

COURSE OUTLINE

**Fire Technology 114
Hazardous Materials**

I. Catalog Statement

Fire Technology 114 is an introduction to basic fire chemistry and physics. This course covers problems of flammability as encountered by firefighters when dealing with toxic substances, fuels, explosives, oxidizers and radioactive materials. It also covers fire fighting practices pertaining to hazardous materials in storage and transit.

Total Lecture Units: 3.0

Total Course Units: 3.0

Total Lecture Hours: 48.0

Total Faculty Contact Hours: 48.0

Prerequisite: Fire Technology 101 or equivalent.

II. Course Entry Expectations

Skills Level Ranges: Reading 5; Writing 5; Listening/Speaking 5; Math 3.

Prior to enrolling in the course, the student should be able to:

1. describe and discuss the components of the history and philosophy of the modern day fire service;
2. analyze the basic components of fire as a chemical reaction, the major phases of fire, and examine the main factors that influence fire spread and behavior;
3. differentiate between fire service training and education; fire protection certificate program and a fire service degree program; and explain the value of education in the fire service;
4. list and describe the major organizations that provide emergency response service and illustrate how they interrelate;
5. identify fire protection and emergency-service careers in both the public and in the private sector;
6. synthesize the role of national, state and local support organizations in fire protection and emergency services;
7. discuss and describe the scope, purpose, and organizational structure of fire and emergency services;
8. describe the common types of fire and emergency services facilities, equipment, and apparatus;

9. compare and contrast effective management concepts for various emergency situations;
10. identify and explain the components of fire prevention including code enforcement, public information, and public and private fire protection systems.

III. Course Exit Standards

Upon successful completion of the required coursework, the student should be able to:

1. develop a basic knowledge and awareness of the dangers of hazardous materials, hazardous waste, and hazardous substances;
2. become familiar with basic procedures for safe, accepted, and legal emergency incident control measures;
3. become knowledgeable of the tactical and safety operations and obligations of a fire department through all phases of a hazardous materials incident;
4. list and compare the safety considerations encumbered by the fire department to ensure compliance with State and Federal Guidelines;
5. understand the implication of the legal mandates controlling the actions of all activities conducted on scene by all agencies involved.

IV. Course Content

Total Faculty Contact Hours = 48

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| A. Chemistry and Physics of Fire | 9 hours |
| 1. Introduction to chemical terms and units of measure | |
| 2. Matter, energy, and electron structure | |
| 3. The naming and forming of compounds | |
| a. Chemical prefixes and suffixes | |
| b. Organic and inorganic | |
| 4. Chemical equations | |
| 5. Introduction to some pertinent laws of chemistry | |
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| B. Properties of Flammable Liquids | 3 hours |
| 1. Flammable liquids and their chemical structure | |
| 2. Bulk flammable liquids | |
| 3. Classification | |
| 4. Hazards and firefighting techniques | |
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| C. Pressurized Industrial Techniques | 3 hours |
| 1. General principles | |
| 2. Natural gas | |
| 3. Anesthetics | |
| 4. Firefighting techniques | |
| 5. Labeling and placarding | |
| 6. Acetylene gases | |
| 7. Hydrogen/gases | |

D. Liquefied Gases	3 hours
1. Liquefied petroleum	
2. Refrigerants	
3. Cryogenics	
4. Hazards and firefighting techniques	
5. Labeling and placarding	
E. Flammable Solids	3 hours
1. Volatile solids	
2. Flammable elements and compounds	
3. Hazards and firefighting techniques	
F. Combustible Metals	3 hours
1. Magnesium and alkaline-earth metals	
2. Use and storage	
3. Hazards and firefighting technique	
G. Plastics	3 hours
1. Production and chemical composition	
2. Identifying plastics	
3. Hazards of manufacture and use	
H. Oxidizing Agents	2 hours
1. Nitrates, chlorates, peroxides, etc.	
I. Blasting Agents	2 hours
1. Ammonium nitrate	
J. Explosives	3 hours
1. Definition and chemical composition	
2. High and low explosives	
K. Unstable Materials	2 hours
1. Organic peroxide	
L. Propellants and Exotic Fuels	2 hours
1. Types	
2. Transportation and firefighting	
M. Water and Air Reactive Materials	2 hours
1. Alkali metals	
2. Hydrides, carbides	
3. Organo-metallics and pyrophorics	

N. Toxic Materials	2 hours
1. Identification of poisons	
2. Cyanides, arsenic, mercury, and lead	
O. Insecticides and Poisonous Gases	2 hours
P. Corrosives	2 hours
1. Acids and bases	
2. Halogens	
Q. Toxic Combustion Products	1 hour
1. Carbon monoxide and carbon dioxide	
2. Teargases	
R. Radioactive Materials	1 hour
1. Structure of the atomic nucleus	

V. Methods of Instruction

The following methods of instruction may be used in the course:

1. lecture;
2. demonstration;
3. films;
4. simulations.

VI. Out of Class Assignments

The following out of class assignments may be used in the course:

1. individual projects (i.e. written assignments, reading reports);
2. group projects (i.e. homework problems, problem solving demonstrations, discussion on textbook topics).

VII. Methods of Evaluation

The following methods of evaluation may be used in the course:

1. quizzes;
2. midterm examination;
3. final examination.

VIII. Textbooks

Hess, Fred, *Chemistry Made Simple, [Revised Edition]*. Main Street Books, 1984.
10th Grade Textbook Reading Level. ISBN: 0385188501

Kenley, Scott W., Meidl, Hames H., *Flammable Hazardous Material [3rd Edition]*.
Upper Saddle River, NJ: Prentice Hall, 1995.

10th Grade Textbook Reading Level. ISBN: 0023801360

Meidl, James, *Explosive and Toxic Hazardous Materials*. Glencoe Press, 1980.

10th Grade Textbook Reading Level.

IX. Student Learning Outcomes

1. Student will be able to develop a basic knowledge and awareness of the dangers of hazardous materials, hazardous waste, and hazardous substances.
2. Student will be able to become familiar with basic procedures for safe, accepted, and legal emergency incident control measures.
3. Student will be able to become knowledgeable of the tactical and safety operations and obligations of a fire department through all phases of a hazardous materials incident.
4. Student will be able to list and compare the safety considerations encumbered by the fire department to ensure compliance with State and Federal Guidelines.
5. Student will be able to understand the implication of the legal mandates controlling the actions of all activities conducted on scene by all agencies involved.