



Basic Fire Investigation

Course Plan

Course Details

- Certification:** Fire Investigator
- CTS Guide:** Fire Investigator (February 2017)
- Description:** This course provides information on securing the fire scene and determining the origin and cause of the fire. Topics include responsibilities of a fire investigator, securing the fire ground, conducting an exterior and interior survey, analyzing fire patterns, interpreting individual fire patterns, discriminating the effects of explosions, examining and removing fire debris, reconstructing the area of origin, inspecting the performance of building systems. The 2014 edition of *NFPA 1033 Standard Professional Qualifications for Fire Investigator* is the basis for this course.
- Designed For:** Fire investigators and law enforcement officers responsible for conducting fire investigations
- Corequisite:** Fire Behavior and Combustion (CA Community College core curriculum), Fire Control 1 (1996), or equivalent fire academy training.
Basic Electricity (CFITrainer.net)
Ethics and the Fire Investigator (CFITrainer.net)
- Standard:** Complete all activities
Complete the summative test with a minimum score of 80%
- Hours:** Lecture: 27:30
Activity: 10:00
Testing: 2:00
- Hours (Total):** 39:30
- Maximum Class Size:** 40
- Instructor Level:** This course requires one (1) primary instructor and sufficient assistant instructors to meet the activity ratio
- Instructor/Student Ratio:** Lecture: 1:40 Activity: 1:10

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Restrictions: Air Quality Management District permit (if required)
Burn cubicles sufficient to accommodate the 1:10 instructor/student ratio
Staffed fire suppression equipment

SFT Designation: CFSTES

Required Resources

Instructor Resources

To teach this course, instructors need:

- *Fire Investigator Principles and Practice*, 4th Edition (2016), Jones and Bartlett
or
Fire Investigator, 2nd Edition, IFSTA
- *NFPA 921: Guide for Fire & Explosion Investigations*, Current Edition
- Fire scene scenarios
- Marking devices
- Tools and equipment used by a fire investigator
- Evidence collection materials
- A device capable of taking photographs (i.e., camera, tablet, cell phone)
- Graph paper and note pad
- Personal protective equipment

The following instructor resources are available online at

- Fire Investigation 1A required activities
<https://osfm.fire.ca.gov/divisions/state-fire-training/cfstes-professional-certification/fire-investigator-2017/>

Student Resources

To participate in this course, students need:

- *Fire Investigator Principles and Practice*, 4th Edition (2016), Jones and Bartlett
or
Fire Investigator, 2nd Edition, IFSTA
- *NFPA 921: Guide for Fire & Explosion Investigations*, Current Edition
- Basic Electricity (CFITrainer.net)
- Ethics and the Fire Investigator (CFITrainer.net)
- A device capable of taking photographs (i.e., camera, tablet, cell phone)
- An electronic device for developing and delivering a presentation
- Personal protective equipment

Facilities, Equipment, and Personnel

The following facilities, equipment, or personnel are required to deliver this course:

- Standard learning environment or facility
- Writing board or paper conference pads
- Markers, erasers
- Computer or tablet with presentation or other viewing software
- Amplification devices
- Projector and screen
- Marking devices, tools, and equipment used by a fire investigator
- Air Quality Management District permit (if required)
- Burn cubicles sufficient to accommodate the 1:10 instructor/student ratio
- Staffed fire suppression equipment
- Qualified assistant instructors

Unit 1: Introduction

Topic 1-1: Orientation and Administration

Terminal Learning Objective

At the end of this topic, a student will be able to identify facility and classroom requirements and identify course objectives, events, requirements, assignments, activities, resources, evaluation methods, and participation requirements in the course syllabus.

Enabling Learning Objectives

1. Identify facility requirements
 - Restroom locations
 - Food locations
 - Smoking locations
 - Emergency procedures
2. Identify classroom requirements
 - Start and end times
 - Breaks
 - Electronic device policies
 - Special needs and accommodations
 - Other requirements as applicable
3. Review course syllabus
 - Course objectives
 - Calendar of events
 - Course requirements
 - Student evaluation process
 - Assignments
 - Basic Electricity (CFITrainer.net) must be completed on-line as homework before the end of this class
 - 4 hours
 - Course completion certificate or transcript required
 - Ethics and the Fire Investigator (CFITrainer.net) must be completed on-line as homework before the end of this class
 - 3 hours
 - Course completion certificate or transcript required
 - Activities
 - Required student resources
 - Class participation requirements

Discussion Questions

1. What are the course requirements?
2. How will you be evaluated?

Activities

1. To be determined by the instructor.

Topic 1-2: Fire Investigator Certification Process

Terminal Learning Objective

At the end of this topic, a student will be able to identify the courses and requirements for Fire Investigator certification and be able to describe the certification task book and testing process.

Enabling Learning Objectives

1. Identify the courses required for Fire Investigator certification
 - Fire Investigation 1A: Basic Fire Investigation
 - Fire Investigation 1B: Evidence and Documentation
 - Fire Investigation 1C: Preparation for Legal Proceedings
 - POST certified Interview and Interrogation #31445 (40 hours)
 - NWCG FI-210 Wildland Fire Origin and Cause Determination (38 hours)
2. Identify any other requirements for Fire Investigator certification
 - Experience [one (1) of the following two (2) options]
 - Have a minimum of two (2) year full-time, paid experience in a California fire department with the primary responsibility as a fire investigator
 - Or
 - Have a minimum of four (4) years volunteer or part-time, paid experience in a California fire department with the primary responsibility as a fire investigator
 - Investigate 20 fires, 10 must be structure fires, as the primary investigator and develop complete fire investigation reports
 - Be appointed to the rank or position of Fire Investigator
 - Performing in an acting capacity does not qualify
3. Describe the certification task book process
 - Complete all prerequisites and course work
 - Submit application and fees to request certification task book
 - Complete all job performance requirements included in the task book
 - Must have identified evaluator verify individual task completion via signature
 - Must have Fire Chief or authorized representative verify task book completion via signature
 - Must be employed by a California fire agency in the position prior to submitting completed task book to State Fire Training
4. Describe the certification testing process
 - Complete course work
 - Schedule online certification test
 - Schedule skills evaluation test

Discussion Questions

1. How many courses are there in the Fire Investigator certification track? What are they?
2. What is the minimum experience required for a full-time, paid fire investigator?

Activities

1. To be determined by the instructor.

Topic 1-3: Responsibilities of a Fire Investigator

Terminal Learning Objective

At the end of this topic, a student will be able to employ all aspects of the scientific method as the operating analytical process throughout the investigation.

Enabling Learning Objectives

1. Describe the scientific method in relation to origin and cause
 - Recognize the need
 - Define the problem
 - Collect the data
 - Analyze the data
 - Develop hypothesis
 - Inductive reasoning
 - Test hypothesis
 - Deductive reasoning
 - Select your final hypothesis
2. Discuss the interrelationship of the investigation within the organizational incident management system

Discussion Questions

1. What are the consequences of not using the scientific method?
2. In what different ways can you test your hypothesis?
3. What impact does your fire investigation have on the incident management system?

Activities

1. To be determined by the instructor.

Unit 2: Securing the Scene and Conducting a Scene Survey

Topic 2-1: Securing the Fire Ground

Terminal Learning Objective

At the end of this topic, a student, given a fire scene, marking devices, tools, equipment, and sufficient personnel will be able to secure the fire ground to protect all evidence or potential evidence from damage or destruction and ensure unauthorized persons recognize the perimeters of the investigative scene and are kept from the restricted areas.

Enabling Learning Objectives

1. Identify fire ground hazards, including explosives and secondary devices
 - Exterior
 - Interior
2. Identify the types of evidence
3. Discuss marking devices and equipment used for securing the scene
 - Establishing perimeters
4. Describe the importance of fire scene security, evidence preservation, and issues relating to spoliation

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5. Use marking devices, tools, and equipment

Discussion Questions

1. What is the most unusual hazard you've come across at a fire scene?
2. How do you determine your perimeter at a fire or explosion?
3. What steps do you take when you find an unauthorized person within your perimeter?
4. What are some common ways to secure a fire scene?
5. Who destroys the most evidence on a fire?

Activities

1. To be determined by the instructor.

CTS Guide Reference: CTS 1-1

Topic 2-2: Conducting an Exterior Survey

Terminal Learning Objective

At the end of this topic, a student, given a fire scene, tools, and equipment, will be able to conduct an exterior survey to identify and preserve evidence, interpret fire damage, identify hazards to avoid injuries, determine accessibility to the property, and discover all potential means of ingress and egress.

Enabling Learning Objectives

1. Describe the types of building construction
2. Recognize the effects of fire on construction materials
3. Identify potential exterior ignition sources
4. Recognize the types of evidence commonly found in the perimeter
5. Discuss potential surveillance sources
 - ATMs
 - Surveillance cameras
 - Bystander videos
 - Dash cameras
 - Social media
 - Cell towers
6. Describe evidence preservation methods
7. Describe the effects of fire suppression
8. Describe fire behavior and spread
9. Recognize fire patterns
10. Recognize the dangers of hazardous materials
11. Identify weather conditions at the time of the fire
12. Assess fire ground and structural condition
13. Observe the damage from and effects of the fire
14. Interpret fire patterns

Discussion Questions

1. How do additions to a structure affect fire spread?
2. What should you look for during an exterior survey?
3. How could weather affect your exterior burn patterns?
4. How would you recover surveillance evidence?

Activities

1. Divide students into small groups. Have each group conduct an exterior survey of a building that includes photographs of possible ignition sources. Have each group select a spokesperson to present their group's findings.
2. Required Final Activity: Conducting an Origin and Cause Fire Investigation

Instructor Note

1. In this section, cover exterior scene examinations of different building types including single-family homes, multi-family dwellings, strip centers, commercial structures, and high-rise.

CTS Guide Reference: CTS 1-2

Topic 2-3: Conducting an Interior Survey

Terminal Learning Objective

At the end of this topic, a student, given a fire scene, tools, and equipment, will be able to conduct an interior survey to identify and preserve areas of potential evidentiary value requiring further examination, determine the evidentiary value of contents, and identify hazards to avoid injuries.

Enabling Learning Objectives

1. Describe the types of interior finishes
2. Recognize the effects of fire on interior finishes
3. Identify potential interior ignition sources
4. Recognize the effects of fire suppression
5. Describe fire behavior and spread
6. Recognize the effects of building contents on fire growth
7. Describe the relationship of building contents to the overall investigation
8. Assess structural conditions
9. Observe the damage and effects of the fire
10. Determine the impact of fire suppression efforts on fire flow and heat propagation
11. Evaluate protected areas to determine the presence and/or absence of contents

Discussion Questions

1. In what ways does fire suppression affect an interior scene?
2. Why is it important to be familiar with the types of furnishings inside the structure?
3. What is the significance of the lack of building contents?
4. Why is the position of the contents prior to the fire important to know?
5. Why is it important to understand the condition of windows and doors at the time of the fire?
6. Whom would you talk to about suppression operations?
7. What are some questions you should ask suppression personnel?

Activities

1. Display a variety of pictures and ask students to:
 - Identify the types of interior finishes and describe the effects of fire
 - Identify potential interior ignition sources
 - Describe fire behavior and spread

- Discuss the effects of building contents on fire growth
- Describe the relationship of building contents to the overall investigation
- Evaluate protected areas to determine the presence and/or absence of contents

2. Required Final Activity: Conducting an Origin and Cause Fire Investigation

CTS Guide Reference: CTS 1-3

Unit 3: Origin and Cause

Topic 3-1: Analyzing Fire Patterns

Terminal Learning Objective

At the end of this topic, a student, given a fire scene, tools, and equipment, will be able to analyze fire patterns to determine fire development, evaluate methods and effects of suppression, recognize false origin area patterns, and identify all areas of origin.

Enabling Learning Objectives

1. Recognize fire behavior and spread based on fire chemistry, fire dynamics, and fire physics
2. Identify the effects fire suppression has on fire patterns
 - Fire streams
 - Ventilation
3. Describe the effects building construction has on fire patterns
 - Design
 - Construction, including construction materials
 - Structural elements
 - Ventilation openings
4. Analyze variations of fire patterns on different materials with consideration given to heat release rate, form, and ignitibility
5. Distinguish the impact of different types of fuel loads
 - Fuel packages
 - Property of flames
6. Evaluate fire spread based on fuel load
7. Analyze information

Discussion Questions

1. How can fire suppression effect fire patterns?
2. By what means do newer furnishings affect fire spread?
3. In what way can interior burn patterns differ from exterior burn patterns?
4. How do windows and doors affect fire spread?
5. Why should you consider all fire patterns?
6. What is the difference between fire effect and fire pattern?

Activities

1. Required Final Activity: Conducting an Origin and Cause Fire Investigation

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Instructor Note

1. ELO #1 should include a basic review of the prerequisite course, Fire Behavior, and Combustion.

CTS Guide Reference: CTS 1-5

Topic 3-2: Interpreting Individual Fire Patterns

Terminal Learning Objective

At the end of this topic, a student, given a fire scene, tools, and equipment, will be able to interpret individual fire patterns and the burning characteristics of the material involved in relationship with all patterns observed and the mechanisms of heat transfer that led to the formation of the pattern.

Enabling Learning Objectives

1. Describe fire dynamics
2. Discuss fire development
3. Describe the relationship of heat release rate, form, and ignitability of materials
4. Interpret the effects of burning characteristics on different types of materials

Discussion Questions

1. What are some common misconceptions when interpreting fire effects? (i.e., glass breaking, spalling, annealed springs, pour patterns, floors burned through)
2. What are the two most common methods of heat transfer?
3. How does the post flashover environment affect fire patterns?
4. In what ways does the orientation of a fuel package affect fire dynamics and ignitability of the material?

Activities

1. Required Activity 3-2-1: Interpreting Fire Dynamics

CTS Guide Reference: CTS 1-4

Topic 3-3: Discriminating the Effects of Explosions

Terminal Learning Objective

At the end of this topic, a student, given tools and equipment, will be able to discriminate the effects of explosions from other types of damage to identify an explosion and preserve its evidence.

Enabling Learning Objectives

1. Describe the different types of explosions and their causes
2. Describe the characteristics of an explosion
3. Explain the difference between low- and high-order explosions
4. Identify explosive effects on glass, walls, foundations, and other building materials
5. Distinguish between low- and high-order explosion effects
6. Analyze damage to document the blast zone and origin

Discussion Questions

1. What is the difference between a positive and negative pressure blast?
2. At a fire scene, what can cause an explosion?

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3. How far out would your perimeter be at an explosion scene?
4. How might an explosion scene differ from a fire scene?

Activities

1. To be determined by the instructor.

Instructor Note

1. For assistance with this topic, reference Explosion Dynamics (CFITrainer.net)

CTS Guide Reference: CTS 1-9

Topic 3-4: Examining and Removing Fire Debris

Terminal Learning Objective

At the end of this topic, a student, given a fire scene, tools, and equipment, will be able to examine and remove fire debris to check for fire cause evidence, identify potential ignition source(s), and preserve evidence without investigator-inflicted damage or contamination.

Enabling Learning Objectives

1. Recognize ignition processes
2. Describe the characteristics of ignition sources
3. Describe the ignitability of various fuels
4. Discuss the use of tools and equipment during the debris search
 - Common
 - Specialized
5. Describe layering techniques for debris removal
 - Gridding
6. Identify the types of fire-cause evidence found in debris
7. Describe evidence-gathering methods and documentation
8. Employ search techniques that further the discovery of fire cause evidence and ignition sources
9. Use search techniques that incorporate documentation
10. Collect and preserve evidence

Discussion Questions

1. What types of ignition sources should you look for when removing fire debris?
2. What are the characteristics of an ignition source?
3. Where is the best place for fire debris during overhaul?
4. What is the purpose of removing debris in layers?
5. At what point should you terminate the overhaul?

Activities

1. Required Final Activity: Conducting an Origin and Cause Fire Investigation

CTS Guide Reference: CTS 1-6

Topic 3-5: Reconstructing the Area of Origin

Terminal Learning Objective

At the end of this topic, a student, given a fire scene, tools, equipment, and sufficient personnel, will be able to reconstruct the area of origin to identify and correlate all

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protected areas and fire patterns related to contents or structural remains, return items potentially critical to cause determination and photo documentation to their prefire location, and discover the area(s) or point(s) of origin.

Enabling Learning Objectives

1. Describe the effects of fire on different types of material
2. Describe the process of reconstruction
3. Describe the importance and uses of reconstruction
4. Examine all materials to determine the effects of fire
5. Identify and distinguish among different types of fire-damaged contents
6. Return materials to their original position using protected areas and fire patterns

Discussion Questions

1. What are the different techniques for reconstructing a fire scene?
2. How might you determine the location of the contents?
3. In the area of origin, what might you find?
4. How would you document the area of origin?

Activities

1. Required Final Activity: Conducting an Origin and Cause Fire Investigation

CTS Guide Reference: CTS 1-7

Topic 3-6: Inspecting the Performance of Building Systems

Terminal Learning Objective

At the end of this topic, a student, given building systems, tools, and equipment, will be able to inspect the performance of building systems, including detection, suppression, HVAC, utilities, and building compartmentation to determine the need for expert resources, consider an operating system's impact on fire growth and spread in identifying origin areas, identify defeated and/or failed systems, and recognize the system's potential as a fire cause.

Enabling Learning Objectives

1. Recognize different types of detection, suppression, HVAC, utility, and building compartmentation
 - Reporting features
2. Identify the types of expert resources for building systems
3. Describe the impact of fire on various systems
4. Describe common methods used to defeat a system's functional capability
5. Explain the types of building system failures
6. Determine the system's operation and its effect on the fire
7. Identify alterations to, and failure indicators of, building systems
8. Evaluate the impact of suppression efforts on building systems

Discussion Questions

1. What are some fire control devices?
2. How can you tell if a building system was functioning properly at the time of the event?
3. Was the design of the existing building system proper for the current fire load? If not, why?
4. How could the fire suppression system affect the fire?

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5. In what ways could the HVAC affect the fire patterns?

Activities

1. To be determined by the instructor.

CTS Guide Reference: CTS 1-8

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Time Table

Segment	Lecture Time	Activity/Skills Time	Total Unit Time
Unit 1: Introduction			
Topic 1-1: Orientation and Administration			
Lecture	0:30		
To be determined by the instructor			
Topic 1-2: Fire Investigator Certification Process			
Lecture	0:30		
To be determined by the instructor			
Topic 1-3: Responsibilities of a Fire Investigator			
Lecture	2:00		
To be determined by the instructor			
Unit 1 Totals	3:00		3:00
Unit 2: Securing the Scene and Conducting a Scene Survey			
Topic 2-1: Securing the Fire Ground			
Lecture	0:30		
To be determined by the instructor			
Topic 2-2: Conducting an Exterior Survey			
Lecture	4:00		
Recommended by State Fire Training		*	
Topic 2-3: Conducting an Interior Survey			
Lecture	4:00		
Recommended by State Fire Training		*	
Unit 2 Totals	8:30	2:00	10:30
Unit 3: Area of Origin			
Topic 3-1: Analyzing Fire Patterns			
Lecture	5:00		
To be determined by the instructor			
Topic 3-2: Interpreting Individual Fire Patterns			
Lecture	3:00		
Activity 3-2-1: Interpreting Fire Dynamics		*	
Topic 3-3: Discriminating the Effects of Explosions			
Lecture	2:00		
To be determined by the instructor			

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Segment	Lecture Time	Activity/Skills Time	Total Unit Time
Topic 3-4: Examining and Removing Fire Debris			
Lecture	2:00		
To be determined by the instructor			
Topic 3-5: Reconstructing the Area of Origin			
Lecture	2:00		
To be determined by the instructor			
Topic 3-6: Inspecting the Performance of Building Systems			
Lecture	2:00		
To be determined by the instructor			
Required Final Activity: Conducting an Origin and Cause Fire Investigation		*	
Unit 3 Totals	16:00	8:00	24:00
Lecture, Activity, and Unit Totals:	27:30	10:00	37:30

Course Totals

Segment Type	Time
Total Lecture Time (LT)	27:30
Total Activity Time (AT)	*10:00
Total Testing Time (TT)	2:00
Total Course Time	39:30

*Note: Activity time will vary depending on the number of students in the program. It is important to remember that the suggested skill hours are for 40 students.