

## **COURSE OUTLINE**

### **Fire Chemistry I**

#### **Course Description**

FS 216. Fire Chemistry I. 3 hours credit. Prerequisite: CH 105 and FS 200 with a C or better. This course will enable the student to gain a basic understanding of chemistry involving hazardous materials. The student will study chemical bonding, hydrocarbon derivatives, combustion, and flammable and dangerous substances. The student will be able to size up and mitigate a hazardous material incident scene using an understanding of physical and chemical properties of hazardous materials. The student will also learn about hazardous materials likely to be encountered in a terrorist event and how to effectively respond.

#### **Course Relevance**

Knowledge of the principles of chemistry emphasized in this course is critical for the safe and effective mitigation of a hazardous materials incident. The ability to identify dangerous chemicals and predict chemical behavior can save lives and property during a chemical emergency.

#### **Required Materials**

Meyer, E. (2004). *Chemistry of hazardous materials*. Upper Saddle River, NJ: Pearson Education Inc.

#### **Learning Outcomes**

The intention is for the student to be able to

1. Understand physical and chemical properties of hazardous materials
2. Identify dangerous properties of certain hazardous substances
3. Understand the different types of chemical reactions
4. Develop mitigation strategies using known chemical information
5. Develop a thorough understanding of the chemistry of corrosive and explosive materials, oxidizers, organic and polymeric compounds and radioactive materials

#### **Primary Learning PACT Skills that will be DEVELOPED and/or documented in this course**

Through the student's involvement in this course, he/she will develop his/her ability in the following primary PACT skill areas:

1. Critical Thinking
  - Through analyzing information and developing appropriate action plans specific to the chemical substance encountered, the student will develop critical thinking skills.
2. Field-Related Technology

- Through a series of demonstrations, discussions and scenarios the student will develop a thorough understanding of the chemistry that is involved in mitigating a hazardous material incident

Secondary skills (developed but not documented):

Communication  
Problem Solving

### **Major Summative Assessment Task(s)**

These learning outcomes and the primary Learning PACT skills will be demonstrated by

1. Completion of exercises and lab demonstrations used to demonstrate the use of chemistry and its laws and theories in hazardous materials mitigation

### **Course Content**

- I. Themes – Key recurring concepts that run throughout this course:
  - A. Identification of chemical specific hazards
  - B. Chemical and class specific mitigation options
- II. Issues – Key areas of conflict that must be understood in order to achieve the intended outcome:
  - A. Chemical compatibilities
  - B. Hazardous materials operations
- III. Concepts – Key concepts that must be understood to address the issues:
  - A. Chemical and physical properties
  - B. Principles of chemical reactions
- IV. Skills/Competencies – Actions that are essential to achieve the course outcomes:
  - A. Chemistry involved in hazardous material response
  - B. Recognizing chemical information when attempting a hazardous material incident.
  - C. Incident scene size up
    1. Identify proper level protective equipment
    2. Predict possible chemical behavior
  - D. Mitigation of an Incident
    1. Tools and equipment
    2. Tactic and strategies

### **Learning Units**

- I. Introduction of hazardous materials
  - A. Identification of hazardous materials
  - B. Mitigation options
- II. Features of matter and energy
- III. Flammable gases and liquids
- IV. Chemical forms of matter

- V. Principles of chemical reactions
- VI. Aspects of DOT hazardous material regulations
- VII. Chemistry of
  - A. Some common elements
  - B. Corrosive materials
  - C. Water reactive materials
  - D. Toxic substances
  - E. Oxidizers
  - F. Polymeric materials
  - G. Explosive materials
- VIII. Radioactive materials

**Learning Activities**

The student will learn through a series of lectures, lab demonstrations, class discussions, multimedia scenarios, exercises and videos.

**Grade Determination**

The student will be graded on assessment tasks, exams and quizzes.