



Western Technical College

## 10503195 Fire Behavior and Combustion

### Course Outcome Summary

#### Course Information

<b>Description</b>	This course explore the theories and fundamentals of how and why fires start, spread, and are controlled.
<b>Career Cluster</b>	Law, Public Safety, Corrections and Security
<b>Instructional Level</b>	Associate Degree Courses
<b>Total Credits</b>	3
<b>Total Hours</b>	54

#### Textbooks

*Fire Dynamics*. 2nd Edition. Copyright 2016. Gorbett, Gregory E. and James L. Pharr. Publisher: Pearson.  
**ISBN-13:** 978-0-13-384270-8. Required.

#### Success Abilities

1. Cultivate Passion: Increase Self-Awareness
2. Live Responsibly: Develop Resilience
3. Live Responsibly: Foster Accountability
4. Refine Professionalism: Improve Critical Thinking
5. Refine Professionalism: Participate Collaboratively
6. Refine Professionalism: Practice Effective Communication

#### Program Outcomes

1. Perform fire prevention activities

## Course Competencies

### 1. Identify physical properties of the three states of matter.

#### Assessment Strategies

- 1.1. Written Objective Test

#### Criteria

- 1.1. Score a minimum of 70%.  
1.2. Complete exam within 90 minutes.  
1.3. Complete exam without using any reference books or notes.  
1.4. Complete exam at prescribed time and place.

#### Learning Objectives

- 1.a. Explain the basic structure of atoms.  
1.b. Explain how atomic structure determines the behavior of elements and compounds.  
1.c. Understand basic chemical and physical properties and concepts and how they influence the behavior of materials involved in fires and hazardous materials incidents.  
1.d. Correlate chemical structure with chemical names to allow for a general prediction of some hazardous chemical behaviors.  
1.e. Describe key physical properties of chemicals and how these properties are related to fire protection

### 2. Categorize the components of fire.

#### Assessment Strategies

- 2.1. Written Objective Test

#### Criteria

- 2.1. Score a minimum of 70%.  
2.2. Complete exam within 90 minutes.  
2.3. Complete exam without using any reference books or notes.  
2.4. Complete exam at prescribed time and place.

#### Learning Objectives

- 2.a. List the five forms of energy.  
2.b.  Explain the concept of the fire triangle.  
2.c.  Explain the concept of the fire tetrahedron.

### 3. Explain the physical and chemical properties of fire.

#### Assessment Strategies

- 3.1. Written Objective Test

#### Criteria

- 3.1. Score a minimum of 70%.  
3.2. Complete exam within 90 minutes.  
3.3. Complete exam without using any reference books or notes.  
3.4. Complete exam at prescribed time and place.

#### Learning Objectives

- 3.a. Describe the chemistry of combustion.  
3.b. Describe the by-products of combustion.  
3.c. Describe the characteristics of solid-fuel fires.  
3.d. Describe the characteristics of liquid-fuel fires.  
3.e. Define the characteristics of gas-fuel fires.

### 4. Describe the process of burning.

#### Assessment Strategies

- 4.1. Written Objective Test

#### Criteria

- 4.1. Score a minimum of 70%.  
4.2. Complete exam within 90 minutes.  
4.3. Complete exam without using any reference books or notes.

4.4. Complete exam at prescribed time and place.

#### **Learning Objectives**

- 4.a. Explain the theories underlying combustion processes.
- 4.b. Describe how fire researchers have identified combustion processes using a variety of different classifications.
- 4.c. Provide a description of the stages and events of fire as it progresses from the initial stage to its final stage

### **5. Use basic terms and concepts associated with the chemistry and dynamics of fire.**

#### **Assessment Strategies**

5.1. Written Objective Test

#### **Criteria**

- 5.1. Score a minimum of 70%.
- 5.2. Complete exam within 90 minutes.
- 5.3. Complete exam without using any reference books or notes.
- 5.4. Complete exam at prescribed time and place.

#### **Learning Objectives**

- 5.a. Explain the causes of flame over, flashover, and backdraft and review the procedures to prevent and protect against such events.
- 5.b. Describe the various methods by which heat and unburned gases move in a confined environment.
- 5.c. Define the five classes of fires and explain how they are classified

### **6. Discuss various materials and their relationship to fires as fuel.**

#### **Assessment Strategies**

6.1. Written Objective Test

#### **Criteria**

- 6.1. Score a minimum of 70%.
- 6.2. Complete exam within 90 minutes.
- 6.3. Complete exam without using any reference books or notes.
- 6.4. Complete exam at prescribed time and place.

#### **Learning Objectives**

- 6.a. Correlate chemical structure with chemical names to allow for a general prediction of some hazardous chemical behaviors.
- 6.b. Understand key physical properties of chemicals and how these properties are related to fire protection

### **7. Describe other suppression agents and strategies.**

#### **Assessment Strategies**

7.1. Written Objective Test

#### **Criteria**

- 7.1. Score a minimum of 70%.
- 7.2. Complete exam within 90 minutes.
- 7.3. Complete exam without using any reference books or notes.
- 7.4. Complete exam at prescribed time and place.

#### **Learning Objectives**

- 7.a. Examine the basic components of the fire extinguishment process.
- 7.b. Review the five basic classifications of fire and explain the various types of agents used to extinguish or control fires in these five classifications.
- 7.c. Examine in detail the variety of agents used for fire extinguishment and explain the application methods for each of these agents
- 7.d. Identify and explain the benefits of using the latest technological advances in fire extinguishing agents such as compressed air foam and ultrafine water mist systems

### **8. Demonstrate how the characteristics of water can be used as a fire suppression agent.**

#### **Assessment Strategies**

8.1. Written Objective Test

**Criteria**

- 8.1. Score a minimum of 70%.
- 8.2. Complete exam within 90 minutes.
- 8.3. Complete exam without using any reference books or notes.
- 8.4. Complete exam at prescribed time and place.

**Learning Objectives**

- 8.a. Explain the extinguishing properties of water.
- 8.b. Describe the advantages and disadvantages of using water as an extinguishing agent.

**9. Compare other methods and techniques of fire extinguishments**