SEMESTER S4

INDUSTRIAL SAFETY ENGINEERING

(Branch- AU/Group- C)

Course Code	**PEAUT415**	**CIE Marks**	40
Teaching Hours/Week (L: T:P: R)	3:0:0:0	**ESE Marks**	60
Credits	5/3	**Exam Hours**	2 Hrs. 30 Min.
Prerequisites (if any)	None	**Course Type**	Theory

Course Objectives:

1. To impart knowledge of various safety management principles and various safety systems
2. To compare different hazard identification tools and choose the most appropriate based on the nature of industry

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SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	**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 and advantages	**9**
2	**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.	**9**

3	**Safety hazards in machines:** Machinery's safeguard - Point of operation, Principle of machine guarding - types of guards and devices. Safety in turning, and grinding. Welding and cutting - safety precautions of gas welding and arc welding. Material handling - classification - safety consideration - manual and mechanical handling. Handling assessments and techniques - lifting, carrying, pulling, pushing, palletizing and stocking. Material handling equipment-operation & maintenance. Maintenance of common elements-wire rope, chains, slings, hooks, clamps. Hearing conservation program in production industries.	**9**
4	**Hazard identification and analysis:** 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, - 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).	**9**

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Course Assessment Method
(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	**15**	**10**	**10**	**40**

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
• 2 Questions from each module. • Total of 8 Questions, each carrying 3 marks **(8x3 =24marks)**	• Each question carries 9 marks. • Two questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 3 sub divisions. **(4x9 = 36 marks)**	**60**

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Understand the fundamental concepts of workplace safety, including definitions, theories of accident causation, and the roles of various stakeholders, promoting a safer work environment	**K2**
CO2	Demonstrate competency in selecting, utilizing, and maintaining personal protective equipment (PPE), and implementing safety protocols like housekeeping and work permit systems to enhance workplace safety	**K2**
CO3	Identify and mitigate safety hazards associated with machinery operations, including machine safeguarding, welding practices, material handling techniques, and maintenance of equipment, ensuring a safer industrial environment	**K2**
CO4	Demonstrate proficiency in identifying, assessing, and managing hazards and risks associated with chemical processes and fire safety, utilizing methodologies like HAZOP and Dow Fire and Explosion Hazard Index to ensure workplace safety.	**K3**

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

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CO-PO Mapping Table (Mapping of Course Outcomes to Program Outcomes)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	1							
CO2	3	2	3	3	2							
CO3	3	3	3	2	3							
CO4	3	3	3	3	3							

Note: *1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation*

Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Industrial Safety, Health and Environment management systems	R.K Jain	Khanna Publications	2000
2	Safety and Health for Engineers	Roger L. Brauer	Wiley	2016
3	Safety management system	Waring, Alan	Chapman & Hall, England	1996

Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Safety management in Industry	Krishnan, N.V.	Jaico Publishing House, New Delhi.	1997
2	Industrial safety	Ronald P. Blake	Prentice Hall, New Delhi.	1992

Video Links (NPTEL, SWAYAM…)	
Module No.	**Link ID**
1	Prof. J. Uma Maheswari, IIT Delhi, https://youtu.be/WxyfKNQkj8g
2	Industrial Safety Engineering, By Prof. Jhareswar Maiti | IIT Kharagpur https://onlinecourses.nptel.ac.in/noc20_mg43/preview https://youtu.be/jFDWlKayrTc
3	Prof .shishir https://youtu.be/Bq4hVTJpvKk
4	Industrial Safety And Fire Safety Management , By Dr. P.K.Ghosh & Mrs.Annapurna Adiley | Chhattisgarh Swami Vivekanand Technical University (CSVTU), Bhilai , https://onlinecourses.swayam2.ac.in/nou23_ge81/previe

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