

**FIRE 72 Course Outline as of Fall 2006****CATALOG INFORMATION**

Dept and Nbr: FIRE 72                      Title: FIRE BEHAVIOR/COMBUST  
 Full Title: Fire Behavior and Combustion  
 Last Reviewed: 9/10/2018

| Units   | Course Hours per Week |                   | Nbr of Weeks |      | Course Hours Total |       |
|---------|-----------------------|-------------------|--------------|------|--------------------|-------|
| Maximum | 3.00                  | Lecture Scheduled | 3.00         | 17.5 | Lecture Scheduled  | 52.50 |
| Minimum | 3.00                  | Lab Scheduled     | 0            | 17   | Lab Scheduled      | 0     |
|         |                       | Contact DHR       | 0            |      | Contact DHR        | 0     |
|         |                       | Contact Total     | 3.00         |      | Contact Total      | 52.50 |
|         |                       | Non-contact DHR   | 0            |      | Non-contact DHR    | 0     |

Total Out of Class Hours: 105.00

Total Student Learning Hours: 157.50

Title 5 Category: AA Degree Applicable

Grading: Grade Only

Repeatability: 00 - Two Repeats if Grade was D, F, NC, or NP

Also Listed As:

Formerly: FIRE 60A

**Catalog Description:**

Theory and fundamentals of how and why fires start, spread, and are controlled. An in-depth study of fire chemistry, fire characteristics of materials, extinguishing and fire control techniques.

**Prerequisites/Corequisites:****Recommended Preparation:**

Eligibility for ENGL 100 or ESL 100

**Limits on Enrollment:****Schedule of Classes Information:**

Description: Theory and fundamentals of how and why fires start, spread, and are controlled. An in-depth study of fire chemistry, fire characteristics of materials, extinguishing and fire control techniques. (Grade Only)

Prerequisites/Corequisites:

Recommended: Eligibility for ENGL 100 or ESL 100

Limits on Enrollment:

Transfer Credit: CSU;

Repeatability: Two Repeats if Grade was D, F, NC, or NP

## **ARTICULATION, MAJOR, and CERTIFICATION INFORMATION:**

|                   |                      |            |           |
|-------------------|----------------------|------------|-----------|
| <b>AS Degree:</b> | <b>Area</b>          | Effective: | Inactive: |
| <b>CSU GE:</b>    | <b>Transfer Area</b> | Effective: | Inactive: |

|               |                      |            |           |
|---------------|----------------------|------------|-----------|
| <b>IGETC:</b> | <b>Transfer Area</b> | Effective: | Inactive: |
|---------------|----------------------|------------|-----------|

|                      |              |            |           |           |
|----------------------|--------------|------------|-----------|-----------|
| <b>CSU Transfer:</b> | Transferable | Effective: | Fall 1981 | Inactive: |
|----------------------|--------------|------------|-----------|-----------|

|                     |  |            |  |           |
|---------------------|--|------------|--|-----------|
| <b>UC Transfer:</b> |  | Effective: |  | Inactive: |
|---------------------|--|------------|--|-----------|

**CID:**

**Certificate/Major Applicable:**

Both Certificate and Major Applicable

## **COURSE CONTENT**

### **Outcomes and Objectives:**

Upon completion of the course, students will be able to:

1. Recognize the early traditions and history regarding extinguishing techniques, causes of fire, and statistics of fires in America.
2. Identify the difference between matter and energy.
3. Compare the three physical states of matter.
4. Describe the basic theory and terminology and fire development.
5. Describe basic fire extinguishment theory and terminology relating to heat.
6. Describe the basic laws of energy and mass.
7. Analyze fire chemistry as it relates to fire flame spread and fire behavior.
8. Analyze flame spread and fire behavior.
9. Analyze the hazardous effects of the products of combustion (carbon monoxide and carbon dioxide).
10. Identify how physical forces caused by fire can effect changes in the physical states of matter.
11. Explain the various testing methods for determining ignition temperature of solids, liquids, and gases.
12. Recognize and relate the difference among a compound, mixture, and a solution.
13. Identify the National Fire Protection Association (NFPA) fire codes of combustible and flammable liquids.
14. State three factors that control heat evolution from fires.
15. List the various forms of heat and the theories of heat transfer.
16. List at least five sources of heat in chemical, electrical, and mechanical categories.
17. Identify the ignition temperature, combustion properties, and smoke and toxic gases generated from burning common combustible

- solids, liquids, and gases.
18. Identify common polymer plastics and their combustion characteristics.
  19. Compare common thermoplastics and thermosetting plastics.
  20. Identify some common gases used in fire protection.
  21. Identify factors impacting wildland fire behavior.
  22. Identify fire behavior in contact with explosives and electricity.

### **Topics and Scope:**

- I. Introduction to the study of fire
  - A. History of fire
  - B. Natural causes of fire
  - C. Fire research
- II. Unit of measurement
  - A. System International (metric system)
  - B. Temperature ratios
- III. Matter and chemical properties change
  - A. Matter
  - B. Properties
  - C. Chemical change
  - D. Conservation of mass and energy
- IV. Heat transfer and the three theories of fire
  - A. Methods of heat transfer
    1. Radiation
    2. Convection
    3. Conduction
  - B. Fire triangle
  - C. Fire tetrahedron
  - D. Powell's Life Cycle of Fire
- V. Ignition
  - A. Piloted and auto ignition
  - B. Chemical kinetics
  - C. Evaporation
  - D. Humidity
  - E. Flash point
  - F. Temperature (ignition)
  - G. Spontaneous combustion
  - H. Flammable limits
  - I. Ignition of thick and thin fuels
  - J. Ignition time solid fuels
- VI. Flame spread
  - A. Smoldering and flaming combustion
  - B. Flame spread/fire spread
  - C. Wind aided and opposed flow
  - D. Spread on solid surfaces
  - E. Downward and upward flame spread
  - F. Flame spread on liquids
  - G. Halon and carbon dioxide extinguishment agents
- VII. Burning rate
  - A. Mass loss rate
  - B. Mass burn rate

- C. Mass burning flux
  - D. Surface temperatures
  - E. Vaporization temperature
  - F. Estimating energy release rates
  - G. Fire growth rate
  - H. Flame velocities
- VIII. Combustion products
- A. Concentration
  - B. Scope of combustion products
  - C. Diffusion flame
  - D. Smoldering or surface oxidation
  - E. Spontaneous combustion
  - F. Narcotic and irritant gases
  - G. Thermoplastics and thermosetting plastics.
- IX. Extinguishment theory
- A. Temperature reduction
  - B. Chemical flame inhibition
  - C. Fuel removal
  - D. Oxygen exclusion
- X. Wildland fire behavior
- A. Weather
  - B. Topography factors
  - C. Environmental elements
- XI. Explosive fire behavior
- A. Types and causes of explosions
  - B. Blasting agents
  - C. Electrical discharge

**Assignment:**

1. Reading one chapter per week.
2. One term paper.
3. One written assignment.
4. Eight to eleven quizzes

**Methods of Evaluation/Basis of Grade:**

**Writing:** Assessment tools that demonstrate writing skills and/or require students to select, organize and explain ideas in writing.

Written homework, Term papers, Definition Paper

Writing  
30 - 40%

**Problem Solving:** Assessment tools, other than exams, that demonstrate competence in computational or non-computational problem solving skills.

None

Problem solving  
0 - 0%

**Skill Demonstrations:** All skill-based and physical demonstrations used for assessment purposes including skill performance exams.

None

Skill Demonstrations  
0 - 0%

**Exams:** All forms of formal testing, other than skill performance exams.

Multiple choice, True/false, Completion

Exams  
60 - 70%

**Other:** Includes any assessment tools that do not logically fit into the above categories.

None

Other Category  
0 - 0%

**Representative Textbooks and Materials:**

Principles of Fire Behavior, Quintiere, James G., Delmar Publishers, 1998,  
Instructor Prepared Materials.