

**FIP 230**  
**CHEMISTRY OF HAZARDOUS MATERIALS I**

**COURSE DESCRIPTION:**

Prerequisites: None

Corequisites: None

This course covers the evaluation of hazardous materials. Topics include use of the periodic table, hydrocarbon derivatives, placards and labels, parameters of combustion, and spill and leak mitigation. Upon completion, students should be able to demonstrate knowledge of the chemical behavior of hazardous materials. Course Hours Per Week: Class 5. Semester Hours Credit: 5.

**COURSE OBJECTIVES:**

Upon completion of this course, the student will be able to:

- a. Identify the classes of fire.
- b. Identify and define hazardous materials
- c. Define energy and matter.
- d. Explain the difference between elements and compounds.
- e. Locate elements via the use of a periodic chart.
- f. Identify the basic types of chemical reactions.
- g. Define the properties of water-reactive materials.
- h. Explain the biological implications of toxicity.
- i. Identify common organic pesticides.
- j. Identify methods/procedures for protection from toxic substances.
- k. Identify common types of explosives.
- l. Explain the responsibility of firefighters encountering explosives.
- m. Identify types of radiation and their effects.
- n. Explain how to use CHEMTREC.
- o. Explain DOT's involvement in hazardous materials.

**OUTLINE OF INSTRUCTION:**

- I. The chemistry of hazardous materials
  - a. Chemistry
  - b. The elements
  - c. Atomic structure
  - d. Important elements
  - e. The periodic table
  - f. Electronic configuration
  - g. The kinetic molecular theory
  
- II. Chemical Compounds
  - a. Ionic bonding
  - b. The naming of ionic compounds
  - c. Chemical formulas for ionic compounds
  - d. Complex Ions

- III. Covalent bonding
  - a. The covalent bond
  - b. How nonmetals combine
  - c. Complex ions
  
- IV. Hydrocarbons
  - a. Straight-chain hydrocarbons: the alkanes
  - b. Isomers
  - c. Straight-chain hydrocarbons: the alkenes
  - d. Isomers of the Alkenes
  - e. Straight-chain hydrocarbons: the alkynes
  - f. Naming straight-chain hydrocarbons
  - g. Cyclical hydrocarbons: the cycloalkanes
  - h. Cyclical Hydrocarbons: the aromatics
  
- V. Hydrocarbon derivatives
  - a. Halogenated hydrocarbons
  - b. The alcohols
  - c. The Ethers
  - d. The ketones
  - e. The aldehydes
  - f. The peroxides
  - g. Esters
  - h. Amines
  - i. Other hydrocarbon derivatives
  
- VI. Fire and pyrolysis
  - a. Theories of fire
  - b. Theories of fire extinguishment
  - c. Pyrolysis
  - d. Bond energies
  
- VII. Flammable and combustible liquids
  - a. Hazards of liquids
  - b. Types of flammable liquids
  
- VIII. Compressed gases
  - a. Physical forms
  - b. Pressure, Temperature, and Volume
  - c. Hazards
  - d. Flammable compressed gases
  - e. Nonflammable compressed gases
  - f. Other gases
  
- IX. Combustible solids
  - a. Wood and wood products
  - b. Elements that burn
  - c. Other flammable solids
  - d. Solids with flash points

- X. Cryogenic gases
  - a. Production
  - b. Uses
  - c. Transportation and storage
  - d. Hazards
  
- XI. Oxidizing agents
  - a. Nitrogen-containing oxidizing agents
  - b. Chlorine-containing oxidizing agents
  - c. The inorganic peroxides
  - d. Other oxidizing agents
  
- XII. Plastics
  - a. Groups of Synthetic Polymers
  - b. Polymerization
  - c. Classes of plastics
  - d. Hazards of plastics
  - e. Extinguishment of fires involving plastics
  - f. Locations involving burning plastics
  - g. Considerations
  
- XIII. Corrosives
  - a. Hazards of the acids
  - b. Inorganic acids
  - c. Organic acids
  - d. Bases
  - e. Other corrosives
  - f. Emergencies involving corrosives
  
- XIV. Unstable materials: organic peroxides and monomers
  - a. Organic peroxides
  - b. Monomers
  
- XV. Toxicity
  - a. Entry routes
  - b. Methods of measurement
  - c. Classification of toxic materials
  - d. DOT Classification
  
- XVI. Radioactivity
  - a. What is radioactivity
  - b. Types of ionizing radiation
  - c. Damage by radioactivity
  - d. Protection against radiation
  - e. Units of measurement
  - f. Response to radioactivity incidents
  
- XVII. Explosives
  - a. Types of explosions
  - b. Other types of explosions

- c. Types of explosives
- d. Other explosives
- e. Blasting agents
- f. Other definitions
- g. DOT classification of explosives
- h. Emergencies involving explosives

XVIII. Water- and air-reactive materials

- a. Water-reactive materials
- b. Air-reactive materials
- c. Emergencies involving pyrophoric materials

**REQUIRED TEXTBOOK AND MATERIALS:**

Textbooks to be selected by instructor.

**STATEMENT FOR STUDENTS WITH DISABILITIES:**

Students who require academic accommodations due to any physical, psychological, or learning disability are encouraged to request assistance from a disability services counselor within the first two weeks of class. Likewise, students who potentially require emergency medical attention due to any chronic health condition are encouraged to disclose this information to a disability services counselor within the first two weeks of class. Counselors can be contacted by calling 686-3652 or by visiting the Student Development Office in the Phail Wynn Jr. Student Services Center, room 1309.