

*National Fire Academy*

# FESHE Model Curriculum

Associate's (Non-Core)

*June 2009*



**FEMA**



# ***Fire and Emergency Services Administration***

**Course Description:** This course introduces the student to the organization and management of a fire and emergency services department and the relationship of government agencies to the fire service. Emphasis is placed on fire and emergency service, ethics, and leadership from the perspective of the company officer.

**Prerequisite:** *Principles of Emergency Services*

- Outcomes:**
1. Acknowledge career development opportunities and strategies for success.
  2. Recognize the need for effective communication skills both written and verbal.
  3. Identify and explain the concepts of span and control, effective delegation, and division of labor.
  4. Select and implement the appropriate disciplinary action based upon an employee's conduct.
  5. Explain the history of management and supervision methods and procedures.
  6. Discuss the various levels of leadership, roles, and responsibilities within the organization.
  7. Describe the traits of effective versus ineffective management styles.
  8. Identify the importance of ethics as it relates to fire and emergency services.
  9. Identify the roles of the National Incident Management System (NIMS) and Incident Management System (ICS).

**Available Texts:** [\*Company Officer\*](#); (2005); Clinton Smoke, Delmar, Cengage  
[\*Management in the Fire Service\*](#), 4<sup>th</sup> Ed; (2008); Carter & Rausch, Jones & Bartlett  
[\*Fire Service Personnel Management\*](#) (2005); Stephen Edwards, Brady, 2<sup>nd</sup> Ed.,  
[\*Fire & Emergency Services Administration: Management and Leadership Practices\*](#) (2006); L. Charles Smeby Jr., Jones & Bartlett  
[\*Fire Administration\*](#) (2008); Randy R. Bruegman & Jeffrey T. Lindsey, Brady

**Supporting  
References/Research  
for Faculty and**

**U.S. Fire Administration**

**Publications:** <http://www.usfa.fema.gov/applications/publications>

See EMS, Fire Safety and Public Education, Fire Administration, Fire

**Students:** Service Operations, Health and Safety  
Applied Research:  
<http://www.usfa.fema.gov>  
Research Reports:  
<http://www.usfa.fema.gov/research>  
Technical Reports:  
<http://www.usfa.fema.gov/applications/publications/browse.cfm?mc=29>  
Topical Fire Research Series:  
<http://www.usfa.fema.gov>  
Learning Resource Center:  
<http://www.lrc.fema.gov>  
**National Institute for Standards and Technology**  
<http://www.fire.nist.gov>: Fire Tests/Data, Software/Models, Publications, FIREDOC (under Publications)  
**References**  
[NFPA 1500](#)  
[NFPA 1021](#)  
[Fire Chiefs Handbook](#); Penwell Current Ed.  
[Fire Service Administration](#); Nancy Grant & David Hoover, NFPA, Current Ed.  
**Lessons Learned Information Sharing:**  
<https://www.llis.dhs.gov/member/secure/index.cfm>

**Assessment:** Students will be evaluated for mastery of learning objectives by methods of evaluation to be determined by the instructor.

**Points of Contact:** Larry Perez, New Mexico State University at Dona Ana, New Mexico (575) 527-7746; Email: [laperez@nmsu.edu](mailto:laperez@nmsu.edu)  
Judith Kuleta, Bellevue Community College, Washington (425) 564-2515; Email: [jkuleta@bellevuecollege.edu](mailto:jkuleta@bellevuecollege.edu)

# Course Outline

---

## *Fire Administration I*

- I. New challenges and opportunities
  - A. Duties
  - B. National Standards
  - C. Career Opportunities
  - D. Education and Training
  
- II. Communication Process
  - A. Verbal
  - B. Written
  - C. Active Listening Skills
  
- III. Management Principles
  - A. Span of Control
  - B. Delegation/Division of Labor
  - C. Unity of Command
  - D. Chain of Command
  - E. Organizational Structure
  
- IV. Tools for Employee Development
  - A. Evaluation and Appraisal of Employees
  - B. Rewards and Motivation
  - C. Progressive System of Discipline
  - D. Grievance Procedures
  
- V. Management and Supervision
  - A. Theories
  - B. History
  
- VI. Managing Resources for Emergency and Non-emergency
  - A. Equipment
  - B. Personnel
  - C. Time
  
- VII. Leadership
  - A. Managers
  - B. Leaders
  - C. Roles and Responsibilities

VIII. Supervision and Management

- A. Styles
- B. Traits
- C. Effectiveness

IX. Safety Assessment

- A. Non-Emergency
- B. Emergency

X. Ethics

- A. Harassment
- B. Conflict of Interest
- C. Public Trust
- D. Code of Ethics
- E. Diversity
- F. Morality

XI. Incident Management System

- A. Duties and Responsibilities
- B. Transfer of Command

XII. Records Management

- A. Formal Documentation
- B. Informal Documentation

# ***Fire Investigation I***

**Course Description:** This course is intended to provide the student with the fundamentals and technical knowledge needed for proper fire scene interpretations, including recognizing and conducting origin and cause, preservation of evidence and documentation, scene security, motives of the firesetter, and types of fire causes.

**Prerequisite:** *Principles of Emergency Services, Building Construction for Fire Protection, Fire Behavior and Combustion or Instructor approval*

- Outcomes:**
1. Identify the responsibilities of a firefighter when responding to the scene of a fire, including scene security and evidence preservation.
  2. Describe the implications of constitutional amendments as they apply to fire investigations.
  3. Identify key case law decisions that have affected fire investigations.
  4. Define the common terms used in fire investigations.
  5. Explain the basic elements of fire dynamics and how they affect cause determination.
  6. Compare the types of building construction on fire progression.
  7. Describe how fire progression is affected by fire protection systems and building design.
  8. Discuss the basic principles of electricity as an ignition source.
  9. Recognize potential health and safety hazards.
  10. Describe the process of conducting investigations using the scientific method.
  11. Identify cause and origin and differentiate between accidental and incendiary.
  12. Explain the procedures used for investigating vehicle fires.
  13. Identify the characteristics of an incendiary fire and common motives of the fire setter.

**Available  
Texts:**

[Introduction to Fire Origin and Cause](#), 3<sup>rd</sup> Ed., (2005); Fire Protection Publications  
[User's Manual for NFPA 921](#) (2003); NFPA  
[Fire Investigation](#); 1<sup>st</sup> Ed; (2009); Russ Chandler, Delmar Cengage  
[Kirk's Fire Investigation](#) (2007); John DeHaan, Prentice Hall

**Supporting  
References/  
Research for  
Faculty and  
Students:**

**U.S. Fire Administration**

Publications:

<http://www.usfa.fema.gov/applications/publications>

See Arson, Fire Data, Fire Protection, Fire Service Operations, Hazardous Materials, Health and Safety, Wildfire

Applied Research:

<http://www.usfa.fema.gov>

Research Reports:

<http://www.usfa.fema.gov/research>

Technical Reports:

<http://www.usfa.fema.gov/applications/publications/browse.cfm?mc=29>

Topical Fire Research Series:

<http://www.usfa.fema.gov>

Learning Resource Center:

<http://www.lrc.fema.gov>

**National Institute for Standards and Technology**

<http://www.fire.nist.gov>: Fire Tests/Data, Software/Models, Publications, FIREDOC (under Publications)

**References**

Lessons Learned Information Sharing:

<http://www.llis.dhs.gov/member/secure/index.cfm>

<http://www.firearson.com>

<http://www.interfire.org/>

[Fire Investigator](#), Fire Protection Publications

[Forensic Fire Scene Reconstruction](#), David Icove, Brady, 2003

[NFPA 1033 Standard for Professional Qualifications for Fire Investigations](#)

[NFPA 921, Guide for Fire and Explosion Investigations](#)

[Practical Fire and Arson Investigating](#), David Redsicker, 2<sup>nd</sup> Ed., 1996

**Assessment:**

Students will be evaluated for mastery of learning objectives by methods of evaluation to be determined by the instructor.

**Points of  
Contact:**

Larry Perez, New Mexico State University at Dona Ana, New Mexico  
(575) 527-7746; Email: [laperez@nmsu.edu](mailto:laperez@nmsu.edu)

Ralph De La Ossa, Long Beach Community College, Long Beach, CA  
(562) 938-4338; Email: [rdelaossa@lbcc.edu](mailto:rdelaossa@lbcc.edu)

# Course Outline

---

## *Fire Investigation I*

- I. Emergency Responder Responsibilities and Observations
  - A. Responsibilities of the Fire Department
  - B. Responsibilities of the Firefighter
  - C. Responsibilities of the Fire Officer
  - D. Observations When Approaching the Scene
  - E. Observations Upon Arrival
  - F. Observations During Firefighting Operations
  - G. Identification of Incendiary Devices
  
- II. Constitutional Law
  - A. Criminal Law
  - B. Constitutional Amendments
  
- III. Case Studies
  - A. Michigan v. Tyler
  - B. Michigan v. Clifford
  - C. Daubert Decision
  - D. Benfield Decision
  - E. Kuhmo/Carmichael Decision
  
- IV. Fire Investigations Terminology
  - A. Terms as They Apply to Structural Fires
  - B. Terms as They Apply to Vehicle Fires
  - C. Other Common Investigative Terms
  
- V. Basic elements of Fire Dynamics
  - A. Ignition
  - B. Heat Transfer
  - C. Flame Spread
  - D. Burning Rate
  - E. Fire Plumes
  - F. Fire Analysis
  
- VI. Building Construction
  - A. Types of Construction
  - B. Building Materials
  - C. Building Components
  
- VII. Fire Protection Systems
  - A. Extinguishment Systems
  - B. Detection Systems

- C. Signaling Systems
  - D. Other Building Services
- VIII. Basic Principles of Electricity
- A. Basic Electricity
  - B. Wiring Systems
  - C. Common Electrical Systems
- IX. Health and Safety
- A. Methods of Identification
  - B. Common Causes of Accidents
  - C. Common Causes of Injuries
- X. Fire Scene Investigations
- A. Examining the Fire Scene
  - B. Securing the Fire Scene
  - C. Documenting the Fire Scene
  - D. Evidence Collection and Preservation
  - E. Exterior Examination
- XI. Determining Point of Origin
- A. Interior Examination
  - B. Area of Origin
  - C. Fire Patterns
  - D. Other Indicators
  - E. Scene Reconstruction
  - F. Point of Origin
- XII. Types of Fire Causes
- A. Accidental
  - B. Natural
  - C. Incendiary
  - D. Undetermined
- XIII. Vehicle Fires
- A. Examination of Scene
  - B. Examination of Exterior
  - C. Examination of Driver and Passenger Areas
  - D. Examination of Engine Compartment
  - E. Examination of Fuel System
  - F. Examination of Electrical System
- XIV. Firesetters
- A. Characteristics of Arson
  - B. Common Motives

# ***Fire Investigation II***

**Course Description:** This course is intended to provide the student with advanced technical knowledge on the rule of law, fire scene analysis, fire behavior, evidence collection and preservation, scene documentation, case preparation and court-room testimony.

**Prerequisite:** *Fire Investigation I*

- Outcomes:**
1. Explain the rule of law as it pertains to arrest, search and seizure.
  2. Interpret a fire scene.
  3. Describe the chemistry of combustion.
  4. Explain the nature and behavior of fire.
  5. Identify the combustion properties of liquid, gaseous, and solid fuels.
  6. Analyze electrical causes of fires.
  7. List the procedures for fingerprinting and evidence collection /preservation.
  8. Evaluate the use of incendiary devices, explosives, and bombs.
  9. List the procedures for fire scene documentation.
  10. Analyze fire-related deaths and injuries.
  11. Discuss interviewing techniques.
  12. Explain the role of the fire investigator in courtroom demeanor and testifying.
  13. List the sources and technology available for fire investigations.
  14. Describe procedures for conducting background investigations.

**Available Texts:** [\*Kirk's Fire Investigation\*, 6<sup>th</sup> Ed., \(2007\)](#); John Dehaan, Prentice Hall [\*User's Manual for NFPA 921\*, \(2008\)](#); NFPA, 5<sup>th</sup> Ed.

**Supporting References/Research for Faculty and Students:**

**U.S. Fire Administration**  
**Publications:** <http://www.usfa.fema.gov/applications/publications>  
See Arson, Fire Data, Fire Protection, Fire Service Operations, Hazardous Materials, Health and Safety, Wildfire

Applied Research:

<http://www.usfa.fema.gov>

Research Reports:

<http://www.usfa.fema.gov/research>

Technical Reports:

<http://www.usfa.fema.gov/applications/publications/browse.cfm?mc=29>

Lessons Learned Information Sharing:

<http://www.llis.dhs.gov/member/secure/index.cfm>

Topical Fire Research Series:

<http://www.usfa.fema.gov>

Learning Resource Center:

<http://www.lcr.fema.gov>

**National Institute for Standards and Technology**

<http://www.fire.nist.gov>: Fire Tests/Data, Software/Models, Publications, FIREDOC (under Publications)

**References**

Lessons Learned Information Sharing:

<http://www.llis.dhs.gov/member/secure/index.cfm>

<http://www.interfire.org>

[\*Analysis and Interpretation of Fire Scene Evidence\*](#); Jose Amirall, 2004

[\*Fire and Arson Scene Evidence: A Guide for Public Safety Personnel\*](#);

U.S. Department of Justice Office of Justice Programs

[\*Forensic Fire Scene Reconstruction\*](#); David Icove, Brady, 2009

[\*Handbook of Forensic Services\*](#), U.S. Department of Justice, Federal Bureau of Investigation

[\*NFPA 901 Standard Classifications for Incident Reporting and Fire Protection Data\*](#), NFPA

[\*NFPA 1033 Standards for Fire Investigator\*](#), NFPA

[\*NFPA 921 Guide for Fire and Explosion Investigations\*](#), NFPA

[\*Passenger Vehicle Identification Manual\*](#), National Insurance Crime Bureau Inc.

**Assessment:**

Students will be evaluated for mastery of learning objectives by methods of evaluation to be determined by the instructor.

**Points of Contact:**

Larry Perez, New Mexico State University at Dona Ana, New Mexico  
(575) 527-7746; Email: [laperez@nmsu.edu](mailto:laperez@nmsu.edu)

Ralph De La Ossa, Long Beach Community College, Long Beach, CA  
(562) 938-4338; Email: [rdelaossa@lbcc.edu](mailto:rdelaossa@lbcc.edu)

# Course Outline

---

## ***Fire Investigation II***

- I. Rule of Law
  - A. Arrest Procedures
  - B. Search and Seizure
  - C. Warrant Searches
  
- II. Interpretations of Fire Scenes
  - A. Structure Fires
  - B. Vehicle Fires
  - C. Ship Fires
  - D. Explosions
  - E. Wildland Fires
  - F. Hazardous Materials Fires
  
- III. Chemistry of Combustion
  - A. Atoms
  - B. Elements
  - C. Compounds
  - D. Organic Compounds
  
- IV. Behavior of Fire
  - A. Heat
  - B. Flame Plumes
  - C. Sequence of a Room Fire
  - D. Effects of Environmental Conditions
  
- V. Combustion Properties
  - A. Liquids
  - B. Gases
  - C. Solids
  
- VI. Electrical Causes of Fires
  - A. Wiring Systems
  - B. Ignition Sources
  - C. Investigation of Fires
  
- VII. Collection of Evidence
  - A. Photography Procedures
  - B. Sketching Procedures and Techniques
  - C. Fingerprint Lifting and Collection Techniques
  - D. Preservation of Evidence
  
- VIII. Incendiary Systems
  - A. Basic Incendiary Devices
  - B. Explosives
  - C. Bombs

- IX. Documentation of Fire Scene
  - A. Sketches
  - B. Photographs
  - C. Incident Reports
  - D. Log Sheets
  - E. Investigation Report
  - F. Chain of Custody
  
- X. Investigation of Fire-related Deaths and Injuries
  - A. Homicide Fire Investigation
  - B. Scene Security
  - C. Scene Examination and Search
  - D. Scene Documentation
  - E. Autopsy Report
  
- XI. Interview Techniques
  - A. Interviewing
  - B. Questioning
  - C. Advising of Rights
  - D. Exceptions to the Rule
  - E. Waiver of Rights
  
- XII. Courtroom Demeanor
  - A. Court Procedures
  - B. Pre-trial Preparation
  - C. Trial Exhibits
  - D. Physical Appearance
  - E. Testifying
  - F. Court Decisions
  
- XIII. Court Decisions
  - A. Daubert Decision
  - B. Benfield Decision
  - C. Kuhmo/Carmichael Decision
  
- XIV. Sources of Information
  - A. Local
  - B. State
  - C. Federal
  - D. Website

# ***Fire Protection Hydraulics and Water Supply***

**Course Description:** This course provides a foundation of theoretical knowledge in order to understand the principles of the use of water in fire protection and to apply hydraulic principles to analyze and to solve water supply problems.

**Prerequisite:** Demonstration of a competency in high school level algebra or the equivalent.

- Outcomes:**
1. Apply the application of mathematics and physics to the movement of water in fire suppression activities.
  2. Identify the design principles of fire service pumping apparatus.
  3. Analyze community fire flow demand criteria.
  4. Demonstrate, through problem solving, a thorough understanding of the principles of forces that affect water at rest and, in motion.
  5. List and describe the various types of water distribution systems.
  6. Discuss the various types of fire pumps.

**Available Texts:** [\*Fire Protection Hydraulics and Water Supply Analysis\*, \(2005\); Pat Brock, Fire Protection Publications](#)  
[\*Fire Protection Handbook\*, \(2008\); NFPA](#)  
[\*Fire Service Hydraulics and Water Supply\*, \(2005\); Mike Wieder, IFSTA/Fire Protection Publications, Current Ed.](#)  
[\*Introduction to Fire Pumps\*, \(2005\); Thomas Sturtevant, Delmar, Cengage](#)  
[\*Fire Department Hydraulics\*, 2<sup>nd</sup> Ed., \(2008\); Eugene Mahoney, Brady, 2008](#)

**Supporting  
References/Research  
for Faculty and  
Students:**

## **U.S. Fire Administration**

Publications:

[http://www.usfa.fema.gov/applications/publications/pubs\\_main.cfm](http://www.usfa.fema.gov/applications/publications/pubs_main.cfm)

See Fire Protection, Fire Administration, Fire Service Operations, Wildfire

Applied Research:

<http://www.usfa.fema.gov/dhtml/inside-usfa/research.cfm>

Research Reports:

[http://www.usfa.fema.gov/dhtml/inside-usfa/r\\_reports.cfm](http://www.usfa.fema.gov/dhtml/inside-usfa/r_reports.cfm)

Technical Reports:

<http://www.usfa.fema.gov/applications/publications/techreps.cfm>

Topical Fire Research Series:

<http://www.usfa.fema.gov/dhtml/inside-usfa/tfrs.cfm>

Learning Resource Center:

<http://www.usfa.fema.gov/dhtml/inside-usfa/lrc.cfm>

**National Institute for Standards and Technology**

<http://www.fire.nist.gov>: Fire Tests/Data, Software/Models, Publications,

**References**

[\*Fire Service Hydraulics\*](#); James Casey, Pennwell, 2<sup>nd</sup>.Ed. 1984

[\*Fire Service Pump Operators Handbook\*](#); Warren Isman, Pennwell 1984

[\*Hydraulics for Firefighting\*](#); William Crapo, Delmar, Cengage

[\*Pumping Apparatus: Driver/Operator Handbook\*](#); Fire Protection Publications, Current Ed.

[\*Techniques of Fire Hydraulics\*](#); Lawrence Erven, Glencoe Fire Service Series, 1972

**Assessment:**

Students will be evaluated for mastery of learning objectives by methods of evaluation to be determined by the instructor.

**Points of Contact:**

Buddy Hyde, Southside Virginia Community College, Virginia

434-949-1084; Email: [buddy.hyde@southside.edu](mailto:buddy.hyde@southside.edu)

Ralph De La Ossa, Long Beach Community College, Long Beach, CA (562) 938-4338; Email: [rdelaossa@lbcc.edu](mailto:rdelaossa@lbcc.edu)

## **Course Outline**

---

### ***Fire Protection Hydraulics and Water Supply***

- I. Water as an extinguishing agent
  - A. Physical properties
  - B. Terms and definitions
  
- II. Math review
  - A. Fractions
  - B. Ratios, proportions, and percentage
  - C. Powers and roots
  
- III. Water at rest
  - A. Basic principles of hydrostatics
    - 1. Pressure and force
    - 2. Six principles of fluid pressure
    - 3. Pressure as a function of height and density
    - 4. Atmospheric pressure
  - B. Measuring devices for static pressure
  
- IV. Water in motion
  - A. Basic principles of hydrokinetics
  - B. Measuring devices for measuring flow
  - C. Relationship of discharge velocity, orifice size, and flow
  
- V. Water distribution systems
  - A. Water sources
  - B. Public water distribution systems
  - C. Private water distribution systems
  - D. Friction loss in piping systems
  - E. Fire hydrants and flow testing
  
- VI. Fire Pumps
  - A. Pump theory
  - B. Pump classifications
  - C. Priming systems
  - D. Pump capacity
  - E. Pump gauges and control devices
  - F. Testing fire pumps

VII. Fire streams

- A. Calculating fire flow requirements
- B. Effective horizontal and vertical reach
- C. Appliances for nozzles
- D. Performance of smooth-bore and combination nozzles
- E. Hand-held lines
- F. Master streams
- G. Nozzle pressures and reaction
- H. Water hammer and cavitations

VIII. Friction loss

- A. Factors affecting friction loss
- B. Maximum efficient flow in fire hose
- C. Calculating friction loss in fire hose
- D. Friction loss in appliances
- E. Reducing friction loss

IX. Engine pressures

- A. Factors affecting engine pressure

X. Standpipe and sprinkler systems

- A. Standpipe systems
  - 1. Classifications
  - 2. Components
  - 3. Supplying Standpipe Systems
- B. Sprinkler systems
  - 1. Classifications
  - 2. Components
  - 3. Supplying sprinkler systems

# ***Hazardous Materials Chemistry***

**Course Description:** This course provides basic chemistry relating to the categories of hazardous materials including recognition, identification, reactivity, and health hazards encountered by emergency services.

**Prerequisite:** None.

- Outcomes:**
1. Identify and describe the common elements of the Periodic Table.
  2. Distinguish between elements, compounds, and mixtures.
  3. Explain the difference between ionic and covalent bonding.
  4. Define the basic chemistry involved with common hydrocarbon derivatives.
  5. Describe the basic chemical and physical properties of gases, liquids, and solids.
  6. Discuss the nine U.S. Department of Transportation hazard classes and their respective divisions.
  7. Demonstrate the utilization of guidebooks, MSDS, and other reference materials to determine an initial course of action.

**Available Texts:** [\*Chemistry of Hazardous Materials\*, 4<sup>th</sup> Ed., \(2004\); Eugene Meyer, Brady](#)  
[\*Hazardous Materials Chemistry\*, \(2006\); Armando Bevelacqua, Delmar, Cengage](#)

**Supporting  
References/Research  
for Faculty and  
Students:**

## **U.S. Fire Administration**

Publications:

<http://www.usfa.fema.gov/applications/publications/>

See Fire Service Operations, Hazardous Materials, Terrorism

Applied Research:

<http://www.usfa.fema.gov>

Research Reports:

<http://www.usfa.fema.gov/research>

Technical Reports:

<http://www.usfa.fema.gov/applications/publications/browse.cfm?mc=29>

Topical Fire Research Series:

<http://www.usfa.fema.gov>

Learning Resource Center:

<http://www.lrc.fema.gov>

## National Institute for Standards and Technology

<http://www.fire.nist.gov/> : Publications

<http://www.fire.nist.gov/aloft/>

### References

[\*The Common Sense Approach to Hazardous Materials\*](#); Frank L. Fire, Pennwell, 1987

[North American Emergency Response Guidebook](#), U.S. Department of Transportation

[Hazardous Chemicals Desk Reference](#); Richard J. Lewis, Sr., John Wiley and Sons, Inc.

[Pocket Guide to Chemical Hazards](#), Center for Disease Control (CDC), National Institute of Occupational Health and Safety (NIOSH)

[Fire Protection Guide to Hazardous Materials](#), National Fire Protection Association (NFPA)

[Emergency Action Guides, Association of American Railroads](#) and the [U.S. Bureau of Explosives](#)

Lessons Learned Information Sharing:

<http://www.llis.dhs.gov/member/secure/index.cfm>

### Assessment:

Students will be evaluated for mastery of learning objectives by methods of evaluation to be determined by the instructor.

### Points of Contact:

Buddy Hyde, Southside Virginia Community College, VA;

(434) 949-1084; Email: [buddy.hyde@southside.edu](mailto:buddy.hyde@southside.edu)

Gary Fulton, PA State Fire Academy, Lewistown, PA;

(717) 248-1115; Email: [gafulton@state.pa.us](mailto:gafulton@state.pa.us)

# Course Outline

---

## ***Hazardous Materials Chemistry I***

- I. Introduction
  - A. General Characteristics of Hazardous Materials
  - B. Hazardous Household Products
  - C. Hazardous Substances in the Workplace
  - D. Hazardous Materials in Transit
  - E. Hazardous Materials within Communities
  - F. NFPA System of Identifying Potential Hazards
  
- II. Matter and Energy
  - A. Matter and Energy Defined
  - B. Common Units of Measurement
  - C. Temperature, Pressure, and Volume Relationships
  - D. Heat Transmission
  - E. Understanding Fluid Principles
  
- III. Chemical Forms of Matter
  - A. Elements and Compounds
  - B. Periodic Classification of Elements
  - C. The Nature of Chemical Bonding
  - D. Writing Chemical Formulas
  - E. Naming Ionic and Covalent Compounds
  
- IV. Principles of Chemical Reactions
  - A. Types of Chemical Reactions
  - B. Factors Affecting the Rate of Reaction
  - C. Oxidation-Reduction Reactions
  - D. Fire Extinguishing Agents
  
- V. Chemistry of Some Common Elements
  - A. Oxygen
  - B. Hydrogen
  - C. Fluorine
  - D. Chlorine
  - E. Phosphorus
  - F. Sulfur
  - G. Carbon
  
- VI. Flammable Gases and Liquids
  - A. Flammability
  - B. General Hazards of Compressed Gases
  - C. Storage and Transport of Compressed Gases

- D. General Hazards of Flammable Liquids
  - E. Storage and Transport of Flammable Liquids
  - F. Response to Flammable Gas and Liquid Emergencies
- VII. Chemistry of Some Hazardous Organic Compounds
- A. The Nature of Organic Compounds
  - B. Aliphatic Hydrocarbons
  - C. Aromatic Hydrocarbons
  - D. Functional Groups
  - E. Halogenated Hydrocarbons
  - F. Alcohols
  - G. Ethers
  - H. Aldehydes and Ketones
  - I. Organic Acids
  - J. Esters
  - K. Amines
  - L. Peroxo-Organic Compounds
- VIII. Chemistry of Some Corrosive Materials
- A. The Nature of Acids and Bases
  - B. The PH Scale
  - C. Acids and Bases as Corrosive Materials
  - D. Sulfuric Acid
  - E. Nitric Acid
  - F. Hydrochloric Acid
  - G. Perchloric Acid
  - H. Hydrofluoric Acid
  - I. Phosphoric Acid
  - J. Acetic Acid
  - K. Alkaline Metal Hydroxides
  - L. Response to Corrosive Material Emergencies
- IX. Chemistry of Some Water-Reactive Materials
- A. The Nature of Water Reactive Materials
  - B. Alkali Metals
  - C. Combustible Metals
  - D. Metallic Hydrides
  - E. Metallic Phosphides
  - F. Metallic Carbides
- X. U.S. Department of Transportation Hazard Classes and Their Divisions
- A. Identification of Hazardous Materials by Container Shape and Size
  - B. Identification of Hazardous Materials by Transportation Placards
  - C. Identification of Hazardous Materials by Shipping Documents
  - D. Identification of Hazardous Materials by Material Safety Data Sheets (MSDS)

XI. Hazardous Materials in Fixed Facilities

- A. Identification of Hazardous Materials by Location and Occupancy
- B. Identification of Hazardous Materials by Container Shape and Size
- C. Identification of Hazardous Materials by NFPA 704 System
- D. Identification of Hazardous Materials by Material Safety Data Sheets (MSDS)

XII. Response Guidelines

- A. Utilization of North American Emergency Response Guidebook
- B. Utilization of NIOSH Pocket Guide to Chemical Hazards
- C. Utilization of NFPA Fire Protection Guide to Hazardous Materials
- D. Utilization of Bureau of Explosives Emergency Action Guides

# ***Legal Aspects of Emergency Services***

**Course Description:** This course will address the Federal, State, and local laws that regulate emergency services and include a review of national standards, regulations, and consensus standards.

**Prerequisite:** None.

- Outcomes:**
1. Define the different types of laws.
  2. Discuss federal, state, and local laws and liabilities applicable to emergency services.
  3. Explain the purpose of national codes and standards.
  4. Discuss applicable court decisions that have influenced emergency services.
  5. Recognize the legal issues and concerns affecting emergency services.

**Available Texts:** [\*Fire Law\*, \(2007\); Thomas D. Schneid, Van Nostrand Reinhold Co. Pub.](#)

[\*Legal Considerations for Fire & Emergency Services\*, \(2007\); J. Curtis Varone, Delmar, Cengage](#)

[\*Fire Service Law\*, Lawrence T. Bennett, Brady, 2007](#)

**Supporting  
References/Research  
for Faculty and  
Students:**

## **U.S. Fire Administration**

Publications:

<http://www.usfa.fema.gov/applications/publications>

See Arson, EMS, Fire Data, Fire Administration, Fire Service Operations, Health and Safety

Applied Research:

<http://www.usfa.fema.gov>

Research Reports:

<http://www.usfa.fema.gov/research>

Technical Reports:

<http://www.usfa.fema.gov/applications/publications/browse.cfm?mc=29>

Topical Fire Research Series:

<http://www.usfa.fema.gov>

Learning Resource Center:

<http://www.lrc.fema.gov>

## **National Institute for Standards and Technology**

<http://www.fire.nsti.gov>; Fire Test/Data, Software/Models, Publications, FIREDOC (under Publications)

## References

[\*Fire and Emergency Law Casebook\*](#), (1996); Thomas D. Schneid, Delmar, Cengage

Lessons Learned Information Sharing:

<http://www.llis.dhs.gov/member/secure/index.cfm>

[\*Blacks Law Dictionary\*](#); Bryan Garner, West Group

[\*Legal Briefings for Fire Chiefs\*](#), Quinlan Publishing

[\*American Bar Association-Guide to Workplace Laws, Rights of Employees\*](#)

[\*Legal Aspects of the Fire Service\*](#); Lawrence Hogan, Amlex

## Assessment:

Students will be evaluated for mastery of learning objectives by methods of evaluation to be determined by the instructor.

## Points of Contact:

Buddy Hyde, Southside Virginia Community College, VA;

(434) 949-1084; Email: [buddy.hyde@southside.edu](mailto:buddy.hyde@southside.edu)

Judith Kuleta, Bellevue Community College, WA;

(425) 564-2515; Email: [jkuleta@bellevuecollege.edu](mailto:jkuleta@bellevuecollege.edu)

## **Course Outline**

---

### ***Legal Aspects of the Emergency Services***

- I. The Legal System of the United States
  - A. Foundations
  - B. U.S. Constitution
  
- II. Civil vs. Criminal
  - A. Differences
  - B. Lawsuits
  - C. Punishments
  - D. Burden of Proof
  
- III. Tort Liability
  
- IV. Negligence
  
- V. Judicial System
  - A. The Court System
  - B. U.S. Supreme Court
  - C. Special Courts
  - D. Local Courts
  - E. Penalties
  
- VI. Federal Laws and the Fire Service
  - A. Fair Labor Standards Act
  - B. Americans with Disabilities Act
  - C. Age Discrimination
  - D. Civil Rights
  - E. Sexual Harassment
  
- VII. Employee Relations
  - A. Physical Testing - Entrance Requirements
  - B. Residency Requirements
  - C. Grooming Standards
  - D. Promotional Testing
  - E. Psychological Examinations
  - F. Polygraphs
  
- VIII. Fire Prevention and Fire Codes
  - A. Fourth Amendment
  - B. Certifications
  - C. Building Code vs. Fire Code
  - D. Civil vs. Criminal
  
- IX. Mutual Aid
  
- X. Hazardous Materials

XI. Volunteers/Contracts  
A. At-will Doctrine

XII. Arson

# ***Occupational Safety and Health for Emergency Services***

**Course Description:** This course introduces the basic concepts of occupational health and safety as it relates to emergency service organizations. Topics include risk and hazard evaluation and control procedures for emergency service organizations.

**Prerequisite:** None.

- Outcomes:**
1. Describe the history of occupational health and safety.
  2. Identify occupational health and safety programs for industry and emergency services today.
  3. Compare the difference between standards and regulations.
  4. List and describe the components of risk identification, risk evaluation, and incident management.
  5. Describe the relevance for safety in the work place including the importance of PPE.
  6. Apply the knowledge of an effective safety plan to pre-incident planning, response, and training activities.
  7. Explain the components of an accountability system in emergency service operations.
  8. Discuss the need for and the process used for post-incident analysis.
  9. Describe the components and value of critical incident management programs.
  10. Describe the responsibilities of individual responders, supervisors, safety officers, and incident commanders, safety program managers, safety committees and fire department managers as they relate to health and safety programs.
  11. Describe the components of a wellness/fitness plan.
  12. Identify and analyze the major causes involved in line-of-duty firefighter deaths related to health, wellness, fitness and vehicle operations.

**Available Text:** [Occupational Safety and Health in the Emergency Service](#), (2005); James S. Angle, Delmar, Cengage

**Supporting  
References/Research  
for Faculty and  
Students:**

**U.S. Fire Administration**

Publications:

<http://www.usfa.fema.gov/applications/publications>

See EMS, Fire Service Administration, Fire Service Operations, Hazardous Materials, Health and Safety, Rescue, Terrorism, Wildfire

Applied Research:

<http://www.usfa.fema.gov>

Research Reports:

<http://www.usfa.fema.gov/research>

Technical Reports:

<http://www.usfa.fema.gov/applications/publications/browse.cfm?mc=29>

Topical Fire Research Series:

<http://www.usfa.fema.gov>

Learning Resource Center:

<http://www.lrc.fema.gov>

**National Institute for Standards and Technology**

<http://www.fire.nist.gov>: Publications

**References**

[Emergency Incident Risk Management](#); Jonathan Kipp and Murry Loflin  
Van Nostrand Reinhold, 1996

[Emergency Rehab](#); Brady

[Fire Department Incident Safety Officer](#); D. W. Dodson, Delmar,  
Cengage

*Fire Department Safety Officer*; David W. Dodson, Thomson, 1998

[Firefighters from the Heart](#); Steve Chikerotis, Thomson Delmar, 2006

*Health and Safety Officer and Incident Safety Officer and Health and  
Safety Officer*; National Fire Academy

[The Fire and EMS Department Safety Officer](#); Gordon Sachs, Prentice  
Hall, 2001

[NFPA Standards 1500, 1521, 1561 and 1581](#)

Lessons Learned Information Sharing:

<https://www.llis.dhs.gov/member/secure/index.cfm>

**Assessment:**

Students will be evaluated for mastery of learning objectives by  
methods of evaluation to be determined by the instructor.

**Points of Contact:**

Ralph De La Ossa, Long Beach Community College, Long Beach, CA;  
(562) 938-4338; Email: [rdelaossa@lbcc.edu](mailto:rdelaossa@lbcc.edu)

Gary Fulton, PA State Fire Academy, Lewistown, PA;  
(717) 248-1115; Email: [gafulton@state.pa.us](mailto:gafulton@state.pa.us)

## **Course Outline**

---

### ***Occupational Safety and Health for the Fire Service***

- I. Introduction
  - A. History of Occupational Safety and Health in Industry
  - B. History of Occupational Safety and Health in Emergency Service Organizations
  - C. Identification of Safety Problems
  - D. Review of National Injury Statistics
  - E. National, State, and Private Organizations Involved with Occupational Safety and Health
  
- II. Safety-Related Regulations and Standards
  - A. Regulations vs. Standards
  - B. Federal Regulations Pertaining to Occupational Safety and Health
  - C. NFPA Standards Pertaining to Occupational Safety and Health
  
- III. Risk Management
  - A. Risk Evaluation
  - B. Risk Control
  
- IV. Safety Program Development and Management
  - A. Essential Elements
  - B. Setting Goals and Objectives
  - C. Cost Benefit Analysis
  - D. Training
  - E. Developing Standard Operating Procedures
  - F. Collecting Data
  - G. Publishing Health and Safety Information
  - H. Evaluating the Results
  
- V. Employee Fitness/Wellness Programs
  - A. Hazards Faced
  - B. Organizational Development
  - C. Employee Acceptance
  - D. Medical Examinations
  - E. Physical Fitness

- VI. Pre-incident Safety
  - A. Hazards Faced
  - B. Station Safety
  - C. Apparatus Safety
  - D. Response Safety
  - E. Pre-incident Planning
  
- VII. Safety at Fire Emergencies
  - A. Hazards Faced
  - B. Incident Priorities and Safety
  - C. Incident Management Systems
  - D. Accountability
  - E. Rapid Intervention
  - F. Rehabilitation
  
- VIII. Safety at EMS Emergencies
  - A. Hazards Faced
  - B. Infection Control
  - C. Personal Protective Equipment
  - D. Incident Management Systems
  - E. Scene Safety
  
- IX. Safety at Specialized Incidents
  - A. Hazards Faced
  - B. Safety at Hazards Materials Incidents
  - C. Safety at Technical Rescue Incidents
  - D. Safety at Terrorism Incidents
  - E. Safety at Natural Disasters
  
- X. Post-incident Safety Management
  - A. Incident Termination
  - B. Post-Incident Analysis
  - C. Critical Incident Stress Management
  
- XI. Personal roles
  - A. Individuals
  - B. Supervisors
  - C. Managers
  - D. Incident Commanders
  - E. Safety Officers
  - F. Safety Program Managers
  - G. Safety Committees

XII. Making It Happen

- A. Determining, Measuring, and Showcasing the Benefits
- B. Selling Management
- C. Selling Employees

IV. Negligence

V. Judicial System

- A. The Court System
- B. U.S. Supreme Court
- C. Special Courts
- D. Local Courts
- E. Penalties

# *Strategy and Tactics*

**Course Description:** This course provides the principles of fire ground control through utilization of personnel, equipment, and extinguishing agents.

**Prerequisite:** *Principles of Emergency Services*

- Outcomes:**
1. Discuss fire behavior as it relates to strategies and tactics.
  2. Explain the main components of pre-fire planning and identify steps needed for a pre-fire plan review.
  3. Identify the basics of building construction and how they interrelate to pre-fire planning and strategy and tactics.
  4. Describe the steps taken during size-up.
  5. Examine the significance of fire ground communications.
  6. Identify the roles of the National Incident Management System (NIMS) and Incident Management System (ICS) as it relates to strategy and tactics.
  7. Demonstrate the various roles and responsibilities in ICS/NIMS.

**Available Texts:** [\*Strategic and Tactical Considerations on the Fireground\*](#); James Smith, Brady, 2008

[\*Firefighting Strategies and Tactics\*](#); Angle, Harlow, Gala, Lombardo & Macluba, Delmar, Cengage, 2008

[\*Fireground Strategies, 2<sup>nd</sup> Ed\*](#); Anthony Avillo, PennWell Books, 2008

**Supporting  
References/Research  
for Faculty and  
Students:**

## **U.S. Fire Administration**

### Publications:

[http://www.usfa.fema.gov/applications/publications/pubs\\_main.cfm](http://www.usfa.fema.gov/applications/publications/pubs_main.cfm)

See Fire Protection, Fire Service Administration, Fire Service Operations, Hazardous Materials, Health and Safety, Rescue, Terrorism, Training, Wildfire

### Applied Research:

<http://www.usfa.fema.gov>

### Research Reports:

<http://www.usfa.fema.gov/research>

### Technical Reports:

<http://www.usfa.fema.gov/applications/publications/browse.cfm?mc=29>

Topical Fire Research Series:

<http://www.usfa.fema.gov>

Learning Resource Center:

<http://www.lrc.fema.gov>

**National Institute for Standards and Technology**

<http://www.fire.nist.gov>: Publications

<http://fire.nist.gov/bfrlpubs/fire02/PDF/f02012.pdf>

<http://fire.nist.gov/6510/6510c.pdf>

Lessons Learned Information Sharing:

<http://www.llis.dhs.gov/member/secure/index.cfm>

### **References**

[\*Building Construction Methods and Materials for the Fire Service\*](#); Michael Smith, Pearson Education

[\*Strategic and Tactical Considerations on the Fireground Study Guide\*](#); James Smith, Trafford Press

[\*Command and Control of Fires and Emergencies \(and Study Guide\)\*](#); Vincent Dunn, Pennwell, 1999

[\*Fire Command: The Essentials of Local IMS\*](#); NFPA, 2002

[\*Fire Officers Handbook of Tactics\*](#); John Norman, Pennwell, 1998

[\*Incident Management for the Street-Smart Fire Officer\*](#); John "Skip" Coleman, Pennwell, 1997

[\*Fire Department Incident Safety Officer\*](#); David Dodson, Delmar, Cengage

[\*Managing Major Fires\*](#); John "Skip" Coleman, Pennwell, 2001

[\*Protecting Life and Property from Wildfire\*](#); James C. Smalley, NFPA, 2005

[\*Structural Firefighting\*](#); Bernard Klaene, NFPA, 2002

Current Events/News

<http://www.firehouse.com>

<http://www.fireengineering.com>

<http://www.withthecommand.com>

### **Assessment:**

Students will be evaluated for mastery of learning objectives by methods of evaluation to be determined by the instructor.

### **Points of Contact:**

Terry Koeper, Crafton Hills College, California  
(909) 389-3261, [tkoeper@craftonhills.edu](mailto:tkoeper@craftonhills.edu)

B. Val Williams, Palm Beach Community College, Florida  
561-868-3772; Email: [williabv@pbcc.edu](mailto:williabv@pbcc.edu)

# Course Outline

---

## ***Strategy and Tactics***

- I. Fire Chemistry Terms and Concepts
  - A. Heat Transfer
  - B. Principle Fire Characteristics of Materials
  - C. Fire Classifications
  
- II. Extinguishing Equipment
  - A. Extinguishing Equipment
  - B. Fire Apparatus
  - C. Personnel Requirement
  
- III. Visual Perception
  - A. Pre-planning
  - B. Size-up
  
- IV. Pre-Fire Planning
  - A. Concept
  - B. Phases
  - C. Methods
  - D. Format
  - E. Occupancy Classifications
  - F. Building Types
  
- V. Basic Divisions of Tactics
  - A. Size-up
    - 1. Facts
    - 2. Probabilities
    - 3. Own Situation
    - 4. Decision
    - 5. Plan of Operation
  
- VI. Rescue
  - A. Life Safety Problems of Fire
  - B. Determination of Life Hazard
  - C. Rescue Resources and Operations
  
- VII. Exposures
  - A. Principle Contributing Factors
  - B. Exposure Protection Operations

VIII. Confinement

- A. Fire Separations
- B. Fire Loading
- C. Built-in Protection
- D. Operations

IX. Ventilation

- A. Relationship to Objectives
- B. Equipment
- C. Roof Types
- D. Methods

X. Salvage

- A. Relationship to Objectives
- B. Equipment
- C. Operations During Fire
- D. Operations After Fire