GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Bachelor of Engineering
Level: UG
Branch: ALL (Except Civil Engineering and Allied Branches)
Subject Code: BE05000451
Subject Name: Occupational Health and Safety Management

w. e. f. Academic Year:	2024-25
Semester:	5
Category of the Course:	Multidisciplinary Open Professional Electives Course

Prerequisite:	Knowledge of fundamentals of safety and safety standards
Rationale:	To learn about occupational health hazards, industrial safety practices, accident prevention techniques, and risk management approaches for ensuring worker health, safety, and sustainable industrial operations.

Course Outcomes:

Sr. No.	CO statement	Marks% weightage
CO-1	Recognize the occupational health related hazards in the workplace	20%
CO-2	Understand the Concept, Philosophy & Psychology for safety management	20%
CO-3	Discuss Electrical safety, fire & explosions, accidental hazards and PPE	40%
CO-4	Explain Hazards & Risk Identification, Assessment & Control Techniques	20%

Teaching and Examination Scheme:

Teaching / Learning Scheme (in Hours per semester)					Total Credits	Assessment Pattern and Marks					Total Marks
						Theory		Tutorial / Practical			
L	T	P	PBL	Total no of hours per semester		ESE (E)	PA / CA (M)	PA/ CA (I)	PBL (I)	ESE (V)	
45	0	0	15	60	2	70	30	0	30	0	130

**** Problem-Based Learning (PBL) aims to accommodate learning beyond syllabus as per clause 9.4 of NBA manual.***

Content:

Sr. No.	Content	Total Hrs
A	**OCCUPATIONAL HEALTH**	
1	• Classification of occupational health hazards, routes of entry of toxic material into human body, dangerous properties of chemical and their health effects, Hierarchy of hazard control: Elimination, Substitutions, Engineering Control, Administrative Control, Personal Protective Equipments (PPE) • Work environmental sampling and its types, Permissible exposure limits,	**12**

	Threshold limit value, lethal dose and lethal concentration, • Ergonomics, constituents of ergonomics, application of ergonomics for safety & health, • Occupational diseases due to metals & dusts, fumes & chemical compounds. • Physical Aspect of Work Environment: Exposure, Assessment/Effects & Control of Noise, Vibration, Heat Stress, Poor Illumination, Radiation	
B	**SAFETY MANAGEMENT**	
1	**Concept, Philosophy & Psychology of safety:** Concept of safety, Nature of concept of safety, Philosophy of safety, safety terminology, philosophy of total safety concept, safety psychology, accident causative factors, general psychological factors, salient points of factories act 1948	**4**
2	**Safety Management:** Concept of management, element of management, functions, management principles, safety management & its responsibilities, safety organization	**4**
3	**Accident Causes and prevention:** Causation, Accident problem, Reasons for prevention, factors impending safety, accident prevention	**3**
4	**Electrical Safety:** Electricity and Hazardous, Indian standards, effects of electrical parameters on human body, safety measures for electric works	**3**
5	**Fire & Explosion:** Fire phenomena, classification of fire and extinguishers, statutory and other standards, fire prevention & protection system, explosion phenomena, explosion control devices, fire awareness signs	**5**
6	**Personal Protective Equipment:** Need of PPE, Indian standards, factors of selection of PPE, non-respiratory equipments, respiratory equipments.	**4**
7	**Hazards & Risk Identification, Assessment & Control Techniques:** Hazards, Risks & detection techniques, Preliminary hazard analysis (PHA) & hazard analysis (HAZAN), failure mode effect analysis (FMEA), Hazard and operability (HAZOP) study, Hazard ranking (DOW & MOND index), Fault tree analysis, Event tree analysis (ETA), major accident hazard control, on-site and off-site emergency plans	**10**
	TOTAL	**45**

Suggested Specification table with Marks (Theory): (For B.E. only)

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
30	**30**	**10**	**00**	**00**	**00**

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.

The syllabus of Occupational Health and safety Management directly contributes to

SDG 3	**Good Health and Well-Being** by equipping students with knowledge of occupational health hazards, industrial hygiene, ergonomics, and workplace safety measures to ensure healthy and safe working environments.
SDG 8	**Decent Work and Economic Growth** by developing understanding of accident prevention, safety management systems, PPE, and hazard control techniques that promote safe and productive workplaces.
SDG 9	**Industry, Innovation and Infrastructure** by providing knowledge of industrial safety engineering, hazard identification, risk assessment methods, and modern safety management practices for sustainable industrial operations.
SDG 11	**Sustainable Cities and Communities** by enhancing awareness of fire safety, explosion control, and emergency planning to minimize industrial risks and improve community safety.
SDG 12	**Responsible Consumption and Production** by promoting safe handling of chemicals, exposure control, and responsible industrial practices for reducing occupational and environmental hazards.
SDG 13	**Climate Action** by strengthening emergency preparedness, industrial risk reduction, and pollution prevention practices that support environmentally sustainable industrial development.

Reference Books:

1. Fundaments of Industrial safety & health by Dr. K. U. Mistry.
2. Industrial Safety & Environmental Management System R. K. Jain & Prof. Sunil S. Rao, Publisher: Khanna Publishers
3. Social & Preventive Medicines by Yashpal Bedi.
4. Industrial & occupational Safety, Health & Hygein - by AHommadi.
5. Occupational Health, a Practical Guide for Managers -by Ann Fingret & Akin Smith.
6. Environmental Health & Technology - by Y P Kudesia & Ritu Kudesia.
7. Environment & Health by Norman M Triff

List of Open-Source Software/learning website:

- NPTEL courses links
  https://onlinecourses.nptel.ac.in/noc20_mg43/preview
  https://onlinecourses.nptel.ac.in/e-learning/preview/noc24_mg52

- Occupational Safety and Health Administration (OSHA) - PPE, exposure standards, chemical hazards - https://www.osha.gov

List of suggested activities for Problem-based Learning (PBL):

Sr. No.	PBL Category	Name of the Activity	No. of Hours	Evaluation Criteria
1	Seminar	Seminar on Occupational Diseases (e.g., silicosis, asbestosis, lead poisoning)	Duration :Total= 10 hrs	Based on content and presentation skills

GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Bachelor of Engineering
Level: UG
Branch: ALL (Except Civil Engineering and Allied Branches)
Subject Code: BE05000451
Subject Name: Occupational Health and Safety Management

Sr. No.	PBL Category	Name of the Activity	No. of Hours	Evaluation Criteria
2	Mini Project	Fire Safety Audit and Emergency Plan Preparation (college lab/Commercial Compliex/School/Appartment/Hospital/Hostel)	Audit: 8 hrs + Plan preparation: 2 hrs = 10 hrs	Based on fire safety audit report, fire risk identification, and prepared emergency planning effectiveness
3	Mini Project	Ergonomic Assessment of Workplace (college lab/office/Workplace for industry worker)	Survey: 5 hrs + Analysis: 5 hrs = 10 hrs	Assessment based on analysis report and application of ergonomic principles
4	Technical Report Writing	Preparation of Material Safety Data Sheet (MSDS) for selected chemical	Study:3 hrs + Documentation : 2 hrs = 5 hrs	Evaluation based on completeness and correctness of MSDS documentation
5	Case Study Analysis	Accident Analysis using Root Cause Techniques (FTA/ETA/FMEA)	Case study: 8 hrs + Analysis: 2 hrs = 10 hrs	Based on analytical report and correctness of applied techniques
6	Industry Visit	• PPE Selection and Compliance Study in different industries • Electrical Safety Inspection and Risk Mapping	Survey: 5 hrs + Report Preparation: 5 hrs = 10 hrs	• Based on report submission and justification of PPE selection • Based on inspection report and identification of Electric hazards
7	Poster / Chart / PowerPoint Presentation	Poster/Presentation (PPE, electrical safety, fire and explosions, safety mgmt etc.)	Preparation & Presentation= 10 hrs	Based on presentation quality, technical content, and communication skills
8	Video Based Learning	Technical Video based learning related to the subject	Duration of video: 5 hrs	Multiple choice questions-based Assessment
9	Group Discussion / Quiz	Software-based Risk Assessment (ALOHA/other tools)	Practice: 6 hrs + Report: 4 hrs = 10 hrs	Based on model application, output interpretation, and report submission
10	Group Discussion / Quiz	Group Discussion on Safety Regulations & Acts (Factories Act 1948, GFR, ILO, etc.)	Discussion :5 hrs	Based on participation, technical understanding, and communication skills

****