COMMON POOL OF GENERIC ELECTIVES (GE) COURSES OFFERED BY THE DEPARTMENT

GENERAL ELECTIVE COURSE : Industrial Safety Instruments (INGE5A)

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Industrial Safety Instruments (INGE5A)	04	03	-	01	Class XII passed with Mathematics/Applied Mathematics/ Biology/+ Chemistry + Physics	Class XII Science

Learning Objectives

The Learning Objectives of this course are as follows:

- To provide knowledge on design features for a process industry and safety in the operation of various equipment in industry.
- To understand the various hazards and prevention in the commissioning stage of industry.
- To recognise and identify the safe operation of equipment in the process industry.
- To plan and train for emergency planning in a process industry.
- To get fundamental knowledge on safe storage of chemicals.

Learning outcomes

The Learning Outcomes of this course are as follows:

- This course would make them familiar with safe design of equipment which are essential to the chemical industry and leads to the design of entire process industries.
- Students would understand the problems and find innovative solutions while industries facing problems in commissioning and maintenance stages.

- Students would understand the chemical plant operations.
- Students can prepare emergency planning for chemical industry problems.
- Students would be able to create safe storage systems

SYLLABUS OF GE-5

UNIT – 1 **(11 hours)**

Need for safety. Safety and productivity. Definitions: Accident, Injury, Unsafe act, Unsafe Condition, Dangerous Occurrence, Reportable accidents. Theories of accident causation. Safety organization- objectives, types, functions, Role of management, supervisors, workmen, unions, government and voluntary agencies in safety. Safety policy. Safety Officer-responsibilities, authority. Safety committee-need, types, advantages. Design process, conceptual design and detail design.

UNIT – 2 **(11 hours)**

Personal protection in work environment

Personal protection in the work environment, Types of PPEs, Personal protective equipment respiratory and non-respiratory equipment. Standards related to PPEs. Monitoring Safety Performance: Frequency rate, severity rate, incidence rate, activity rate. Housekeeping: Responsibility of management and employees. Advantages of good housekeeping. 5 s of housekeeping. Work permit system- objectives, hot work and cold work permits. Typical industrial models and methodology. Entry into confined spaces.

UNIT – 3 **(12 hours)**

Electrical safety and hazards

Introduction – electrostatics, electromagnetism, stored energy, energy radiation and electromagnetic interference –Indian electricity act and rules-statutory requirements from electrical inspectorate- international standards on electrical safety – first aid-cardiopulmonary resuscitation (CPR). Primary and secondary hazards - shocks, burns, scalds, falls - Human safety in the use of electricity - Classes of insulation-voltage classifications -current surges- over current and short circuit current-heating effects of current electrical causes of fire and explosion. Lightning hazards, lightning arrestor, installation – earthing, specifications, earth resistance, earth pit maintenance.

UNIT – 4 **(11 hours)**

Hazard and risk, Types of hazards Classification of Fire, Types of Fire extinguishers, fire explosion and toxic gas release, Structure of hazard identification and risk assessment. Identification of hazards: Inventory analysis, Fire and explosion hazard rating of process plants - The Dow Fire and Explosion Hazard Index, Preliminary hazard analysis, Hazard and Operability study (HAZOP)) – methodology, criticality analysis, corrective action and follow-up. Control of Chemical Hazards, Hazardous properties of chemicals, Material Safety Data Sheets (MSDS)

Practical component: **(30 hours)**

1. Conduct the inspection and evaluate the hazards using analytical instruments and methods.
2. Conduct unaided safety inspection of a workplace, identifying the more common hazards, deciding whether they are adequately controlled and, where necessary, suggesting appropriate and cost effective remedial action.
3. At the end of the course a safety assessment report can be added in the Mini project report along with Industry inspection report.

Essential/recommended readings

1. R.K Jain (2000) Industrial Safety, Health and Environment management systems, Khanna Publications.
2. Paul S V (2000), Safety management System and Documentation training Programme handbook, CBS Publication.
3. Krishnan, N.V. (1997). Safety management in Industry. Jaico Publishing House, New Delhi.
4. John V. Grimaldi and Rollin H.Simonds. (1989) Safety management. All IndiaTraveller Book Seller, Delhi.
5. Ronald P. Blake. (1973). Industrial safety. Prentice Hall, NewDelhi.

Suggested books

1. Alan Waring. (1996). Safety management system. Chapman & Hall, England.
2. Vaid, K.N., (1988). Construction safety management. National Institute of Construction Management and Research, Mumbai
3. Montgomery, D.C., “Design and Analysis of experiments”, John Wiley and Sons, 8th edition, 2012.

Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.