

## Fire Science and Technology I



**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:** July 24, 2017

Program Information	CTE Certification Elements
<p><b>Industries / Pathways:</b> Public Services Industry: Emergency Response Pathway</p> <p><b>Grade Levels :</b> 10</p> <p><b>CSU/UC Approval:</b> No</p> <p><b>Community College Course:</b> No</p> <p><b>Pathway Sequence(s) That Include This Course:</b></p> <p><b>Emergency Response Pathway Course Sequence:</b></p> <p>Introduction to Health and Human Service Careers or Health Professions and Organizations First Aid, Emergency Response and CPR Career Explorations Anatomy and Physiology <i>Fire Science and Technology I</i></p>	<p><b>Course Level:</b> Concentrator</p> <p><b>CALPADS Pathway:</b> PUB 233</p> <p><b>CALPADS Course Title:</b> Fire Science and Technology I</p> <p><b>State Course ID:</b> 8421</p> <p><b>Total Hours:</b> 90 hours</p> <p><b>Course Length:</b> 1 Semester</p> <p><b>Local Course Number:</b> FPT1</p> <p><b>Board Approval:</b> Pending Board Action on 12/7/17</p> <p><b>Labor Market Demand:</b> High</p> <p><b>Course Type:</b> Career-Technical Preparation</p>

Fire Science and Technology II Fire Technology Internship (Grades 10-11-12) CPR Recertification Fire Technology III	
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## Competencies / Outcomes

Students will:

1. Employ healthy nutritional and active lifestyles.
2. Connect modern fire procedures to a historical past.
3. Demonstrate awareness of fire behavior.
4. Exhibit correct formations for drills and ceremony.
5. Employ correct procedures during emergency incidents.
6. Demonstrate proper understanding of fire apparatus and its use.
7. Maintain proper maintenance on fire apparatus.
8. Employ search and rescue techniques and recover victims.
9. Manipulate fire suppression apparatus and equipment.
10. Practice regular physical activity including, stretching, cardiovascular, weightlifting using appropriate techniques.

## Standards

### CTE Pathway Standards

1. CTE.PS.B.1.1 [Understand the responsibilities, requirements, and advancement opportunities in emergency response careers.](#)
2. CTE.PS.B.1.5 [Summarize the laws, regulations, and organizational protocols that define the guidelines governing selected emergency agencies and services.](#)
3. 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.](#)
4. CTE.PS.B.3.3 [Employ active listening, concise reporting, and familiarity with emergency response communication equipment to interact efficiently and effectively.](#)
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.3.8 [Use and maintain a variety of communication equipment, understanding the importance of using current and up-to-date technology and communication equipment.](#)

7. CTE.PS.B.3.10 [Gather information and ideas from primary and secondary sources accurately and coherently.](#)
8. CTE.PS.B.4.1 [Describe the basic elements of safety and survival for emergency response personnel.](#)
9. CTE.PS.B.4.6 [Complete certification in emergency care as appropriate—for example, cardiopulmonary resuscitation \(CPR\), automated external defibrillator \(AED\), and first aid.](#)
10. CTE.PS.B.5.1 [Understand that physical fitness and proper nutrition are needed to perform the duties of emergency response personnel.](#)
11. CTE.PS.B.7.4 [Explain the steps taken, including appropriate personnel and safety measures, for a hazardous-material release.](#)
12. CTE.PS.B.8.1 [Understand the history, organization, and operation of fire services.](#)
13. 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.](#)
14. CTE.PS.B.9.1 [Understand and use medical terminology and related knowledge of anatomy, physiology, diseases, diagnoses, pharmacology, therapeutics, and common abbreviations necessary for emergency medical services.](#)
15. 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.](#)
16. CTE.PS.B.9.7 [Execute protocols in emergency management response when working with an on-scene accident.](#)
17. CTE.PS.B.10.2 [Explain the role of fire personnel in wildland fires, structure fires, auto accidents, medical aid, swift-water rescue, civil disturbances, search and rescue operations, hazardous material spills, train wrecks, floods, and earthquakes.](#)

## 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: Nutrition

### Description

This unit covers personal nutrition. Lessons include creating a balanced meal preparation and portion control for each student. Lesson's also include the importance of water hydration. The intended learning objective is directing students towards healthy lifestyles for active services.

### Key Activities/Topics

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

1. Distinguish between facts and myths regarding nutrition practices, products, and physical performance. 1.1.N
2. Research and discuss the practical use of current research-based guidelines for a nutritionally balanced diet. 1.2.N
3. Explain the importance of variety and moderation in food selection and consumption. 1.3.N
4. Describe dietary guidelines, food groups, nutrients, and serving sizes for healthy eating habits. 1.4.N
5. Describe the relationship between poor eating habits and chronic diseases such as heart disease, obesity, cancer, diabetes, hypertension, and osteoporosis. 1.5.N
6. Explain how to keep food safe through proper food purchasing, preparation, and storage practices. 1.6.N
7. Describe nutrition practices that are important for the health of a pregnant woman and her baby. 1.7.N
8. Describe the prevalence, causes, and long-term consequences of unhealthy eating. 1.8.N
9. Analyze the relationship between physical activity and overall health. 1.9.N
10. Evaluate various approaches to maintaining a healthy weight. 1.10.N
11. Identify the causes, symptoms, and harmful effects of eating disorders. 1.11.N
12. Explain why people with eating disorders need professional help. 1.12.N
13. Describe the amounts and types of physical activity recommended for teenagers' overall health and for the maintenance of a healthy body weight. 1.13.N
14. Analyze the harmful effects of using diet pills and anabolic steroids. 1.14.N
15. Explain the physical, academic, mental, and social benefits of physical activity and the relationship between a sedentary lifestyle and chronic disease. 1.15.N

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

## Unit 2: History of the Fire Services

### Description

This unit covers the basic historical background and development of the fire service. Lessons describe both the culture and organizational structures of the fire service. Lessons also cover basic information on department regulations and policies.

### Key Activities/Topics

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

1. Summarize the history of the fire service.
2. Explain the organizational characteristics, cultural challenges, and cultural strengths that influence the fire service.
3. Describe the mission of the fire service. [NFPA® 1001, 5.1.1]
4. Describe the organization of fire departments. [NFPA® 1001, 5.1.1]
5. Distinguish among functions of fire companies. [NFPA® 1001, 5.1.1]
6. Summarize primary knowledge and skills the firefighter must have to function effectively. [NFPA® 1001, 5.1.1, 6.1.1]
7. Distinguish among the primary roles of fire service personnel. [NFPA® 1001, 5.1.1, 6.1.1]
8. Describe fire department organizational principles. [NFPA® 1001, 5.1.1]
9. Locate information in departmental documents and standard or code materials. [NFPA® 1001, 5.1.2]
10. Distinguish between fire department SOPs and rules and regulations. [NFPA® 1001, 5.1.1]
11. Explain the ways the fire service may interact with other organizations. [NFPA® 1001, 5.1.1]

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

## Unit 3: Fire Behavior

### Description

This unit covers fire behavior and includes the description of the science of fire, various physical states fuel can be found, classification of fires, and the stages of fire development. The relationship between fire behavior and fire fighting operations is also discussed.

### Key Activities/Topics

Upon successful completion of this unit, the student will be able to:

1. Explain the science of fire as it relates to energy, forms of ignition, and modes of combustion. [NFPA® 1001, 5.3.11]
2. Describe the impact of thermal energy on heat, temperature, and heat transfer. [NFPA® 1001, 5.3.12]
3. Recognize the physical states of fuel. [NFPA® 1001, 5.3.10]
4. Explain the relationship between oxygen and life safety. [NFPA® 1001, 5.3.11]
5. Identify the products of self-sustained chemical reactions. [NFPA® 1001, 5.3.11]
6. Explain the factors that affect fire development. [NFPA® 1001, 5.3.11]
7. Describe the stages of fire development. [NFPA® 1001, 5.3.11]
8. Recognize signs, causes, and effects of rapid fire development. [NFPA® 1001, 5.3.11]
9. Describe the methods through which fire fighting operations can influence fire behavior. [NFPA® 1001, 5.3.11, 5.3.12]

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

## Unit 4: Fire Academy Drills and Ceremony Preparation

### Description

This unit covers Fire Academy drills and ceremony preparation. Students learn different formational drills and procedures expected in the Fire Academy. Students also learn the maintenance and upkeep of the uniform.

### Key Activities/Topics

Upon successful completion of this unit, the student will be able to:

1. Maintain a standard of uniform that holds up to Fire Academy Regulations.
2. Understand proper maintenance of clothing and dress.
3. Exhibit proper hair and facial hair protocol that reflects Fire Academy Regulations.
4. Perform in proper ceremony drills through formation and unity.
5. Exhibit correct formations depending on the activity.

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

## Unit 5: Portable Fire Extinguishers

### Description

After completing this lesson, students will be able to select, use, and correctly maintain portable fire extinguishers.

### Key Activities/Topics

Upon successful completion of this lesson, the student shall be able to:

1. Explain portable fire extinguisher classifications. [NFPA® 1001, 5.3.16]
2. Describe types of portable fire extinguishers. [NFPA® 1001, 5.3.16]
3. Define the ratings in a portable fire extinguisher rating system. [NFPA® 1001, 5.3.16]
4. Explain the considerations taken when selecting and using portable fire extinguishers. [NFPA® 1001, 5.3.16]
5. Identify procedures used for the inspection, care, and maintenance of portable fire extinguishers. [NFPA® 1001, 5.3.16, 5.5.1]
6. Operate a stored pressure water extinguisher. [NFPA® 1001, 5.3.16; Skill Sheet 7-I-1]
7. Operate a dry chemical (ABC) extinguisher. [NFPA® 1001, 5.3.16; Skill Sheet 7-I-2]
8. Operate a carbon dioxide (CO<sub>2</sub>) extinguisher. [NFPA® 1001, 5.3.16; Skill Sheet 7-I-3]

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

## Unit 6: Fire Apparatus

### Description

This unit covers various fire apparatus. This lesson describes basic information about the various types of equipment and how it can protect firefighters.

### Key Activities/Topics

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

1. Describe the purpose of personal protective equipment. *[NFPA® 1001, 5.1.1, 5.3.3]*
2. Describe characteristics of each type of personal protective equipment. *[NFPA® 1001, 5.3.2]*
3. Summarize guidelines for the care of personal protective clothing. *[NFPA® 1001, 5.1.1, 5.3.3, 5.5.1]*
4. Explain safety considerations for personal protective equipment. *[NFPA® 1001, 5.3.1]*
5. Identify respiratory hazards. *[NFPA® 1001, 5.3.1]*
6. Identify types of respiratory protection equipment. *[NFPA® 1001, 5.3.1]*
7. Describe the limitations of respiratory protection equipment. *[NFPA® 1001, 5.3.1]*
8. Explain methods for storing respiratory protection equipment. *[NFPA® 1001, 5.5.1]*
9. Describe general donning and doffing considerations for protective breathing apparatus. *[NFPA® 1001, 5.3.1, 5.3.2]*
10. Summarize general considerations for protective breathing apparatus inspections and care. *[NFPA® 1001 5.1.1, 5.5.1]*
11. Summarize safety precautions for refilling SCBA cylinders. *[NFPA® 5.5.1]*
12. Explain procedures for replacing SCBA cylinders. *[NFPA® 1001 5.3.1]*
13. Explain safety precautions for SCBA use. *[NFPA® 1001 5.3.1]*
14. Describe non-emergency and emergency exit indicators. *[NFPA® 5.3.1]*
15. Describe non-emergency exit techniques. *[NFPA® 1001 5.3.1]*
16. Demonstrate the method for donning structural personal protective clothing for use at an emergency. *[NFPA® 1001, 5.1.2, 5.3.1, 5.3.2, 5.3.3, Skill Sheet 6-I-1]*
17. With structural personal protective clothing in place, demonstrate the over-the-head method of donning an SCBA. *[NFPA® 1001 5.3.1, 5.3.2, 5.3.3, Skill Sheet 6-I-2]*
18. With structural personal protective clothing in place, demonstrate the coat method of donning an SCBA. *[NFPA® 1001 5.3.1, 5.3.2, 5.3.3, Skill Sheet 6-I-3]*
19. With structural personal protective clothing in place, demonstrate the method for donning an SCBA while seated. *[NFPA® 1001 5.3.1, 5.3.2, 5.3.3, Skill Sheet 6-I-4]*

20. Doff personal protective equipment, including respiratory protection, and prepare for reuse. *[NFPA® 1001 5.1.2, 5.3.2, 5.3.3, Skill Sheet 6-I-5]*
21. Demonstrate the steps for inspecting an SCBA. *[NFPA® 1001 5.3.2, 5.5.1; Skill Sheet 6-I-6]*
22. Demonstrate the steps for cleaning and sanitizing an SCBA. *[NFPA® 1001 5.3.2, 5.5.1; Skill Sheet 6-I-7]*
23. Demonstrate the method for filling an SCBA cylinder from a cascade system, wearing appropriate PPE, including eye and ear protection. *[NFPA® 1001 5.3.1; Skill Sheet 6-I-8]*
24. Demonstrate the method for filling an SCBA cylinder from a compressor/purifier system wearing appropriate PPE, including eye and ear protection. *[NFPA® 1001 5.3.1; Skill Sheet 6-I-9]*
25. Demonstrate the one-person method for replacing an SCBA cylinder. *[NFPA® 1001 5.3.1; Skill Sheet 6-I-10]*
26. Demonstrate the two-person method for replacing an SCBA cylinder. *[NFPA® 1001 5.3.1; Skill Sheet 6-I-11]*

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