Subject Code: 01CH0505
Subject Name: Safety In Chemical Industries
B.Tech. Year – III (Semester V)

Objective:
The course should be taught and curriculum should be implemented with the aim to develop required skills so that students are able to acquire following competency:

- Handle chemicals and operate chemical plant safely

Credits Earned: 4 Credits

Course Outcomes: The theory should be taught and practical should be carried out in such a manner that students are able to acquire required learning out comes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

i. Explain Indian and International Safety standards.

ii. Identify the causes of accident and explain various engineering control methods

iii. Explain storage, handling and transportation of hazardous materials.

iv. Classify fire extinguishing agents and methods

Pre-requisite of course: Basics of Chemical Engineering Process.

Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	IA (I)	CSE (C)	Viva (V)	Term work (TW)	
3	2	0	4	50	30	20	25	25	150

Contents:

Unit	Topics	Contact Hours
1	**Describe importance of safety in Industry** Importance of Industrial Safety .	3

2	**Classify the hazards** Types of hazard (1) Chemical hazard (2) Thermal hazard (3) Electrical hazard (4) Mechanical hazard (5) Vibrational hazard (6) Biological hazard (7) Radioactive hazard	4
3	**Describe safety aspects in plant layout** Safety aspects in plant layout, Ventilation and lighting.	3
4	**Identify different colour codes for chemical plants** Color codes and symbols for safety in chemical plants (a) Classification of Color codes and symbols (b) Color codes for gas cylinders (c) Color codes for pipelines	6
5	**Classify Personal Protective Devices** **List Personal Protective Devices in each** Personal Protective Devices (PPDs) (a) Non respiratory (b) Respiratory	6
6	**Explain Indian and International safety standards** Indian Standards & codes for safety & health	6
7	**Discuss characteristics of hazardous chemicals** hazardous chemicals like (a) Chlorine (b) Nitric Acid (c) Ammonia (d) Carbon Monoxide (e) Caustic Soda (f) Phosphoric Acid. (g) Sulfuric Acid (h) HCl	10
8	**Handle hazardous chemicals for Storage, Handling &Transportation, Fire Hazards** Storage, Handling & Transportation of hazardous chemicals, Fire hazards & their causes	10
	Total Hours	**48**

List of Tutorials:

Sr.No. Practical/Exercise

(Outcomes' in Psychomotor Domain)

1 Prepare a chart of Indian safety standards

2 Identify different hazards in a given chemical plant

3 Identify different chemical hazards in a given chemical plant

4 Identify colour codes for pipelines

5 Identify colour codes for gas cylinders

6 Identify different safety symbols for chemical industry

7 Demonstrate Personal Protective Devices

8 Prepare a handouts of safe handling practices for hazardous chemicals

References:

Sr. No.	Title of Books	Author	Publication
1	Manual of Chemical Technology,	D.Venkateswarlu,	Chemical
	Chemtech-I	K.R.Upadrashta, K.D. Chandrasekaran	Engineering Education Development Centre, IIT, Madras, 1975
2	Fundamentals of Industrial Safety &	Dr. K. U. Mistry	Siddharth
3	Health Chemical Process Safety: Fundamentals	Daniel A. Crowl,	Prakashan, Ahmadabad 3rd Edition, 2011,
4	with application Industrial Safety Management	Joshef F. Louvar N. K. Tarafdar,	Prentice Hall, USA, Dhanpatrai and
		K. J. Tarafdar	Co.Ltd., New-Delhi, 1st Edition, 2012
5	Industrial safety management	L M Deshmukh	Tata McGraw Hill,
6	Industrial Safety, Health & Environment	Sunil S. Rao, R.K.	New Delhi, 2006 Khanna Publishers,
	management	Jain	New Delhi, 2006

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyse	Evaluate	Create
15%	20%	15%	10%	5%	5%

Instructional Method:

a. The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

b. The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.

c. Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

Online Web Resources:

a. https://www.osha.gov/archive/Publications/osha3091.html

b. https://ohsonline.com/Articles/2011/08/01/Eight-Tips-for-Chemical-Safety.aspx

c. https://www.ilo.org/legacy/english/protection/safework/cis/products/safetytm/introduc.htm

Design Based Problems (DP)/ Open Ended project (OEP):

In the beginning of the session, subject faculty will allot an OEP / DP to the students. Students will be free to choose a topic of their choice which will be relevant to the syllabus and they will either prepare a working model/ report / presentation / poster on their topic.