National Fire Academy

R0776 – Fire Investigation: Electrical Systems
Version: 2nd Edition, 2nd Printing, July 2020

Length of Course: 6 Days (45 hr., 30 min., contact hours, Sunday – Friday)
Prerequisite: Yes
Curriculum: Fire Investigation
Training Specialist: Lester Rich
Instructor Email: lester.rich@fema.dhs.gov
Meeting Time: 8 AM – 5 PM

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Course Description (Catalog)

This six-day specialized course addresses the critical skills essential to the effective investigation and evaluation of fires involving potential electrical fire causes. This course uses current techniques, practices, protocols, and standards to assist investigators in the evaluation of electrical systems and associated components. Students will be provided with a basic knowledge of electricity, electrical circuits and distribution systems, and common electrical faults and failures. Students will develop a working knowledge of the National Electrical Code® (NEC) and how it applies to fire investigations.

Students will learn to apply arc fault survey analysis theory and arc mapping that will effectively assist in fire origin determination. Students will demonstrate a general knowledge of electricity by building electrical circuits and systems through a series of instructor-led, hands-on practical activities.

Student Qualifications

The target audience for "Fire Investigation: Electrical Systems" (FI: ES) is aspiring or current fire investigators. Priority is given to full-time personnel with current fire investigation and/or code enforcement responsibility.

Students should have successfully completed the following prior to taking this course:

- The National Fire Academy's (NFA's) R0206 or R0772 "Fire Investigation: Essentials" (FI: E) or a basic fire investigation course from an approved state.
- Certified Fire Investigator (CFI) Trainer (www.cfitrainer.com) modules:
  - Basic Electricity.
  - Electrical Safety.
  - Arc Mapping Basics.

Course Scope (Goal)

Students will demonstrate current techniques, practices, protocols and standards that assist investigators in the evaluation of electrical systems and associated components.

Outdoor activities will require students to have work clothes and boots, participate in a series of practical activities that involve working with tools and electrical test equipment, and be capable of processing a fire scene (bending, kneeling, and lifting up to 50 pounds).

R0776 expands upon concepts presented in R0772, FI: E.

Course Objectives (Course Learning Outcomes – TLOs)

After successfully completing this course, you will be able to accomplish the following:

- Apply and demonstrate electrical theory to include current, voltage, and power.
- Use Ohm's and Joule's laws to calculate unknown values.
- Distinguish among the theories and physics of electrical systems to determine their relevance in a fire investigation.
- Apply the fundamentals of electric utility system operations, including generation, transmission, distribution, and typical electrical service supplies to buildings and facilities.
- Analyze the components of fuses and breakers to determine if the source of heat for ignition was the result of tampering or a failure.
- Analyze the failure modes and limitations of over-current protection device (OCPD) types, styles, and brands.
- Demonstrate knowledge of branch circuit components and installation methods.
- Evaluate safety methods, equipment, and techniques used to evaluate electrical systems.
- Evaluate the source, path, and load components to determine their potential involvement in a fire investigation.

- Discern and evaluate electrical faults, failures, and associated high-resistance connection (HRC) characteristics.
- Using knowledge of source, path and load, build a service entrance and connect the appropriate circuits.
- Apply arc mapping to the reconstruction of a fire scene to determine the area of origin.
- Evaluate artifacts to determine if an appliance failed, if it caused a fire, or if the appliance was damaged as a result of the fire.

Course Delivery Method

The NFA offers specialized training courses and advanced management programs of national impact in an academic classroom environment on campus at the National Emergency Training Center (NETC) in Emmitsburg, Maryland. This is a six-day, on-campus, instructor-led delivery. Students will be provided course materials to review prior to the start of each offering. Students will be expected to bring their laptop or tablet capable of Wi-Fi access in order to participate in class. Additionally, students will take exams on the devices and can potentially receive communications via the web-based D2L learning system.

This course requires participation in a series of practical activities that involve tools and electrical test equipment conducted at the Fire Science Training Complex outdoor classrooms. Work clothing and clothing appropriate for inclement weather is required.

Course Schedule

The purpose of the course schedule is to give you, at a glance, the required preparation, activities, and evaluation components of your course.

DAY 1	DAY 2	DAY 3
Introduction, Welcome and Administrative Overview Activity I-1: Electrical Questions	Unit 5: Circuit Protection Methods and Devices	Unit 10: High-Resistance Connections
Break	*Break*	*Break*
Unit 1: Basic Electricity	Unit 6: Circuit Breaker Issues	Unit 10: High-Resistance Connections (cont'd)
Break	*Break*	*Break*
Unit 2: Ohm's Law and Joule's Law Activity 2.1: Ohm's Law and Joule's Law Calculations Activity 2.2: Hypothesis Testing	Unit 7: Typical Circuit Components	Unit 10: High Resistance Connections (cont'd) Case Study Unit 11: Building an Electrical Service Activity 11.1: Preparing Basic Electrical Drawings Activity 11.2: Service Entrance Build-Out
Lunch	*Lunch*	*Lunch*
Unit 3: Electrical Power Delivery	Unit 8: Scene Safety Activity 8.1: Identify Test Points	Unit 11: Building an Electrical Service (cont'd) Activity 11.2: Service Entrance Build-Out (cont'd)
Break	*Break*	*Break*
Unit 3: Electrical Power Delivery (cont'd)	Unit 9: Evaluate the Components Activity 9.1: Identifying Poor Electrical Workmanship	Activity 11.2: Service Entrance Build-Out (cont'd)
Break	*Break*	*Break*
Unit 4: Electrical Service Equipment	Activity 9.2: Black Box Experiment	Activity 11.2: Service Entrance Build-Out (cont'd)

DAY 4	DAY 5	DAY 6
Activity 11.3: Circuit Build-Out*	Unit 12: Arc Mapping	Unit 13: Appliance Failures
Break	*Break*	*Break*
Activity 11.3: Circuit Build-Out (cont'd)	Unit 12: Arc Mapping (cont'd)	Unit 13: Appliance Failures (cont'd)
Break	*Break*	*Break*
Activity 11.3: Circuit Build-Out (cont'd)	Unit 12: Arc Mapping (cont'd) In-Class Activity: Identification Quiz	Activity 13.1: Appliance Modification
Lunch	*Lunch*	*Lunch*
Activity 11.3: Circuit Build-Out (cont'd)	Activity 12.1: Ohm's Wall Activity 12.2: Artifact Identification	Lab Activity Demonstrations
Break	*Break*	*Break*
Activity 11.3: Circuit Build-Out (cont'd)	Activity 12.1: Ohm's Wall (cont'd) Activity 12.2: Artifact Identification (cont'd)	Final Exam
Break	*Break*	*Break*
Activity 11.3: Circuit Build-Out (cont'd)	Activity 12.1: Ohm's Wall (cont'd) Activity 12.2: Artifact Identification (cont'd) Participate in Lab Activity Demonstrations	Graduation

*Activity length is subject to the number of instructors and the skillset of the students; therefore, flexibility has been built into the schedule and is at the discretion of the instructor.

Grading Methodology (Evaluation Procedures)

A minimum total score of 80 is required for successful completion of this course. The total course score is derived from the graded activities and final exam. The weighting of evaluation methods below will be electronically calculated within D2L.

Evaluation Method	Percent of Final Grade
Service Entrance Build-Out Activity	30%
Circuit Build-Out Activity	50%
Final Exam	20%

Exams

Exams contain one question per enabling objective. A test bank of 4 exam questions for each enabling objective will randomly distribute test questions for each student to ensure integrity. Numerical score is based on number of correct responses.

Final Numerical Score	Letter Grade
33-36	A
29-32	B
26-28	C
22-25	D
21 or below	F

Assignments/Activities

Final Numerical Score	Letter Grade
8	A
7	B
6	C
5 or below	F

Assignments are a combination of individual and group activities. The purpose of these activities is for students to demonstrate their overall understanding of the course content. Students will apply key concepts of basic electrical principles. The instructors will read, comment and provide feedback on students' work throughout the course.

While all activities and assignments are not graded, each activity and assignment will be reviewed by the instructor to ensure students have mastered the course objectives.

Students who do not complete the entire course will be awarded an Incomplete (I) grade. In accordance with NFA academic policies, an Incomplete (I) grade must be removed by the end of the next semester following the course, or it automatically becomes a Failing (F) grade.

If a student fails an on-campus course, the student will not be issued a stipend for that course. Students can then reapply for the failed course or any other NFA course and go through the

random selection process. Students do not have to successfully complete the failed course before attending another NFA course.

Grading Rubrics

GRADING RUBRIC: SERVICE ENTRANCE BUILD-OUT

Name	
Panel #	

Content Area	Unsatisfactory 0	Satisfactory 1	Good 2	Area Score
Workmanship	Unable to estimate wire lengths resulting in excessive wiring. Unable to recognize or explain the potential effects of poor workmanship (i.e., poor wire connections, incorrect installations, and fire hazards).	Neat wiring: • Only one conductor under a screw. • Conductor is not nicked and does not have strands removed to reduce size. All insulation is removed from conductors under or connected to a terminal.	Meets all satisfactory criteria **and** is able to identify, recognize, and discuss the effects of potential poor workmanship prior to energizing the circuit.	
Functionality	Unable to make functional connections **or** unable to explain the electrical path within the service entrance: • Weather head. • Service drop wires. • Meter socket. • Ground wire. • Breaker panel/bus bars.	Makes functional connections and can explain the electrical path within the service entrance. Able to point out: • Weather head. • Service drop wires. • Meter socket. • Ground wire. • Breaker panel/ bus bars.	Able to explain the path of electricity from the distribution center to point of use and discuss potential interruptions and faults at each point of the service entrance: • Weather head. • Service drop wires. • Meter socket. • Ground wire. • Breaker panel/ bus bars.	

Content Area	Unsatisfactory 0	Satisfactory 1	Good 2	Area Score
Task	Unable to complete **any** of the following: • Install conductor to the weather head. • Connect that conductor from the weather head to the meter base. • Install a conductor from the meter base to the breaker panel. • Connect each end of that conductor. • Connect the grounding electrode conductor to the electrical panel. • Properly terminate connections.	Able to complete **all** of the following: • Install conductor to the weather head. • Connect that conductor from the weather head to the meter base. • Install a conductor from the meter base to the breaker panel. • Connect each end of that conductor. • Connect the grounding electrode conductor to the electrical panel. • Properly terminate connections.	Able to complete all of the satisfactory items **and** discuss the equipment involved in a typical electrical service entrance, locate and explain the function of service entrance connections, identify potential faults and failures, and provide solutions to prevent or remedy those potential failures.	
Safety	Unable to locate energized conductors. Unable to use safety equipment or locate incoming conductors without instructor assistance.	Properly identifies energized conductors. Properly uses safety equipment to test for voltage.	Correctly estimates wire lengths to properly terminate connections. Identifies the appropriate meter category (safety rating).	

TOTAL SCORE: _____

GRADING RUBRIC: CIRCUIT BUILD-OUT ACTIVITY

Name	
Panel #	

Content Area	Unsatisfactory 0	Satisfactory 1	Good 2	Score Activity
Workmanship	Unable to recognize or explain the potential effects of poor workmanship (i.e., poor wire connections, incorrect installations, and fire hazards).	Able to explain the effects of poor workmanship and offer solutions or correct such findings (i.e., incorrect use of conductors, neutral and phase conductors both white, multiple wires on a receptacle, improper grounding etc.).	Meets all satisfactory criteria **and** is able to identify and recognize potential poor workmanship before energizing the circuit.	
Functionality	Circuit does not operate correctly; unable to resolve issues without instructor assistance.	All circuits operate for jobs 1–7 on the first attempt; able to identify and resolve the problem without instructor assistance.	Meets all satisfactory criteria **and** is able to explain what makes a circuit work (functionality of a three- and four-way switch).	
Task	Given a specific wiring job, is unable to identify which cables and conductors are energized.	Able to identify which cables and conductors are energized given a specific switch or circuit configuration. Uses the appropriate color for each wire.	Meets all satisfactory criteria **and** can explain the relevance of energized cables and conductors as related to arc mapping.	
Safety	• Puts themselves or others in danger. • Unable to identify critical test points of service entrance equipment. • Unable to use test equipment to verify the presence or absence of electricity.	Identifies all critical test points of service entrance equipment and correctly/safely uses testing equipment to verify the presence or absence of electricity.	Meets all satisfactory criteria **and** is able to verbally explain the consequences of using faulty or unlisted test equipment.	

TOTAL SCORE: _____

Required Reading Assignments

Student completion of reading assignments will be evidenced by their class participation and will not be a separately graded activity.

Course Overview

Unit 1: Basic Electricity

Terminal Objective	Evaluated by
Apply and demonstrate electrical theory to include current, voltage and power.	Final Exam

Enabling Objectives	Course Component	Evaluated by
Apply the National Fire Protection Association (NFPA) Scientific Method guidelines to a fire investigation.	Lecture/ Discussion In-Class Activity 2.2: Hypothesis Testing	Final Exam
Introduce and define electrical terminology.	Lecture/ Discussion	Final Exam
Demonstrate application of basic electrical concepts.	Lecture/ Discussion In-Class Demonstration: Hand-Held Crank Generator In-Class Demonstration: Current Clamp-On Meter In-Class Demonstration: Service Entrance Demonstration/ Mock Up In-Class Demonstration: Resistance Change Lab Activity Demonstration Activity 11.2: Service Entrance Build-Out In-Class Activity 11.1: Preparing Basic Electrical Drawings Lab Activity Demonstration Activity 11.3: Circuit Build-Out	Final Exam Lab Activity Demonstration Activity 11.2: Service Entrance Build-Out Lab Activity Demonstration Activity 11.3: Circuit Build-Out

Unit 2: Ohm's Law and Joule's Law

Terminal Objective	Evaluated by
Use Ohm's and Joule's laws to calculate unknown values.	Final Exam

Enabling Objectives	Course Component	Evaluated by
Define Ohm's and Joule's Laws.	Lecture/ Discussion	Final Exam
Calculate wattage, voltage, power, resistance, and amperage to determine missing values using the application of Ohm's and Joule's laws.	Lecture/ Discussion In-Class Activity 2.1: Ohm's Law and Joule's Law Calculations	Final Exam
Analyze the operation of simple electrical circuits using Ohm's and Joule's laws.	Lecture/ Discussion In-Class Activity 9.2: Black Box Experiment	Final Exam

Unit 3: Electrical Power Delivery

Terminal Objective	Evaluated by
Distinguish among the theories and physics of electrical systems to determine their relevance in a fire investigation.	Lab Activity Demonstration Activity 11.2: Service Entrance Build-Out

Enabling Objectives	Course Component	Evaluated by
Explain how electricity arrives at a structure and is delivered from the transformer to the load center.	Lecture/ Discussion	Final Exam
Illustrate transformer theory, including types of transformers, voltage/current relationship, and application.	Lecture/ Discussion	Final Exam
Differentiate between single-phase and three-phase power systems.	Lecture/ Discussion In-Class Demonstration: Fuse/Disconnect Assembly	Final Exam
Apply the concepts of open neutral and alternate flow paths.	Lecture/ Discussion	Final Exam

Unit 4: Electrical Service Equipment

Terminal Objective	Evaluated by
Apply the fundamentals of electric utility system operations, including generation, transmission, distribution, and typical electrical service supplies to buildings and facilities.	Lab Activity Demonstration Activity 11.2: Service Entrance Build-Out

Enabling Objectives	Course Component	Evaluated by
Describe the function and purpose of electrical service equipment.	Lecture/ Discussion	Final Exam
Identify and differentiate the types of installed electrical service equipment used and the potential failures within those systems.	Lecture/ Discussion	Final Exam

Unit 5: Circuit Protection Methods and Devices

Terminal Objective	Evaluated by
Analyze the components of fuses and breakers to determine if the source of heat for ignition was the result of tampering or a failure.	Final Exam

Enabling Objectives	Course Component	Evaluated by
Distinguish among the types, styles and function of an over-current protection device (OCPD).	Lecture/ Discussion In-Class Demonstration: GFCI Operation Principles	Final Exam
Interpret OCPD operation and principles, and associate them with a fire investigation.	Lecture/ Discussion Video: “Circuit Breaker Open in Slow Motion”	Final Exam

Unit 6: Circuit Breaker Issues

Terminal Objective	Evaluated by
Analyze the failure modes and limitations of over-current protection device (OCPD) types, styles and brands.	Final Exam

Enabling Objectives	Course Component	Evaluated by
Compare and contrast known deficiencies and potential failure modes of specific circuit breaker types.	Lecture/ Discussion	Final Exam
Differentiate between manufacturer styles, specifications and characteristics of circuit breakers.	Lecture/ Discussion In-Class: Large Group Discussion Using Images	Final Exam

Unit 7: Typical Circuit Components

Terminal Objective	Evaluated by
Demonstrate knowledge of branch circuit components and installation methods.	Final Exam

Enabling Objectives	Course Component	Evaluated by
Accurately distinguish between wiring methods and system components.	Lecture/ Discussion Activity 9.2: Black Box Experiment Activity 11.1: Preparing Basic Electrical Drawings Activity 12.1: Ohm's Wall	Final Exam
Explain common electrical issues with fixtures and installation.	Lecture/ Discussion In-Class: Large Group Discussion Using Images	Final Exam

Unit 8: Scene Safety

Terminal Objective	Evaluated by
Evaluate safety methods, equipment, and techniques used to evaluate electrical systems.	Final Exam

Enabling Objectives	Course Component	Evaluated by
Review safety equipment to use on a fire investigation scene.	Lecture/ Discussion	Final Exam
Demonstrate the ability to use multimeters and non-contact voltage testers.	Lecture/ Discussion In-Class Multimeter and Voltage Tester Demonstration All In-Class and Lab Activity Demonstration	Final Exam
Demonstrate how to locate sources of power and safely test them for the presence of electricity.	Lecture/ Discussion Activity 8.1: Identify Test Points	Final Exam Activity 11.2: Service Entrance Build-Out

Unit 9: Evaluate the Components

Terminal Objective	Evaluated by
Evaluate the source, path, and load components to determine their potential involvement in a fire investigation.	Final Exam

Enabling Objectives	Course Component	Evaluated by
Examine the distribution system and panelboard.	Lecture/ Discussion	Final Exam
Consider the types of heating sources, and estimate their damage potential.	Lecture/ Discussion In-Class Activity 9.1: Identifying Poor Electrical Workmanship	Final Exam
Describe and demonstrate various heat/load sources.	Lecture/ Discussion In-Class Activity 9.2: Black Box Experiment	Final Exam

Unit 10: High-Resistance Connections

Terminal Objective	Evaluated by
Discern and evaluate electrical faults, failures, and associated high-resistance connection (HRC) characteristics.	Final Exam

Enabling Objectives	Course Component	Evaluated by
Explain best practices for establishing a good connection.	Lecture/ Discussion In-Class Demonstration: How to Prepare Wires	Final Exam
Differentiate between arc damage and thermal impact to receptacle components.	Lecture/ Discussion In-Class Demonstration	Final Exam
Compare and contrast the damage effects to receptacles caused by fire exposure.	Lecture/ Discussion Case Study Video: "PVC Flaming Ignition"	Final Exam
Differentiate the overheating characteristics for various materials, such as plastics and metals.	Lecture/ Discussion Video: "Polypropylene Flaming Ignition"	Final Exam

Unit 11: Building an Electrical Service

Terminal Objective	Evaluated by
Using knowledge of source, path and load, build a service entrance, and connect the appropriate circuits.	Final Exam Lab Activity Demonstration Activity 11.3: Circuit Build-Out

Enabling Objectives	Course Component	Evaluated by
Analyze the operation of simple electrical circuits.	Lecture/Discussion In-Class Activity 11.1: Preparing Basic Electrical Drawings Videos: "Three-way switches & How they work" "How to Wire a 4 Way Switch"	Final Exam
Create wiring diagrams for simple electrical circuits.	Lecture/Discussion Lab Activity Demonstration Activity 11.2: Service Entrance Build-Out	Final Exam Lab Activity Demonstration Activity 11.2: Service Entrance Build-Out

Unit 12: Arc Mapping

Terminal Objective	Evaluated by
Apply arc mapping to the reconstruction of a fire scene to determine the area of origin.	Final Exam

Enabling Objectives	Course Component	Evaluated by
Use appropriate terminology to document arc mapping.	Lecture/ Discussion	Final Exam
Given an electrical artifact, determine if the cause of the damage was electrical, mechanical or thermal.	Lecture/ Discussion Lab Activity Demonstration: Arc/Melting/Mechanical Damage of Conductors Assessment (existing conductor artifacts) Lab Activity Demonstration: Open Neutral Demonstration Lab Activity Demonstration: Overload Conductor Demo w/Arc Welder Lab Activity Demonstration: Series Parallel Wiring Demo Lab Activity Demonstration Activity 12.1: Ohm's Wall	Final Exam
Systematically employ the methodology of arc mapping.	Lecture/ Discussion Lab Activity Demonstration Activity 12.1: Ohm's Wall Lab Activity Demonstration Activity 12.2: Artifact Identification In-Class Activity: Knowledge Check	Final Exam

Unit 13: Appliance Failures

Terminal Objective	Evaluated by
Evaluate artifacts to determine if an appliance failed, if it caused a fire, or if the appliance was damaged as a result of the fire.	Final Exam

Enabling Objectives	Course Component	Evaluated by
Examine and evaluate the circuitry and operation of safety devices in household appliances.	Lecture/ Discussion Activity 13.1: Appliance Modification Activity	Final Exam
Determine the circumstances that cause appliances to fail.	Lecture/ Discussion Lab Activity Demonstration: Iron Fire	Final Exam
Explain existing safeguards to prevent a small household appliance from exceeding normal temperatures.	Lecture/ Discussion Lab Activity Demonstration: Iron Fire	Final Exam

Policies

Class Attendance and Cancellation Policy

Attendance

- You are required to attend all sessions of the course. If you do not, you may not receive a certificate, and your stipend may be denied.
- If you need to depart campus early and miss any portion of the course and/or graduation, you must make the request in writing to the NFA training specialist. The training specialist, in collaboration with the superintendent, may waive the attendance requirement in order to accommodate you with extraordinary circumstances as long as you complete all course requirements. If you receive approval for departing early, you must forward the approval to the Admissions Office so your stipend reimbursement is not limited.

Academic Honesty

Students are expected to exhibit exemplary ethical behavior and conduct as part of the NFA community and society as a whole. Acts of academic dishonesty, including cheating, plagiarism, deliberate falsification, and other unethical behaviors, will not be tolerated.

Students are expected to report academic misconduct when they witness a violation. All cases of academic misconduct shall be reported by the instructor to the training specialist.

If a student is found to have engaged in misconduct and the allegations are upheld, the penalties may include, but are not limited to, one or a combination of the following:

- Expulsion.
- Withholding of stipend or forfeiture of stipend paid.
- Exclusion from future classes for a specified period; depending on the severity it could range from 1-10 years.
- Forfeiture of certificate for course(s) enrolled in at NETC.

Refer to NFA-specific Standard Operating Procedure 700.1 – *Academic Code of Conduct and Ethics* for more information.

Cancellations or No-Shows

NFA's mission for delivery of courses is impaired significantly by cancellations and no-shows. It is very difficult and costly to recruit students at the last minute. Currently there is a two-year ban on student attendance for students who are no-shows or cancel within 30 days of the course start date without a valid reason. If you receive such a restriction, your supervisor needs to send a letter to our Admissions Office explaining the cancellation/no-show.

Course Failure

If you fail an on-campus course, you will not be issued a stipend for that course. You can re-apply for the failed course, or any other NFA course, and go through the random selection process. You don't have to successfully complete the failed course before attending another NFA course.

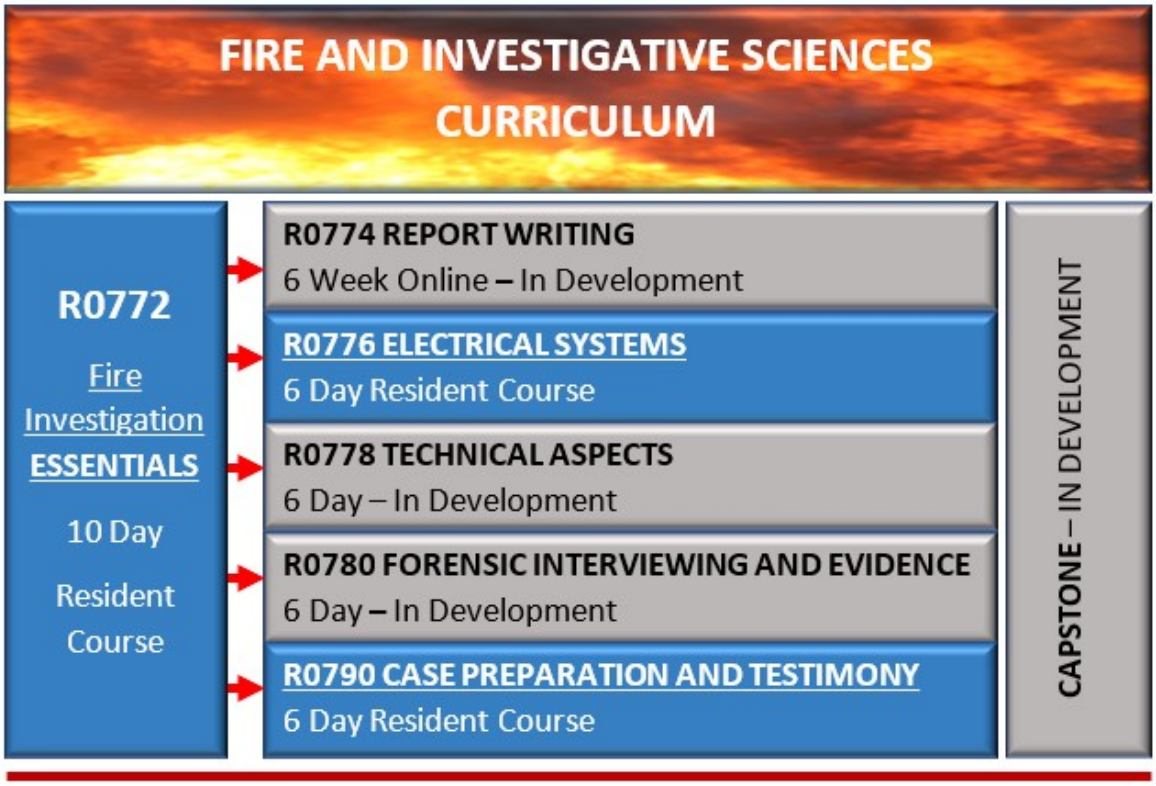
Student Code of Conduct Policy

Students, instructors and staff are expected to treat each other with respect at all times. Inappropriate behavior will not be tolerated and may result in removal from campus and denial of stipends. Please refer to the National Emergency Training Center Welcome package for additional information. (This link is also available at the following URL: https://training.fema.gov/emiweb/downloads/netc_welcome_package.pdf?v20151217).

Fire and Investigative Sciences Curriculum

The NFA hosted a comprehensive curriculum review of the Fire and Investigative Sciences Curriculum with renowned, national experts. The review focused on an assessment of national needs, duplications, gaps in existing programs and training; performed a detailed technical review and audit of NFA's existing course materials; and prepared a short- and long-range plan for NFA's current and future Fire and Investigative Sciences programs and curriculum that will meet national training and service needs. NFA works collaboratively on all curriculum updates with our trusted partner, the Bureau of Alcohol, Tobacco, Firearms, and Explosives (ATF), Fire Programs and Training Branch.

As a result of the review, a Professional Fire Investigator career track was created to align the needs within the profession and in the field, with the needs of current investigators:



Course Descriptions

Fire Investigation: Essentials (R0772) NEW

This 10-day course is the foundation of the Fire and Investigative Sciences Curriculum. The course utilizes National Fire Protection Association (NFPA) 921, *Guide for Fire and Explosion Investigations*, and NFPA 1033, *Standard for Professional Qualifications for Fire Investigator*, and other professional documents to addresses the technical and scientific knowledge and skills needed to conduct successful fire/arson investigations.

Using a combination of classroom instruction, activities, written assignments and group projects, students will demonstrate the ability to conduct science-based fire investigations that culminate, when appropriate, in prosecution for the crime of arson. Outdoor activities will require students to have work clothes and boots and be capable of processing a fire scene (bending, kneeling, and lifting up to 50 pounds). Successful completion of this course satisfies the education and testing requirements for International Association of Arson Investigators (IAAI) Fire Investigation Technician (FIT) certification.

Fire Investigation: Report Writing and Analysis (R0774) IN DEVELOPMENT

This six-week, instructor-led online course will enable fire investigators to prepare, review and critique fire investigation reports. Students will develop and revise reports in accordance with NFPA 921 and 1033. Students' reports will undergo a technical and legal review and be presented to an expert in the field of fire investigation. It is anticipated that this course will require up to eight hours of self-directed work per week. R0774 will expand upon concepts presented in R0772, "Fire Investigation: Essentials."

Fire Investigation: Electrical Systems (R0776) NEW

This six-day, specialized course addresses the critical skills essential to the effective investigation and evaluation of fires involving potential electrical fire causes. Students will demonstrate current techniques, practices, protocols and standards that assist investigators in the evaluation of electrical systems and associated components.

Outdoor activities will require students to have work clothes and boots, participate in a series of practical activities that involve working with tools and electrical test equipment, and be capable of processing a fire scene (bending, kneeling, and lifting up to 50 pounds). R0776 expands upon concepts presented in R0772, "Fire Investigation: Essentials."

Fire Investigation: Technical Aspects of Fire Dynamics (R0778) IN DEVELOPMENT

This six-day, specialized course will enable investigators to develop a forensic analysis of a fire scene based on evidence, fire dynamics, and related fire scene analysis best practices. The course provides an overview of scene documentation, timeline development, fire dynamics in structures, standardized testing, and physical and computational fire modeling.

Outdoor activities require students to have work clothes and boots and be capable of processing a fire scene (bending, kneeling, and lifting up to 50 pounds). The instruction uses current techniques, procedures, protocols, and standards to aid the fire investigator. R0778 expands upon concepts presented in R0772, "Fire Investigation: Essentials."

Fire Investigation: Forensic Interviewing and Evidence (R0780) IN DEVELOPMENT

This six-day, specialized course will address critical skills essential to fire investigation to include interviewing strategies and the identification, collection, packaging, preservation, processing, and testing of evidence from a fire and/or crime scene. Using a combination of classroom instruction, activities, written assignments and projects, students will demonstrate the ability to conduct science-based fire investigations with the application of current practices in the forensics investigation field. Outdoor activities require students to have work clothes and boots and be capable of processing a fire scene (bending, kneeling, and lifting up to 50 pounds). Successful completion of this course satisfies the education and testing requirements for IAAI Evidence Collection Technician (ECT) certification. R0780 expands upon concepts presented in R0772, "Fire Investigation: Essentials."

Fire Investigation: Case Preparation and Testimony (R0790) NEW

This six-day course is an intense, interactive, and realistic experience providing students with case development, case review, and the knowledge and skills to prepare to testify as an expert. This course is offered in a blended format; students are assigned a cold case file two weeks prior to arrival with corresponding course work. Once students arrive on campus, they will use the case file to complete an expert origin and cause report from which the student will provide testimony in a courtroom setting. Students who fail to complete the pre-arrival distance learning activities will be removed from the in-residence portion of the course and forfeit stipend reimbursement. Successful completion of this course satisfies the requirements of the IAAI for Expert Testimony. This course expands upon concepts presented in "Fire Investigation: Essentials" (R0772). Students seeking additional interviewing, evidence, and data collection instruction should consider the new course "Fire Investigation: Forensic Interviewing and Evidence" (R0780).

Fire Investigation: Capstone Project (M0795) IN DEVELOPMENT

This online, instructor-led course is the culmination of knowledge and skills acquired through the completion of the Fire Investigation curriculum (772-790 series courses). Students must demonstrate proficiency in accordance with national standards and competencies.

The Fire and Investigative Sciences Curriculum also offers a two-day course for first responders. This course is not considered part of the professional track; however, it does meet a critical, national need. Response personnel considering a career in fire investigation are strongly encouraged to attend the two-day course.

Fire Investigation: First Responders (W/O0770)

This two-day course presents a basic overview of a fire investigation. Students will review the basics of fire chemistry and develop an understanding of the role of the first responder in relation to fire suppression and fire investigation. The course will stress the importance of fire scene awareness, evidence identification, preservation, and the basics of a fire investigation. Students will develop an appreciation of the convergence of suppression, investigation, science, and law.