

Fire Science and Technology III



Industry Sector: [Public Services](#)

Pathway: Emergency Response

This course is designed to introduce students to fire behavior, fire suppression, fire fighting techniques, and emergency medical response. The course replicates a full time paid fire academy and is based on three core values: Communication, Teamwork and Discipline.

Last Revised: August 31, 2017

Program Information	CTE Certification Elements
<p>Industries / Pathways: Public Service Industry: Emergency Response Pathway</p> <p>Grade Levels: 12</p> <p>CSU/UC Approval: No</p> <p>Community College Course: No</p> <p>Pathway Sequence(s) That Include This Course:</p> <p>Emergency Response Pathway Course Sequence: Introduction to Health and Human Service Careers or Health Professions and Organizations First Aid, Emergency Response and CPR Career Explorations</p>	<p>Course Level: Capstone</p> <p>CALPADS Pathway: PUB-233</p> <p>CALPADS Course Title: Fire Science and Technology III</p> <p>State Course ID: 8422</p> <p>Total Hours: 45 hours</p> <p>Course Length: 1 Semester</p> <p>Board Approval: Pending Board Action on 12/7/17</p> <p>Labor Market Demand: High</p> <p>Course Type: Career-Technical Preparation</p>

Anatomy and Physiology Fire Science and Technology I Fire Science and Technology II Fire Technology Internship (Grades 10-11-12) CPR Recertification <i>Fire Technology III</i>	
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Competencies / Outcomes

1. Recall and build upon prior Fire Science and Technology courses.
2. Exhibit proper ventilation techniques for first responders.
3. Demonstrate proper techniques and procedures related to auto extrication.
4. Don and doff firefighter personal protective equipment.
5. Demonstrate different techniques for fire fighter ground ladders, including carrying, raising and lowering.
6. Perform hose lays and advance hose lines for fire suppression.
7. Perform multi-company drills with precise direction and focus.
8. Exhibit strong leadership in group settings.
9. Employ search and rescue techniques and recover victims.
10. Manipulate fire suppression apparatus and equipment.
11. Demonstrate proper techniques and procedures during fire related incidents.
12. Practice regular physical activity including, stretching, cardiovascular, weightlifting using appropriate techniques.

CTE Pathway Standards

1. CTE.PS.B.2.4 [Recognize multiagency coordination; unified command, training, identification and management of resources; qualification and certification; and the collection, tracking, evaluation, and dissemination of information.](#)
2. CTE.PS.B.2.5 [Describe the principles and responsibilities of the Incident Command System \(ICS\) and the National Incident Management System \(NIMS\).](#)
3. CTE.PS.B.2.6 [Review a simulated local hazard mitigation plan based on a potential hazard to the community, and describe the appropriate response.](#)
4. CTE.PS.B.3.1 [Identify the characteristics of successful teams, including leadership, cooperation, collaboration, and effective decision-making skills as applied in emergency services.](#)
5. CTE.PS.B.3.6 [Adhere to Health Insurance Portability and Accountability Act \(HIPAA\) regulations and agency guidelines regarding public and media communications.](#)

6. CTE.PS.B.3.9 [Practice verbal and nonverbal emergency terminology and communication techniques to be used when interacting with emergency response personnel in a variety of emergency situations.](#)
7. CTE.PS.B.3.10 [Gather information and ideas from primary and secondary sources accurately and coherently.](#)
8. CTE.PS.B.4.2 [Know and use the appropriate personal protective equipment \(PPE\) required for emergency services duties.](#)
9. CTE.PS.B.4.3 [Know how to establish situational awareness, identify hazards, and assess personal, team, or environmental risks.](#)
10. CTE.PS.B.4.6 [Complete certification in emergency care as appropriate—for example, cardiopulmonary resuscitation \(CPR\), automated external defibrillator \(AED\), and first aid.](#)
11. CTE.PS.B.5.4 [Design and implement a personal plan for achieving and maintaining an acceptable level of nutrition, strength and agility, and a lifetime fitness mindset.](#)
12. CTE.PS.B.6.2 [Analyze the history and outcomes of catastrophic events and the appropriate emergency responses.](#)
13. CTE.PS.B.6.3 [Review a hazard mitigation plan to reduce death and injury for potential man-made and natural hazards.](#)
14. CTE.PS.B.9.3 [Perform technical skill and equipment use required for emergency response occupations—for example, airway, oxygen, and ventilation procedures; suction; bleeding control; shock management; cardiac arrest management; immobilization techniques; traction; splinting; transport; defibrillation; and wound management.](#)
15. CTE.PS.B.9.11 [Describe the function of emergency vehicles, use of medical and communication equipment, and the necessity of maintaining inventory as required for emergency services practices and procedures.](#)
16. CTE.PS.B.8.3 [Explain the fundamentals and scientific principles of fire behavior, combustible materials, extinguishing agents, hazardous and toxic materials, forms of energy, and fire prevention/suppression techniques for all types of fires and conditions.](#)
17. CTE.PS.B.8.4 [Demonstrate the operation of fire protection equipment and systems.](#)
18. CTE.PS.B.8.5 [Demonstrate the skills necessary to perform fire suppression and basic rescue operations using firefighting techniques and rescue equipment.](#)
19. CTE.PS.B.8.6 [Identify structural characteristics of building construction types as they relate to fire protection and suppression, and recognize the signs and causes of potential building collapse and other hazards.](#)

Common Core Standards for Literacy in History/Social Studies, Science and Technical Subjects

Reading

1. RST.9-10.3 (9th and 10th) [Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.](#)
2. RST.11-12.3 (11th and 12th) [Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.](#)
3. RST.9-10.9 (9th-10th) [Compare and contrast findings presented in a text to those from other sources \(including their own experiments\), noting when the findings support or contradict previous explanations or accounts.](#)
4. RST.11-12.9 (11th and 12th) [Synthesize information from a range of sources \(e.g., texts, experiments, simulations\) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.](#)

Writing

1. WHST.9-10.4, WHST.11-12.4 (9-10 & 11-12) [Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.](#)

Units

Unit 1: Recap of Fundamentals of Fire Technology I and II

Description

After completing this unit students will be able to recall fundamentals of Fire Technology, Years 1 and 2.

Key Topics/Activities

Upon successful completion of this lesson, students will be able to demonstrate knowledge of the following:

Year 1:

1. Healthy eating habits and exercise (Nutrition).
2. The historical information surrounding the creation of the Fire Services (History of Fire Service)
3. The habits and behavior of Fire (Fire Behavior)
4. Marching drills and ceremony etiquettes (Fire Academy Drills and Ceremony)
5. Proper use and maintenance of Portable Fire Extinguishers (Fire Extinguishers)
6. The use and maintenance of different apparatus used by emergency responders (Fire Apparatus)

Year 2:

1. The use and maintenance of equipment used in first responding (Personal Protective Equipment).
2. The use and maintenance of breathing apparatus used in first response (Personal Protective Equipment).
3. The construction and maintenance of various ground ladders (Ladders).
4. Proper techniques for safety during search and rescue in different scenarios (Search and Rescue)
5. The necessary maintenance of ropes and proper knot tying techniques (Ropes and Knots)
6. The use and maintenance of using various Fire Technology tools (Fire Tech Tools)

Key concepts will be assessed through performance of skills, written and oral examinations.

Unit 2: Ventilation

Description

After completing this unit, students shall be able to apply tactical ventilation knowledge and practices following the policies and procedures set forth by the authority having jurisdiction (AHJ). Lessons cover tactical ventilation and types of ventilation, reasons for ventilation, and considerations that should be taken into account when performing ventilation. Content covers the effects of building systems on tactical ventilation.

Key Topics/Activities

Upon successful completion of this lesson, students will be able to:

1. Describe reasons for tactical ventilation. *[NFPA® 1001, 5.3.11]*
2. Identify considerations that affect the decision to ventilate. *[NFPA® 1001, 5.3.11, 5.3.12]*
3. Explain the critical fire behavior indicators present during tactical ventilation. *[NFPA® 1001, 5.3.11]*
4. Define horizontal and vertical ventilation. *[NFPA® 1001, 5.3.11]*
5. Explain the means for achieving horizontal and vertical ventilation. *[NFPA® 1001, 5.3.11, 5.3.12]*
6. Describe the types of horizontal ventilation. *[NFPA® 1001, 5.3.11, 5.3.12]*
7. Describe the types of vertical ventilation. *[NFPA® 1001, 5.3.11, 5.3.12]*
8. Recognize other types of ventilation situations. *[NFPA® 1001, 5.3.11]*
9. Explain the effects of building systems on tactical ventilation. *[NFPA® 1001, 5.3.11, 5.3.12]*
10. Ventilate using mechanical negative pressure in a window. *[NFPA® 1001, 5.3.11, 5.3.12; Skill Sheet 13-I-1]*
11. Ventilate using mechanical negative pressure in a doorway. *[NFPA® 1001, 5.3.11, 5.3.12; Skill Sheet 13-I-2]*
12. Ventilate using mechanical positive pressure. *[NFPA® 1001, 5.3.11, 5.3.12; Skill Sheet 13-I-3]*
13. Perform horizontal hydraulic ventilation. *[NFPA® 1001, 5.3.11, 5.3.12; Skills Sheet 13-I-4]*
14. Demonstrate the procedure for sounding a roof. *[NFPA® 1001, 5.3.12; Skill Sheet 13-I-5]*
15. Ventilate using a rotary saw to cut an opening. *[NFPA® 1001, 5.3.12; Skill Sheet 13-I-6]*
16. Ventilate using an axe to cut an opening. *[NFPA® 1001, 5.3.12; Skill Sheet 13-I-7]*
17. Demonstrate the procedure for opening a flat roof. *[NFPA® 1001, 5.3.12; Skill Sheet 13-I-8]*
18. Perform the steps for opening pitched roofs. *[NFPA® 1001, 5.3.12; Skill Sheet 13-I-9]*
19. Demonstrate the procedure for making a trench cut using a rotary saw. *[NFPA® 1001, 5.3.12; Skill Sheet 13-I-10]*

Key concepts will be assessed through performance of skills, written and oral examinations.

Unit 3: Auto Extrication

Description

After completing this unit, students will be able to maintain extrication and rescue tools and equipment. Students will also be able to perform basic vehicle extrication skills as well as describe the role of a Firefighter II in supporting specialized technical rescue teams.

Key Topics/Activities

Upon successful completion of this lesson, students will be able to:

1. Explain considerations for maintenance of electric generators and lighting equipment. [NFPA® 1001, 6.4.2, 6.5.4]
2. Describe the types of rescue tools and equipment. [NFPA® 1001, 6.4.2, 6.5.4]
3. Explain the uses and limitations of each type of rescue tool. [NFPA® 1001, 6.4.1, 6.4.2, 6.5.4]
4. Identify the role of a fire department during vehicle extrication. [NFPA® 1001, 6.4.1]
5. Describe safety considerations that must be identified and mitigated during vehicle extrication. [NFPA® 1001, 6.4.1]
6. Explain the use of cribbing material during vehicle extrication. [NFPA® 1001, 6.4.1]
7. Describe the methods used for gaining access to victims during vehicle extrication. [NFPA® 1001, 6.4.1]
8. Prevent horizontal movement of a vehicle using wheel chocks. [NFPA® 1001, 6.4.1; Skill Sheet 10-II-2]
9. Stabilize a vehicle using cribbing. [NFPA® 1001, 6.4.1; Skill Sheet 10-II-3]
10. Stabilize a vehicle using a system of ropes and webbing. [NFPA® 1001, 6.4.1; Skill Sheet 10-II-5]
11. Remove a windshield in an older model vehicle. [NFPA® 1001, 6.4.1; Skill Sheet 10-II-7]
12. Remove a tempered glass side window. [NFPA® 1001, 6.4.1; Skill Sheet 10-II-8]
13. Remove a roof from an upright vehicle. [NFPA® 1001, 6.4.1; Skill Sheet 10-II-9]
14. Remove a roof from a vehicle on its side. [NFPA® 1001, 6.4.1; Skill Sheet 10-II-10]

Key concepts will be assessed through performance of skills, written and oral examinations.

Unit 4: Search and Rescue

Description

After completing this unit, students will be able to describe, as well as perform, search and victim removal methods to use during structural search and rescue. Students will also be able to explain and perform firefighter survival skills used during structural search and rescue.

Key Topics/Activities

This unit covers structural search, victim removal, and firefighter survival. Lessons describe basic structural search methods, explain victim removal methods, and detail firefighter survival methods and skills. Upon successful completion of this lesson, students will be able to:

1. Summarize the impact of building construction and floor plans on structural search techniques. *[NFPA® 1001, 5.3.9]*
2. Explain size-up and situational awareness considerations during structural searches. *[NFPA® 1001, 5.3.9]*
3. Summarize safety guidelines for structural search and rescue. *[NFPA® 1001, 5.3.9]*
4. Differentiate between primary and secondary search techniques. *[NFPA® 1001, 5.3.9]*
5. Recognize basic search methods. *[NFPA® 1001, 5.3.9]*
6. Describe victim removal methods. *[NFPA® 1001, 5.3.5, 5.3.9]*
7. Explain firefighter survival methods. *[NFPA® 1001, 5.3.1, 5.3.5, 5.3.9]*
8. Explain what survival actions firefighters can take when needed. *[NFPA® 1001, 5.3.1, 5.3.5]*
9. Describe the actions of a rapid intervention crew or team (RIC/RIT) when locating a downed firefighter. *[NFPA® 1001, 5.3.5, 5.3.9]*
10. Demonstrate the procedure for conducting a primary search. *[NFPA® 1001, 5.3.9; Skill Sheet 9-I-1]*
11. Demonstrate the procedure for conducting a secondary search. *[NFPA® 1001, 5.3.9; Skill Sheet 9-I-2]*
12. Demonstrate the incline drag. *[NFPA® 1001, 5.3.9; Skill Sheet 9-I-3]*
13. Demonstrate the webbing drag. *[NFPA® 1001, 5.3.9; Skill Sheet 9-I-4]*
14. Demonstrate the cradle-in-arms lift/carry — One-rescuer method. *[NFPA® 1001, 5.3.9; Skill Sheet 9-I-5]*
15. Demonstrate the seat lift/carry — Two-rescuer method. *[NFPA® 1001, 5.3.9; Skill Sheet 9-I-6]*
16. Demonstrate the extremities lift/carry — Two-rescuer method. *[NFPA® 1001, 5.3.9; Skill Sheet 9-I-7]*
17. Demonstrate the actions required for transmitting a MAYDAY report. *[NFPA® 1001, 5.2.4, 5.3.5, 5.3.9; Skill Sheet 9-I-8]*
18. Demonstrate the proper procedures for an SCBA air emergency. *[NFPA® 1001, 5.3.1, 5.3.5, 5.3.9; Skill Sheet 9-I-9]*
19. Demonstrate the actions required for withdrawing from a hostile environment with a hoseline. *[NFPA® 1001, 5.3.5, 5.3.9; Skill Sheet 9-I-10]*
20. Demonstrate low profile maneuvers without removing SCBA – Side technique. *[NFPA® 1001, 5.3.1, 5.3.5, 5.3.9; Skill Sheet 9-I-11]*
21. Perform low profile maneuvers without removing SCBA – SCBA- first technique. *[NFPA® 1001, 5.3.1, 5.3.5, 5.3.9; Skill Sheet 9-I-12]*
22. Demonstrate the method for breaching an interior wall. *[NFPA® 1001, 5.3.5, 5.3.9; Skill Sheet 9-I-13]*
23. Demonstrate the steps for disentangling from debris or wires. *[NFPA® 1001, 5.3.5, 5.3.9; Skill Sheet 9-I-14]*

Key concepts will be assessed through performance of skills, written and oral examinations.

Unit 5: Fire Attack

Description

After completing this unit, students will be able to discuss fire control of fires in structures, in Class C fires, in Class D fires, vehicle fires, and ground cover fires and be able to perform various skills related to fire attack.

Key Topics/Activities

Lessons cover fire control and describe fire control in structures, stored Class A materials, ground cover, vehicles, Class C materials, and Class D materials. Upon successful completion of this lesson, students will be able to:

1. Describe initial factors to consider when suppressing structure fires. *[NFPA® 1001, 5.3.8, 5.3.10]*
2. Summarize considerations taken when making entry. *[NFPA® 1001, 5.3.8, 5.3.10]*
3. Describe direct attack, indirect attack, combination attack, and gas cooling techniques. *[NFPA® 1001, 5.3.8, 5.3.10]*
4. Describe safety considerations that must be identified for upper level structure fires. *[NFPA® 1001, 5.3.8, 5.3.10]*
5. Explain actions taken when attacking belowground structure fires. *[NFPA® 1001, 5.3.8, 5.3.10]*
6. Discuss methods of fire control through exposure protection and controlling building utilities. *[NFPA® 1001, 5.3.18]*
7. Describe steps taken when supporting fire protection systems at protected structures. *[NFPA® 1001, 5.3.8, 5.3.10, 5.3.14]*
8. Explain considerations taken when deploying, supplying, and staffing master stream devices. *[NFPA® 1001, 5.3.8]*
9. Describe situations that may require suppression of Class C fires. *[NFPA® 1001, 5.3.8, 5.3.10]*
10. Identify hazards associated with suppressing Class C fires. *[NFPA® 1001, 5.3.8, 5.3.10]*
11. Describe actions associated with suppressing Class D fires. *[NFPA® 1001, 5.3.8, 5.3.10]*
12. Explain actions taken when suppressing a vehicle fire. *[NFPA® 1001, 5.3.7]*
13. Compare methods used to suppress fires in stacked and piled materials, small unattached structures, and trash containers. *[NFPA® 1001, 5.3.8]*
14. Summarize the main influences on ground cover fire behavior. *[NFPA® 1001, 5.3.19]*
15. Compare types of ground cover fires. *[NFPA® 1001, 5.3.19]*
16. Describe elements that influence ground cover fire behavior. *[NFPA® 1001, 5.3.19]*
17. Identify the parts of a ground cover fire. *[NFPA® 1001, 5.3.19]*
18. Describe protective clothing and equipment used in fighting ground cover fires. *[NFPA® 1001, 5.3.19]*
19. Describe methods used to attack ground cover fires. *[NFPA® 1001, 5.3.19]*
20. Summarize safety principles and practices when fighting ground cover fires. *[NFPA® 1001, 5.3.19]*
21. Attack a structure fire using a direct, indirect, or combination attack. *[NFPA® 1001, 5.3.8, 5.3.10, 5.3.13; Skill Sheet 17-I-1]*
22. Attack a structure fire above, below, and at ground level – Interior attack. *[NFPA® 1001, 5.3.8, 5.3.10, 5.3.13; Skill Sheet 17-I-2]*

23. Turn off building utilities. *[NFPA® 1001, 5.3.18; Skill Sheet 17-I-3]*
24. Connect supply fire hose to a fire department connection. *[NFPA® 1001, 5.3.8, 5.3.10, 5.3.14; Skill Sheet 17-I-4]*
25. Operate a sprinkler system control valve. *[NFPA® 1001, 5.3.8, 5.3.10, 5.3.14, 5.3.15; Skill Sheet 17-I-5]*
26. Stop the flow of water of an activated sprinkler. *[NFPA® 1001, 5.3.8, 5.3.10, 5.3.14; Skill Sheet 17-I-6]*
27. Deploy and operate a portable master stream device. *[NFPA® 1001, 5.3.8; Skill Sheet 17-I-7]*
28. Attack a passenger vehicle fire. *[NFPA® 1001, 5.3.7; Skill Sheet 17-I-8]*
29. Attack a fire in stacked or piled materials. *[NFPA® 1001, 5.3.8; Skill Sheet 17-I-9]*
30. Attack a fire in a small unattached structure. *[NFPA® 1001, 5.3.8; Skill Sheet 17-I-10]*
31. Extinguish a fire in a trash container. *[NFPA® 1001, 5.3.8; Skill Sheet 17-I-11]*
32. Attack a ground cover fire. *[NFPA® 1001, 5.3.19; Skill Sheet 17-I-12]*

Key concepts will be assessed through performance of skills, written and oral examinations.