GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Chemical Engineering
Minor Degree: Industrial Process Safety
Subject Code: N115AA01
Semester – V (w.e.f. AY 2025-26)
Subject Name: Industrial Hygiene and Occupational Health

Type of course: Minor degree course

Prerequisite: A good understanding regarding basics of chemicals and their properties, human anatomy.

Rationale:
The main objective of this subject is to study hygiene to be maintained in Industry and use of PPEs as a mode of protection against harmful chemicals. It also includes ventilation, illuminations and sound that are to be maintained under standards. The subject focuses on occupational health, regular medical examination and ways to conduct them and how to use first aid kit in case of accident.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	0	30	0	100

Content:

Sr. No.	Content	Total Hrs
1	**Industrial Hygiene:** Definition of Industrial Hygiene, Industrial Hygiene: Control Methods, Substitution, Changing the process, isolation, wet method, local exhaust ventilation, personal hygiene, housekeeping and maintenance, waste disposal, special control measures. Route of entry to human system, recognition, evaluation and control of basic hazards, concepts of dose response relationship, bio-chemical action of toxic substances.	9
2	**Personal Protective Equipment:** Need for personal protection equipment, selection, applicable standards, supply, use, care & maintenance, respiratory and non-respiratory personal protective equipment. Non-respiratory personal protective devices: Head protection, Ear protection. Face and Eye protection. Hand protection, Foot protection, body protection. Respiratory personal protective devices: Classification of respiratory personal protective devices. Selection of respiratory personal protective devices. Instructions and training, maintenance and care of breathing apparatus.	8
3	**Ventilation and Illumination:** Purpose of ventilation, Thermal environment and its measurement. Indices of heat stress. Natural ventilation. Mechanical	10

	ventilation. Air conditioning. Control of heat exposures at source, dilution and local ventilation. Recommended values for air changes required for various areas as per Factories Act, 1948 and National Standards. Purpose of lighting. Benefits of good illumination. Phenomenon of lighting and safety. Lighting and the work. Sources and types of artificial lighting. Principles of good illumination. Recommended optimum standards of illumination. Maintenance. Noise and Vibration: Noise and ill-effect of noise on human health- Auditory & non-auditory, Noise Induced Hearing Loss (NIHL). Measurement and evaluation of noise. Control of Noise Hazards- Noise absorption techniques, Silencers. Permissible level of exposure to noise in Industry.	
4	**Occupational Health:** Definition, Common Occupational Diseases, Occupations involving risk of contracting these disease - mode of causation of the diseases and its effects - diagnostic methods. Biological monitoring - Method of prevention Compensation for occupational diseases. Evaluation of injuries Occupational Health Management Services at the work place. List of notifiable diseases, Occupational Health Surveillance-Pre employment, Periodical, Post employment Medical examination, Occupational exposure & Risk based health surveillance Occupational Health Hazards & Occupational Diseases, Measurement and evaluation of noise Adverse health effects of noise, vibration, cold, heat stress, improper illumination, thermal radiation, ionizing and non-lionizing radiations. Permissible threshold exposure limits - short term and long term effects of exposures - Preventive and control measures, Occupational risk and hazards to firefighters.	10
5	**First Aid:** Definition, Purpose, Principles of First aid, First Aider-Role & Responsibilities and Qualities. Fundamentals of First-Aid- for thermal burns & chemical burns, Fractures, Fainting, Shock, insects and animal bites, Suffocation, Toxic Ingestion - Bleeding Wounds and Bandaging, Artificial Respiratory, Cardiopulmonary Resuscitation (CPR), Techniques. Victim transportation, Rescue Techniques. First Aid Box and its contents, Victim transportation, Rescue Techniques. First Aid Box and its contents	8

Suggested Specification table with Marks (Theory): (For BE only)

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	**15**	**20**	**10**	**15**	**0**

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Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. Techniques of Safety Management By Dan Petersen (ISBN:978-18-8-558139-6),McGraw-Hill Book Co. Ltd., New York, N.Y.(USA)
2. Industrial Safety and Environment By A.K. Gupta Laxmi Publications, New Delhi
3. Accident Prevention Manual for Industrial Operations (ISBN: 97808-7-912024-5), National Safety Council 1121, Spring Lake Drive, Itasca, Illinois 60143 (USA)
4. Industrial Safety and Environment (ISBN: 978-81-3-1804544), A.K. Gupta Laxmi Publications, New Delhi.
5. "Health & Safety At Work" Booklets Department of Employment and Productivity, U.K
6. Encyclopedia of Occupational Health and Safety, ILO.

Course Outcomes:

Sr. No.	CO statement	Marks % weightage
CO-1	To understand the different approaches for the industrial hygiene	15%
CO-2	To know about the personal protective equipment and its application in different scenario	25%
CO-3	To analyze the methods for proper ventilation and illumination	25%
CO-4	To apply the knowledge about occupational health	15%
CO-5	To apply the concepts of first aid kit	20%

List of Practical/Tutorials:

1. Sampling and Estimation of Gases in Work Environment: Oxides of Nitrogen, Sulfur Dioxide, Ammonia & Chorine
2. Sampling and Analysis of. Mercury

3. Demonstration of Personal Protective Equipment (PPE)
4. Measurement of illumination level at working place with the help of digital Lux meter
5. Noise Level Measurement. (a) Measurement of Sound pressure level in dBA and dB linear. 6. (b) Frequency analysis of noise
7. Measurement of Ventilation: 8. Measurement of thermal Dry Bulb Temperature Wet Bulb Temperature Determination of relative humidity and effective corrective effective. 1) Aspirator Hygrometer. 2) Kata-Thermometer 3) Globe-Thermometer
9. Demonstration of CPR technique (Cardiopulmonary Resuscitation)

Major Equipments:

Aspirator Hygrometer, Kata Thermometer, Lux meter, Atomic absorption spectroscopy, PPE with respirator and without respirator.

List of Open Source Software/learning website:

Reference to NIOSH, and NPTEL can be made for a better understanding regarding regulations and standards in occupational health management and industrial hygiene.