment & Management	Probability theory, Event and Fault trees, QRA and LOPA
11.	41-42	Accident Investigations, Case Histories and Major Accidents	Static electricity, Chemical reactivity, System designs procedures, Case study of Major Accidents

Evaluation Scheme:

EC No.	Evaluation Component (EC)	Duration (min)	Weightage (%)	Date & Time	Nature of Component
1.	Project	20	20	Once in a Semester	Take Home (Power point)
2.	Mid-semester Examination	90	30	<TEST_1>	Closed Book
3.	Comprehensive examination	180	50	<TEST_C>	Closed & Open* Book

***For Open Book Examination, only text book (original/xerox) and hand written class notes are permissible.**

Chamber Consultation Hour: To be announced in the class.

Notices: All notices concerning this course will be displayed on the chemical engineering notice board and *Nalanda web portal*.

Make-up policy: Make-up will be granted as per Academic Regulations 2015. The decision of the instructor-in-charge in all matters of make-up shall be final (Sec. 4.07, Academic Regulations-2015).

Instructor-In-charge
CHE F413