

Course Specification Sheet

OSHE 111 Introduction to Occupational Safety, Health, and Environment

Course Description:

This course presents general safety, health, and environment concepts and terms, historical developments, program concepts and terms, legislative overview including worker's compensation law, problem identification, hazard recognition, evaluation and control concepts, and program management.

Minimum Topics:

1. Historical Perspectives
2. Safety and Health Professions
3. Theories of Accident Causation
4. Regulatory History
5. Workers' Compensation
6. Loss Control Programs
7. Injury and Illness Record Keeping
8. Identifying Hazards
9. Safety Audit & Inspection
10. Accident Investigation and Analysis
11. Computers and Information Management
12. Safety Training & Promoting Safety

Course Objectives:

1. Describe the history of the safety movement in the United States, including significant safety legislation and the importance of worker's compensation. (Related to program outcome performance criteria: 2A1, 2A2, and 2A4)
2. Describe important sources of loss control information. (Related to program outcome performance criterion: 2A1)
3. Explain how loss control information is analyzed and used to develop effective loss control programs. (Related to program outcome performance criteria: 2B2 and 2B4)
4. Relate how the elements of effective safety, industrial hygiene and environmental programs are interrelated and dependent on one another. (Related to program outcome performance criteria: 2A1 and 2B4)

Course Specification Sheet

OSHE 112 Design of Hazard Controls

Course Description:

Prerequisite: Current enrollment or prior credit for OSHE 111. This course studies the application of scientific and engineering principles and methods to achieve optimum safety and health conditions through the analysis and design of process, equipment, products, facilities, operations, and environment. A variety of topics will be covered, including product design, plant layout, construction, maintenance, pressure vessels and piping, mechanical systems, materials handling and storage, ventilation, power tools, electrical equipment, confined space, and transportation vehicles and systems.

Minimum Topics:

1. Hazard Control in General
2. Buildings and Plant Layout
3. Construction of Plant Facilities
4. Maintenance of Plant Facilities
5. Boilers and Unfired Pressure Vessels
6. Machine Safeguarding & Lockout/Tagout
7. Personal Protective Equipment
8. Electrical Safety
9. Fire Hazards and Life Safety
10. Materials Handling and Storage
11. Crane, Conveyor, and Rigging
12. Powered Industrial Truck
13. Hand and Portable Power Tool

Course Objectives:

1. Identify a variety of occupational hazards. (Related to program outcome performance criteria: 2A1 and 2B2)
2. Recognize information resources regarding occupational hazards. (Related to program outcome performance criteria: 2A1 and 2A2)
3. Explain basic principles and technologies to analyze and control occupational hazards. (Related to program outcome performance criteria: 2B2 and 2B4)
4. Project objective: Select a specific work area from a list provided by the instructor, then analyze the work for potential hazards and develop controls to eliminate or mitigate the hazards. (Related to program outcome performance criteria: 2B2, 2B4, and 3.1)

Course Specification Sheet

OSHE 121 Safety and Health Program Management and Administration

Course Description:

Prerequisite: Current enrollment or prior credit for OSHE 111. This course addresses the application of management principles and techniques to the management of safety and health and loss control programs. Topics include planning, organizing, budgeting, resourcing, operating, implementing and evaluating safety functions.

Minimum Topics:

1. Introduction to Corporate Organization
2. Evolution of Modern Safety Concepts
3. OSHA Responsibilities and Implementation
4. Organization and Administration Effects
5. Safety Management
6. Cost Analysis
7. Performance Measurement and Motivation
8. Systems Safety Analysis
9. Employee Selection, Placement and Training
10. Psychological Aspects and Ergonomics
11. Product Safety

Course Objectives:

1. Describe the history of modern industrial safety management and explain how the principles of modern safety management developed. (Related to program outcome performance criteria: 1.3 and 2A1)
2. Discuss the safety roles and responsibilities of managers at the various levels of authority within a typical industrial organization. (Related to program outcome performance criterion: 2A1)
3. Describe the proactive elements of management systems that can be used to develop and implement effective safety programs. (Related to program outcome performance criteria: 1.3, 2B4, and 2B6)
4. Describe the reactive elements of safety programs that are used in effective programs. (Related to program outcome performance criteria: 2B4 and 2B6)

Course Specification Sheet

OSHE 141 Principles of Industrial Hygiene and Toxicology

Course Description:

This course introduces the basic industrial hygiene principles of anticipation, recognition, evaluation and control of workplace conditions as they relate to occupational health. Class discussion will focus on a variety of occupational hazards including air contaminants, chemical hazards, biological hazards and physical hazards.

Minimum Topics:

1. Introduction to Industrial Hygiene
2. Definitions of terms, professionals and the disciplines involved in industrial hygiene work
3. Federal and state regulations and standards pertaining to the work of an Industrial Hygienist
4. Broad Categories and Specific hazards, including environmental factors/stresses
5. Ethics of the IH profession
6. Job description of an IH or OEHS professional
7. Methods of hazards control
8. Toxicology and risk assessment (basics)
9. Classifications of toxic agents and classes of toxicity
10. Inhalation toxicology and health effects
11. Toxicokinetics and toxicodynamics
12. Occupational Dermatitis/Eye Hazards
13. Air Contaminants
14. Other hazardous Chemicals
15. Ionization Radiation and Extreme Temperature
16. Ergonomics
17. Biohazards and Noise

Course Objectives:

1. Describe the basic principles of industrial hygiene, i.e., the anticipation, recognition, evaluation and control of hazards in the workplace. (Related to program outcome performance criteria: 2B2 and 2B4)
2. Describe briefly federal, state and industry regulations and guidelines regarding worker health on the job. (Related to program outcome performance criteria: 2A2 and 2A4)
3. Apply fundamental concepts of industrial hygiene, such as toxicology and risk assessment, in the work environment, including standards, regulations and controls. (Related to program outcome performance criterion: 2A1)
4. Describe specific factors or stresses in the workplace and their potential health effects. (Related to program outcome performance criterion: 2A3)
5. Demonstrate proper methods in the use and care of IH instrumentation, controls, administrative procedures and PPE. (Related to program outcome performance criteria: 2A1 and 2B1)

Course Specification Sheet

OSHE 231 Safety Laws, Regulations, and Standards

Course Description:

Prerequisite: OSHE 111. This course studies the development processes, sources, and applications for minimum safety requirements established by laws, regulations, standards, and codes. Major topics include OSHA General Industry and Construction Standards, the enforcement of safety standards, and the role of NIOSH and ACGIH in the safety movement.

Minimum Topics:

Module 1: Occupational Safety and Health Act (1970) vs. Occupational Safety and Health Administration (OSHA) and How to Use the Code of Federal Regulations

- The evolution of the OSHE - Laws, regulations, codes and standards
- Students recall - three branches of the government and why we need laws, regulations and standards
- Industry standards-making organizations (professional organizations etc)
- Types of OSHA standards
- Vertical and Horizontal Standards
- The CFR Made Easy - What is a CFR and how is it Organized?
- Annual updates of the Federal CFRs and when each CFR is updated?
- Organization of the Code of Federal Regulations (CFR) Inspections, Citations and Proposed Penalties - (1903: 1-22)
- Record Keeping and Occupational Injuries and Illnesses - (1904 Subpart A -G)
- OSHA Log 300; 300A; 301

Module 2: The Content of the OSHA Laws, Regulations and Standards - Specifics

- Alphabet from A-Z
- OSHA regulations as minimum safety standards
- General Industry Standards (29 CFR 1910) (note: we are skipping 1926 Construction and 1928 Agriculture)
- Working and Walking Surfaces (Subpart D)
- Exit Routes, Emergency and Fire Prevention Plans (Subpart E)
- Powered Platforms, Manlifts, and Vehicle-Mounted Work Platforms (Subpart F)
- Occupational Health and Environmental Control (Subpart G)
- Personal Protective Equipment (PPEs) (Subpart I)
- Hazardous Substances (Subpart H)
- General Environmental Controls (Subpart J)
- Process Safety Management Standards (PSM)
- Hazardous Substances - Hazardous Waste Operations and Emergency Response (HAZWOPER)

Module 3: The Content of the OSHA Laws, Regulations and Standards - Specifics

- Machinery and Machine Guarding (Subpart O)
- Hand and Portable Powered Tools and Other Hand-Held Equipment (Subpart P)
- Welding, Cutting, and Brazing (Subpart Q)
- Electrical (Subpart S)

- Combustible Dust (NFPA 654)

Course Objectives:

1. Identify the origin/sources of safety laws, regulations and standards and differentiate between the sources. (Related to program outcome performance criteria: 2A1 and 2A2)
2. Describe the historical development of the Occupational Safety and Health Act of 1970 (as a broad legislative framework for safety regulations and standards). (Related to program outcome performance criteria: 2A1 and 2A2)
3. List the major pieces of the OSH Act as they affect industrial health and safety, and the environment. (Related to program outcome performance criteria: 2A1 and 2A2)
4. Demonstrate mastery knowledge of how the regulatory material found in the *Code of Federal Regulations* (CFR) is organized and presented for ease of reference (CFR made easy). (Related to program outcome performance criterion: 2A2)
5. Demonstrate knowledge of standards and codes developed by industry and private organizations to supplement and compliment the federal regulations. Explain how these materials are used as “consensus standards.” (Related to program outcome performance criterion: 2A4)
6. Demonstrate knowledge of the content of the safety regulations found in 29CFR 1910 (General Industry Regulations). (Related to program outcome performance criterion: 2A2)

Course Specification Sheet OSHE 242 Ergonomics

Course Description:

Prerequisites: Enrollment in or prior credit for Mathematics 241 and OSHE 111. This course explores ergonomic design principles which involve the planning and adapting of equipment and tasks to promote workers' efficiency and comfort. Major topics include: human anatomy, physiology, anthropometry, and other characteristics; and the application of ergonomic principles to workstations, tool design, and material handling procedures.

Minimum Topics:

1. Introduction to Ergonomics
2. Human Anatomy, Posture, and Biomechanics
3. Anthropometry and Workstation Design
4. Standing VS. Sitting
5. How the Mind Works
6. Human Senses
7. Interaction with the Environment
8. Manual Material Handling
9. The Upper Body at Work
10. Hand-Tool Design
11. Physiology, Workload, and Work Capacity
12. Ergonomic Job Analysis
13. Psychosocial Stress and Work Organization

Course Objectives:

1. Select different conceptual frameworks and models to summarize the diversity of ergonomics subjects. (Related to program outcome performance criterion: 2A1)
2. Relate the human musculoskeletal system with the work that human performs. (Related to program outcome performance criterion: 2A3)
3. Describe the importance of anthropometric information and apply it to the design of workstation, equipment, and tool. (Related to program outcome performance criterion: 2A3)
4. Compare and assess the differences between standing and sitting postures and their importance in proper workstation design. (Related to program outcome performance criterion: 2A3)
5. Predict how body tissues respond to excessive loading and apply the basic principles for the design of hand tools and equipment. (Related to program outcome performance criterion: 2A3)
6. Explain the biomechanics of shoulder and back injuries. (Related to program outcome performance criterion: 2A3)

7. Summarize ergonomic risk factors for musculoskeletal disorders and recommend interventions to the redesign of work. (Related to program outcome performance criteria: 2A3, 2B4, and 3.1)

Course Specification Sheet

OSHE 251 Environmental Laws and Regulations

Course Description:

This course presents an introduction to federal and state environmental regulations which impact the safety function in industry. Major topics include hazardous waste management, disposal and cleanup, technologies for the control and prevention of air, water, and soil contamination, and environmental program management.

Minimum Topics:

- How Environmental law are made
- National Environmental Policy Act (NEPA)
- Control of Toxic Substances (TSCA and FIFRA)
- Clean Water Act
- Clean Air Act
- Waste Management and Hazardous Release (CERCLA)
- Energy Regulation
- Ocean Regulation
- International Regulation

Course Objectives:

1. Describe the process or processes by which environmental laws, regulations and standards are created, passed, implemented or interpreted by various branches of the government (Senate/Congress/Executive/Judiciary). (Related to program outcome performance criteria: 2A1 and 2A2)
2. Discuss the history of environmental movement leading to various environmental legislations in the U.S. (Related to program outcome performance criterion: 2A1)
3. Demonstrate knowledge of some environmental laws related to toxic chemical usage and emissions e.g. Toxic Chemical Substances Act (federal); state laws e.g. the California Proposition 65 (Prop 65) and the Massachusetts Toxics Use Reduction Act (1989). (Related to program outcome performance criterion: 2A2)
4. Identify and discuss the basic provisions of each of the following environmental laws and their amendments: TSCA; FIFRA; OSH Act; CAA; CWA; SDWA; RCRA; CERCLA (and amendments SARA and EPCRA); Hazardous Materials and Transportation Act (MTA); and Hazardous Materials Transportation Uniform Safety Act (HMTA). (Related to program outcome performance criterion: 2A4)
5. Identify specific Code of Federal Regulations (CFR) and government announcements in the Federal Register (FR). (Related to program outcome performance criterion: 2A2)

Course Specification Sheet

OSHE 261 Fire Protection and Prevention

Course Description:

Prerequisite: OSHE 111. This course introduces the basic principles of fire and fire prevention in the work place. Emphasis will be placed on evaluating existing and planned facilities from a fire and explosion standpoint, and applying the basic principles of hazard recognition, evaluation and control when developing fire prevention and emergency response activities.

Minimum Topics:

1. Fire in History and Contemporary Life
2. Understanding America's Fire Problem
3. Fire Behavior
4. Building Design and Construction
5. Concepts of Egress Design
6. Assessing Life Safety in Buildings
7. Fire Department Structure and Management
8. Fire Department Facilities and Equipment
9. Preventing Fire Loss
10. Controlling Fire Loss through Active Fire Protection Systems
11. Fire Investigation
12. Introduction to the NFPA 101 – Life Safety Code
13. Planning for Emergency Response
14. OSHA Requirements Relative to Fire Prevention and Emergency Action/Response Plans
15. Public and Private Support Organizations
16. Careers in Fire Protection

Course Objectives:

Upon completion of the course, students will be able to:

1. Define the term “fire” (Related to program outcome performance criterion: 2A1)
2. Explain the Fire Triangle and Fire Tetrahedron (Related to program outcome performance criterion: 2A1)
3. Explain various methods of fire and explosion control (Related to program outcome performance criterion: 2A5)
4. List and explain the classes of fire (Related to program outcome performance criterion: 2A1)
5. Describe characteristics of combustible solids such as wood, plastics, polymers and textiles (Related to program outcome performance criterion: 2A1)
6. Define key terms relative to flammable and combustible liquids, gases and vapors as well as hazardous materials (Related to program outcome performance criterion: 2A1)
7. Explain the NFPA/NEC Electrical Hazard Classification System (Related to program outcome performance criterion: 2A2)
8. Describe the general procedure for conducting a fire investigation (Related to program outcome performance criteria: 2A1 and 2A5)
9. Explain the elements of building fire safety (Related to program outcome performance criterion: 2A1)

10. Compare and contrast the properties of wood, steel, concrete, glass, gypsum, masonry and plastics with respect to fire (Related to program outcome performance criterion: 2A1)
11. Explain the concept of Flame Spread Ratings (Related to program outcome performance criterion: 2A1)
12. Explain the concept of Fire Loading Based on Occupancy (Related to program outcome performance criterion: 2A1)
13. Describe basic methods of smoke management (Related to program outcome performance criterion: 2A5)
14. Explain NFPA 220 relative to the Types of Building Construction (Related to program outcome performance criterion: 2A4)
15. Describe the economic benefits of sprinkler/deluge systems (Related to program outcome performance criterion: 2A5)
16. Compare and contrast the dry pipe, wet pipe and deluge type systems (Related to program outcome performance criterion: 2A5)
17. Explain the properties, characteristics and limitations of the following extinguishing agents (Related to program outcome performance criterion: 2A5):

- CO ₂	- Dry Powder
- Halon	- Nitrogen
- Dry Chemical	- Steam
18. Explain OSHA and NFPA requirements for the inspection and maintenance of fire extinguishing systems and portable fire extinguishers (Related to program outcome performance criterion: 2A2)
19. Describe the services that can be performed by heat and smoke detection devices (Related to program outcome performance criterion: 2A5)
20. Explain the purpose of the NFPA Life Safety Code (Related to program outcome performance criterion: 2A2)
21. Explain the difference between a “specification” code and a “performance” code (Related to program outcome performance criterion: 2A2)
22. Describe the relationships between Building Codes and Fire Codes (Related to program outcome performance criterion: 2A2)
23. Describe OSHA requirements for (Related to program outcome performance criteria: 2A2 and 2A5):
 - Controlling Hot Work
 - Fire Watches
 - Emergency Action Plans
 - Fire Prevention Plans
 - Fire Brigades
24. Describe how to prepare a Welding, Burning/Hot Work Permit (Related to program outcome performance criterion: 2A5)

Course Specification Sheet

OSHE 311 Safety and Health Program Development

Course Description:

Prerequisite: OSHE 111. This course presents the key elements necessary to develop or to assess occupational safety and health programs. Major topics include management commitment and employee involvement; worksite analysis; hazard correction and control; training, and evaluation.

Minimum Topics:

- Introduction and Management Commitment
- Safety and Health Management Guidelines
- Determining the direction of the Safety and Health Programs
- Assessment of the Management Commitment
- Employee Involvement
- Business Owners and Employee Relationships
- Establishing Hazard Inventories
- Worksite Analysis
- Hazard Corrections, Prevention and Controls Programs
- Safety and Health Training
- Evaluation of Safety and Health Programs

Course Objectives:

1. Describe the basic elements that make up an effective occupational safety and health program, such as safety and health mission, policy, management commitment and employees' involvement. (Related to program outcome performance criterion: 2A1)
2. Demonstrate the use of proven concepts of analyzing occupational safety and health programs for organizations by preparing a research paper or term based on the knowledge from this course. (Related to program outcome performance criteria: 1.3, 2B4, 2B6, and 3.1)
3. Assess or evaluate existing occupational safety and health programs based on the illnesses or injury rates reported by a corporation, e.g. annual corporate social responsibility reports. (Related to program outcome performance criterion: 2B6)
4. Apply proven management principles to correct deficiencies discovered through the assessment of an occupational safety and health program. (Related to program outcome performance criteria: 1.3, 2B4, 2B6, and 3.1)
5. Develop a new written occupational safety and health program for a firm/industry after researching the process and occupational safety and health risk potential based on analysis of illness/injury data. (Related to program outcome performance criterion: 2B4)

Course Specification Sheet

OSHE 322 Behavior Aspects of Safety

Course Description:

Prerequisites: Psychology 101. This course will introduce students to the application of scientific research based principles and methods to bring about change in the work culture through attitude, behavior and environmental conditions. Specific topics will include traditional approaches and philosophies for improving safety, environmental effects, incentives, developing and building cultural change, identifying critical behavior, developing checklists, giving and receiving recognition, and measuring performance.

Minimum Topics:

1. Elements of the Workplace System
2. Problems Using Psychological Approaches to Preventing Accidents
3. Core Concepts for the Course
4. Establishing Theories For Behavior-based Safety: The Total Safety Culture
5. Person-Based vs. Behavior-Based
6. The Required Paradigm Shift
7. The Nature of the Worker
8. Principles of Behavior
9. Critical Behaviors
10. Analysis of Behaviors
11. The Role of Activators
12. The Role of Consequences
13. Intervention for Change
14. Actively Caring
15. Promoting Teamwork
16. Obtaining Buy-in and Support

Course Objectives:

1. List the components of a workplace; i.e., its human, situational and environmental components, and describe their interrelationships. (Related to program outcome performance criterion: 2A3)
2. Explain how many current safety practices in the workplace are not effective reducing the number workplace incidents below present levels. (Related to program outcome performance criterion: 2B2)
3. Describe the characteristics of a Total Safety Culture and identify the elements that must be present in order to create such a culture. (Related to program outcome performance criteria: 2A1 and 3.2)
4. Apply the characteristics of human nature to produce meaningful, permanent changes in behavior that will promote safety. (Related to program outcome performance criterion: 2B4)
5. Express the principles upon which behavior is based. (Related to program outcome

performance criterion: 2B4)

6. Define, identify, observe, and analyze critical behaviors. (Related to program outcome performance criterion: 2B2)
7. Examine how activators and consequences can be used to modify and mold behavior. (Related to program outcome performance criterion: 2B4)
8. Recommend interventions in established behavior patterns to develop acceptable safety practices. (Related to program outcome performance criterion: 2B4)
9. Justify and obtain support and buy-in for a Total Safety Culture through behavior based safety efforts. (Related to program outcome performance criteria: 2B4 and 3.2)

Course Specification Sheet

OSHE 323 Product Safety and Liability

Course Description:

Prerequisite: OSHE 111. This course examines the importance of considering the safety of a product in its ultimate use. It considers aspects of product design; intended use and foreseeable misuse; and potential injury mechanisms. It uses classic products liability case studies to provide practical application of the principles learned. It also looks at manufacturer liabilities through injury tort actions.

Minimum Topics:

1. Introduction and General Information
2. Product Liability Issues
3. Safety Costs and Losses
4. Standards and Criteria
5. Modern Concepts of Accident Prevention
6. Hazardous Characteristics of Products
 - a. Hazards which Cause Injury
 - b. Hazards which Cause Sickness
 - c. Malfunctions
 - d. Environmental Factors
 - e. Operator Error
7. Minimizing Accidents and Their Effects
8. Diagnostic Tools and Methodologies
 - a. Fault Tree Analysis
 - b. Failure Mode and Effect Analysis
 - c. Operating Hazard Analysis
9. Product Safety Program
 - a. Risk Assessment
 - b. Manufacturing the Safe Product

Course Objectives:

1. List the kinds of potential liabilities associated with such products as drugs; children's toys; automobiles and related products, food products; etc. (Related to program outcome performance criterion: 2A1)
2. Discuss ways in which consumers may bring tort suits against manufacturers. (Related to program outcome performance criterion: 2A2)
3. Describe the hazardous characteristics of products. (Related to program outcome performance criterion: 2B2)
4. Describe methods used to identify and correct potential safety problems during the conceptual and design phases of a new product. (Related to program outcome performance criterion: 2B2)

5. Describe the causes of and ways to minimize malfunctions. (Related to program outcome performance criteria: 2B2 and 2B4)
6. Explain the causes of operator error and methods of minimizing such errors. (Related to program outcome performance criteria: 2B2 and 2B4)
7. Describe methodologies used to test products to ascertain potential defects, safety hazards, and liabilities. (Related to program outcome performance criterion: 2B4)
8. Assist in the development of a Product Safety Design Review Process. (Related to program outcome performance criteria: 2B4 and 3.3)
9. Describe the components of a comprehensive product safety management program from the conceptual phase through decommissioning. (Related to program outcome performance criteria: 2B4 and 2B6)

Course Specification Sheet

OSHE 341 Field Methods of Industrial Hygiene and Toxicology

Course Description:

Prerequisites: Math 241 and OSHE 141. This course presents an examination of the methods used by the industrial hygienist and environmental scientist or engineer for the identification and assessment of health hazards in the workplace and in the general environment. Major topics include: establishment and use of methodologies to sample and evaluate exposures to air contaminants (gasses, vapors, aerosols, and particulates), microorganisms and allergens, noise, heat, and cold stress, electrical and magnetic radiation, and ionizing and ultraviolet radiation. The course also includes equipment use, maintenance, and calibration.

Minimum Topics:

- Introduction to field evaluation techniques and methods
- Why conduct IH field evaluation? And where, what, whom and how to sample?
- How to sample airborne contaminants
 - Gases & vapors
 - Particulates
 - Noise
 - Radiation
 - Heat and cold stress
 - Light
- Calibration of IH devices and equipment
- Field evaluations of IH controls

Course Objectives:

1. Describe the basic principles of sampling of airborne contaminants and physical agents (e.g. noise) and analytical methods - including answering questions: why's; what's; when's and how's of sampling, etc. (Related to program outcome performance criterion: 2A1)
2. Design and implement air sampling programs for gases, vapors, aerosols and particulates in occupational and non-occupational environments. (Related to program outcome performance criterion: 2B3)
3. Design and implement sampling programs for other health hazards such as microorganisms, noise, heat and cold, and various radiation sources. (Related to program outcome performance criterion: 2B3)
4. Describe the common analytical methods used by accredited laboratories. (Related to program outcome performance criterion: 2A1)
5. Select, calibrate and use of the proper direct reading instruments and other air flow instruments for sampling or industrial hygiene evaluation. (Related to program outcome performance criterion: 2B1)

6. Use statistical data to assist in making decisions and to establish violation or non-violation of occupational standards such as Occupational Exposure Limits (OEL) or National Ambient Air Quality Standards (NAAQs) for non-occupational environments and as a basis to develop control methods. (Related to program outcome performance criteria: 2B3 and 2B4)

Course Specification Sheet

OSHE 381 Safety in Chemical and Process Industries

Course Description:

Prerequisites: Enrollment in or prior credit for Chemistry 101 and Physics 191. The course introduces the fundamentals of chemical and process industry safety. Major topics include: toxic, fire, and pressure hazards inherent in chemical plants and petroleum refineries, and the methods used to identify, assess, and eliminate those hazards. It also introduces students to federal safety regulations for process safety management.

Minimum Topics:

1. Introduction to Chemical Process Safety
2. Federal Process Safety Management Regulations
3. Toxicology
4. Industrial Hygiene Principles
5. Source Models
6. Toxic Release and Dispersion Models
7. Characteristics of Flammable and Explosive Materials
8. Designs to Prevent Fires and Explosions
9. Causes of Over-pressurization
10. Introduction to Reliefs
11. Relief Sizing
12. Hazard Identification Methodologies
13. Risk Assessment Methodologies
14. Accident Investigations

Course Objectives:

1. Discuss the provisions of the federal Process Safety Management (PSM) regulations and describe how they are applied at typical industries in the area. (Related to program outcome performance criteria: 2A4 and 2A6)
2. Identify the toxic effects of chemicals encountered in the industrial environment; and discuss how engineering controls are used to eliminate these hazards. (Related to program outcome performance criteria: 2B2 and 2B4)
3. Discuss the physical characteristics of materials which make them flammable or explosive; and describe the controls that are used in the industrial setting to counter these hazards. (Related to program outcome performance criteria: 2A3 and 2B4)
4. State the causes of over-pressurization in equipment and systems in the industrial environment; and describe the operation and use of devices to prevent its occurrence. (Related to program outcome performance criteria: 2B2 and 2B4)
5. Describe how each of the formal Process Hazard Analysis (PHA) techniques discussed in class is used and list the advantages and disadvantages of each technique. (Related to program outcome performance criteria: 2A6 and 2B4)

6. Complete a research project, based on an actual case history, which demonstrates mastery of the principles learned in the class. (Related to program outcome performance criteria: 2B2, 2B4, and 3.1)

Course Specification Sheet

OSHE 382 Construction Safety

Course Description:

Prerequisites: Enrollment in or prior credit for OSHE 111 and OSHE 121. The course addresses the application of management principles, communication and human relations factors, safety/health rules, industry and federal standards, accident investigation, and technical issues especially within the job planning phases in the construction environment.

Minimum Topics:

1. Construction Safety in General
2. Construction Safety Program
3. Workers' Compensation in Construction
4. Contractor Selection
5. Construction Substance-Abuse Programs
6. Rewards/Incentives
7. Prejob/Pretask Planning
8. Accident Investigation and Reconstruction
9. Safety Training
10. Regulatory Requirements
11. Phase Planning for Site Preparation
12. Excavation, Concrete, and Steel Erection
13. Fall Prevention and Protection
14. Hazardous Materials & Confined Spaces
15. Mechanical and Electrical Systems

Course Objectives:

1. Understand construction safety in an increasingly challenging and changing environment. (Related to program outcome performance criteria: 2A1 and 2A6)
2. Describe the roles of organizations and personnel involved in major construction projects and explain how each affects site safety. (Related to program outcome performance criteria: 2A2 and 2A6)
3. Illustrate how contractors and subcontractors can be qualified and selected for a construction project. (Related to program outcome performance criterion: 2A6)
4. Demonstrate how site safety programs can be coordinated among the many contractors on a construction site to provide the overall safety. (Related to program outcome performance criteria: 2A6 and 2B6)
5. Explain the legal aspects including liability and regulatory requirements of construction safety. (Related to program outcome performance criteria: 2A2 and 2A6)
6. Examine many technical issues in construction, particularly the requirements and applications of safety planning in the early job phases. (Related to program outcome

performance criteria: 2A6, 2B2, 2B4, and 3.1)

7. Achieve the following project objectives:
 - 1) Present an analysis of the safety and health issue/hazard in both oral and written formats.
 - 2) Formulate changes to produce positive impact against the select safety and health issue/hazard under study.
 - 3) Provide ample supporting detail, organize the presentation and report in logical manner, and use effective language, appropriate word choices, and correct grammar and syntax. (Related to program outcome performance criteria: 2B2, 2B4, and 3.1)

Course Specification Sheet

OSHE 421 Measurement of Safety Performance and Accident Investigation and Analysis

Course Description:

Prerequisite: Enrollment in or prior credit for Math 241. This course presents methods to objectively evaluate a company's safety progress. The course covers two distinct topics: (1) safety performance measurement, and (2) incident investigation and analysis. The first segment of the course addresses ways of measuring safety performance objectively and subjectively using safety audits, inspections, observations, performance appraisal systems, and injury/illness statistics. The second segment of the course addresses the causes of accidents, systematic ways of conducting investigations, documenting the findings, causes and other significant data, and drafting recommendations.

Minimum Topics:

- Mishap regulatory reporting requirements
- OSHA recordability determination, statistical data and trend analysis
- Management and legal aspects of investigation
- Investigation and root cause analysis techniques
- Need for and conducting incident investigations
- Fire investigation
- Human aspects and incident investigation interview techniques
- Material aspects
- Environmental aspects
- Identifying and measuring lagging and leading OSHE performance metrics
- Roles and responsibilities for incident investigation teams and management

Course Objectives:

1. Discuss the importance of maintaining accurate records to measure an organization's safety performance. (Related to program outcome performance criterion: 2A1)
2. Identify the various parameters that can be used to track safety performance in the workplace. (Related to program outcome performance criterion: 2A1)
3. Given raw sample data, be able to calculate statistical rates, trends and other indicators and to interpret the meanings of these results. (Related to program outcome performance criterion: 2B2)
4. Discuss both traditional methods and recent developments in acquiring, classifying, and recording the data collected from investigating safety and health incidents that occur in the workplace. (Related to program outcome performance criteria: 2A1 and 2B5)
5. Discuss the methods used to investigate safety and health incidents, and determining causal factors. Specifically discuss: insurance First Report of Injury forms, Root-Cause Analysis methodologies, and other methods for determining accident causes. (Related to program outcome performance criterion: 2B5)

Course Specification Sheet

OSHE 423 Insurance - Workers' Compensation, Loss Control and Risk Management

Course Description:

Prerequisite: OSHE 111. This course discusses the different aspects of workers' compensation, loss control, and risk management and how they interface to produce a comprehensive approach to controlling hazards, risks, and worker losses in a proactive plan for management of business/entity.

Minimum Topics:

- Workers Compensation Basics
 - Pre- Workers Compensation
 - Workers Compensation Systems
- Loss Control/Prevention
 - Hiring Practices
 - Organizational Functions
 - Claims Management
 - Medical Case Management
 - Medical Questionnaires
 - Monitoring Methodologies
 - Claims Reviews
 - Medical Management Strategies
 - Settlement Options
- Safety Management
 - OSHA
 - Operational Safety Programs

Course Objectives:

1. Describe the history of and explain the importance of workers' compensation. (Related to program outcome performance criterion: 2A1)
2. Discuss the policies and coverage of workers' compensation. (Related to program outcome performance criterion: 2A2)
3. State the process of the workers' compensation claims and the management of the medical cases. (Related to program outcome performance criterion: 2A2)
4. Explain the roles of loss control and risk management. (Related to program outcome performance criteria: 2A1 and 2B6)
5. Utilize OSHA and other pertinent operational safety programs to improve loss control and risk management. (Related to program outcome performance criteria: 2A1 and 2B6)

Course Specification Sheet

OSHE 424 System Safety Methodologies

Course Description:

Prerequisites: Mathematics 241, OSHE 111, and OSHE 121. This course presents the concepts of Risk Management and Loss Control through the use of systematic approaches to hazard anticipation, identification, evaluation and control. Major topics include: an introduction to qualitative methods of evaluating the hazards and risks associated with systems, processes, equipment, and other entities. It also includes a review of techniques for mitigating or managing identified risks.

Minimum Topics:

- System Safety Methodologies in General
- Understanding Risk
- Hazard Evaluation Procedures
- Hazard Identification Methods in General
- Hazard and Operability Study (HazOp) and Project
- Layers of Protection Analysis (LOPA) and Project
- Event Tree Analysis (ETA) and Project
- Fault Tree Analysis (FTA) and Project
- System Safety Analysis Overview

Course Objectives:

1. Describe and compare the basic features of the following hazard evaluation techniques (Related to program outcome performance criteria: 2B2 and 2B4):
 - Safety Review
 - Checklist Analysis
 - Relative Ranking
 - Preliminary Hazard Analysis
 - What-if Analysis
 - What-if/Checklist Analysis
 - Hazard and Operability Analysis (HazOp)
 - Failure Modes and Effect Analysis
 - Layers of Protection Analysis (LOPA)
 - Fault Tree Analysis (FTA)
 - Event Tree Analysis (ETA)
 - Cause-Consequence Analysis
 - Human Reliability Analysis
2. Select the best hazard evaluation technique based on the conditions of the job and the desired output of the analysis. (Related to program outcome performance criteria: 2B2 and 2B4)
3. Prepare information for and perform a hazard analysis using one or more of the methods studied in the class. (Related to program outcome performance criteria: 2B2, 2B4, 3.1, and 3.3)

4. Make recommendations based on hazard analysis results as well as federal and industrial regulations and practices to control identified hazards. (Related to program outcome performance criteria: 2B2, 2B4, 3.1, and 3.3)

Course Specification Sheet

OSHE 441 Industrial Toxicology

Course Description:

Prerequisites: General Biology 151, Zoology 241, and OSHE 241. This course examines the effects of industrial toxicants on the human body. Major topics include: the discipline of toxicology, acute and chronic exposures and effects, routes and characteristics of exposures, target organs and systems, dose and response, and carcinogenesis. It also discusses the toxic characteristics of various classes of toxic materials.

Minimum Topics:

1. General Principles of Toxicology
2. Absorption, Distribution, and Elimination of Toxic Agents
3. Biotransformation: A Balance between Bioactivation and Detoxification
4. Hematotoxicity: Chemically Induced Toxicity of the Blood
5. Hepatotoxicity: Toxic Effects on the Liver
6. Nephrotoxicity: Toxic Responses of the Kidney
7. Neurotoxicity: Toxic Responses of the Nervous System
8. Dermal and Ocular Toxicity: Toxic Effects of the Skin and Eyes
9. Pulmonotoxicity: Toxic Effects in the Lung
10. Immunotoxicity: Toxic Effects on the Immune System
11. Reproductive Toxicity
12. Mutagenesis and Genetic Toxicology
13. Chemical Carcinogenesis

Course Objectives:

1. Describe and define the general principles of toxicology, including terminology; the dose response relationship; routes of entry; absorption, distribution, and elimination of toxic agents; and biotransformation of substances in the body. (Related to program outcome performance criterion: 2A3)
2. Describe the adverse effects caused by various toxic agents on specific tissues and organs including the liver, blood, kidneys, nervous system, skin, eyes, lungs, and immune system. (Related to program outcome performance criterion: 2A3)
3. Discuss toxicological areas of special concern including reproductive toxicology and carcinogenesis. (Related to program outcome performance criterion: 2B2)
4. Discuss adverse health effects associated with selected classes of chemical agents including metals, pesticides, organic solvents, and naturally occurring toxins. (Related to program outcome performance criterion: 2B2)
5. Describe the role and application of toxicology in modern times, including risk assessment, public health, epidemiology, and control strategies. (Related to program outcome performance criteria: 2B2 and 2B4)

Course Specification Sheet

OSHE 442 Principles of Radiation Safety

Course Description:

Prerequisites: OSHE 141, PHYS 191, and PLAB 193. This course describes and defines the various forms of ionizing and non-ionizing radiation and the methods that are used to detect, identify, and measure workplace levels of radiation. It also describes control methods which employ engineering methods, administrative methods, and personal protective equipment to eliminate or minimize the hazards posed by radiation.

Minimum Topics:

1. Introductory Concepts
2. Atom Structure and Energetics
3. Radioactive Transformation
4. Major Sources of Radiation
5. Radiation Interactions and Dose
6. Radiation Bioeffects and Risk
7. Radiation Shielding
8. Measurement of Radiation
9. Internal Radiation Dosimetry
10. Radiation Protection Standards
11. Radiation Protection Programs
12. Environmental Radiological Assessment
13. Radon - A Public Health Issue
14. Radioactive Wastes

Course Objectives:

1. Describe and identify the various forms of ionizing and non-ionizing radiation typically encountered in the workplace. (Related to program outcome performance criterion: 2A1)
2. Describe the various hazards associated with exposures to ionizing and non-ionizing radiation. (Related to program outcome performance criteria: 2A1 and 2B3)
3. Select and use the proper means and methods for detecting and identifying ionizing and non-ionizing radiation. (Related to program outcome performance criterion: 2B2)
4. Select and use methods for measuring levels of ionizing and non-ionizing radiation. (Related to program outcome performance criterion: 2B3)
5. Provide accurate analysis of potential hazards posed by detected levels of ionizing and non-ionizing radiation. (Related to program outcome performance criterion: 2B2)
6. Select and implement proper controls and countermeasures to protect workers and the public from the effects of ionizing and non-ionizing radiation. (Related to program outcome performance criterion: 2B4)

Course Specification Sheet

OSHE 451 Hazardous Materials Management

Course Description:

Prerequisite: OSHE 251. This course examines acceptable policies, procedures, and methods for the use of hazardous materials, and the disposal of oil and hazardous wastes produced by industry. Major topics include characteristics of hazardous materials, including methods for their transportation and storage. It also includes advanced aspects of risk assessment; applicable environmental legislation; waste characterizations, minimization and recovery; chemical, physical, and biological waste treatment methods; thermal, injection well and landfill disposal methods; and a section on the transportation of hazardous wastes.

Minimum Topics:

1. Introduction & Overview
2. Administration and Regulatory Requirements
 - a. RCRA
 - b. HAZWOPER
 - c. HazCom
 - d. Others (DOE, DOT, etc.)
3. Hazardous Materials and Hazardous Wastes
 - a. Defining HazMat and Hazardous Waste
 - b. HazMat/Hazardous Waste Exposures
 - c. Personal Protective Equipment - Selection and Use
 - d. Monitoring Methodologies
4. Waste Minimization
5. On-Site Waste Management
6. Waste Treatment and Disposal Technologies
7. Waste Transportation
8. Emergency Response Organization and Planning
9. Emergency Response Methods
10. Emergency Response Equipment

Course Objectives:

1. Describe state and federal requirements for management of waste and hazardous waste materials, as found in 40 CFR 240 to 271. (Related to program outcome performance criterion: 2A2)
2. Analyze an industrial facility's produced waste and develop a program to effectively and efficiently manage that waste. (Related to program outcome performance criteria: 2B2 and 2B4)
3. Describe the operation of a treatment, storage, and disposal (STD) facility, and how to select a TSD facility to meet a company's waste disposal requirements. (Related to program outcome performance criteria: 2A1 and 2B4)

4. Describe the various methods of treating or disposing of hazardous waste, i.e., incineration, injection, impoundments, etc., and give the advantages and disadvantages of each type. (Related to program outcome performance criterion: 2B4)
5. Respond to a simulated emergency involving hazardous materials, demonstrating proper, safe methods for hazard identification, evaluation, and control. (Related to program outcome performance criteria: 2B2, 2B4, and 3.3)

Course Specification Sheet

OSHE 452 Pollution Fundamentals and Control Technologies

Course Description:

Prerequisite: OSHE 251. This course explores the mechanisms of air, water and soil pollution and the steps to eliminate or minimize impacts on the ecology and human health and safety. The course is also designed to explore the existing pollution prevention and control technologies and the evaluation of their performance.

Minimum Topics:

- Identify sources of air, water and soil pollutants (including population growth); human health, ecological and safety concerns of pollution
- Identify air pollution control technologies, e.g., cyclones, precipitators, electrostatic filters, etc.
- Identify water pollution control technologies, e.g., biological treatment systems
- Identify soil pollution control technologies, e.g., excavation and treatment
- Identify pollution prevention and cleaner (pollution prevention) production methods, including recycling
- Evaluate the performance of various pollution control technologies, e.g., modeling plumes and sampling and analysis
- Describe current methods of ground-level ozone pollution control methods

Course Objectives:

1. Describe the biosphere and its components e.g. people (population), vegetation, hydrological cycle, etc. (Related to program outcome performance criterion: 2A1)
2. Explain different categories and sources of air, water and soil pollution and analyze chemical and physical processes that transform or transport pollutants in the environment. (Related to program outcome performance criteria: 2A1 and 2A3)
3. Evaluate the impacts of air, water and soil pollution on human health and welfare (e.g. buildings and aesthetics), living organisms and the ecosystem. (Related to program outcome performance criterion: 2A3)
4. Classify the technologies for the treatment of drinking water; and pollution control technologies for air, water and soil (land). (Related to program outcome performance criterion: 2B4)
5. Select correct pollution control technologies for specific industrial application in order to meet state and federal regulatory and standard requirements. (Related to program outcome performance criteria: 2A4 and 2B4)
6. Evaluate the effectiveness of different pollution control technologies. (Related to program outcome performance criterion: 2B4)

Course Specification Sheet

OSHE 471 Education and Training Methods for Occupational Safety and Health

Course Description:

This course introduces the concepts of adult training and education with emphasis on occupational safety and health. Major topics include: instructional system design, including performing a training needs assessment tasks analysis, program design goals and objectives, performance evaluation, delivery methods and media; computer-based training methods; systems to manage costs; and record keeping.

Minimum Topics:

1. Management Involvement in Safety Training
2. The Role of the Supervisor in Safety Training
3. Facts about Safety Training
4. OSHA Requirements for Safety Training
5. Other Requirements
6. Determining Training Needs
7. Establishing Training Objectives
8. Determining Course Content
9. Developing Instructional Outlines
10. Use of Audio/Visual Aids and Equipment
11. Examination, Testing and Validation
12. Training Recordkeeping
13. Drills and Exercises
14. On-The-Job Training

Course Objectives:

1. Define and describe the differences between education and training. (Related to program outcome performance criterion: 2A1)
2. Given a suitable training topic, develop a “map” for the steps in developing a training course. (Related to program outcome performance criterion: 2B4)
3. Given a suitable training topic, perform a skills analysis. (Related to program outcome performance criterion: 2B2)
4. Given an accurate skills analysis for a training topic, write a set of training objectives for that topic. (Related to program outcome performance criteria: 2B2 and 2B4)
5. Given proper training objectives, develop a course of instruction designed to achieve the training objectives. (Related to program outcome performance criteria: 2B2 and 2B4)
6. Develop a method of criterion testing that will demonstrate achievement of the objectives of the training. (Related to program outcome performance criteria: 2B4 and 2B6)